Ia Ara Aotearoa
Transporting
NEW ZEALAND

Road and rail

– delivering for New Zealand

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Foreword

Most of us don't think too hard about how the things we need in our daily lives get to us. We just trust that they do, that the getting there doesn't cost too much, and when our needs are satisfied, any consideration we did give quickly goes away. It's a bit like how most of us don't know how a car works, it goes and we only care when it doesn't. Or how those drugs work to improve our asthma or cure dad's cancer. We trust the experts. The transport industry is also run by experts, in many different businesses across the world. They know where they fit in a well-oiled supply chain and they are constantly tweaking how they do things and responding to challenges - often several times a day.

We need door-to-door, fast, efficient movement with minimal stops and starts to reduce transport costs.

Why is it that as a society we are content for politicians to stand over this chain and dictate to it? We don't expect a political philosophy to tell us how to repair our cars, or determine how our loved ones are medicated. Yet for some reason transportation has been politicised in New Zealand in recent years. We're told roads, cars and trucks are bad, presumably because they represent a market economy and because vehicles emit CO_2. Trains are "in" because they have never been able to be run as a profitable business in New Zealand and thereby, require Government control and subsidies.

The road freight transport industry is by no means against other modes of freight transport - in fact, our members are probably the largest customers of rail and where there are appropriate levels of demand, it makes great sense as a commuter solution for passengers.

Nick Leggett | Chief Executive

However, because we are experts in what we do, we know that rail cannot cope with much more of the freight task without slowing down movement, making it less efficient and more costly to the consumer. **Because rail delivers goods point-to-point and not door-to-door, trucks are still going to be required at either end to complete the journey.** More movement points mean slower, and more costly delivery, which in turn, adds economic drag.

Our online spending habits on those clothes or books from Amazon are driving new requirements from the chain that delivers them to us. We need door-to-door, fast, efficient movement with minimal stops and starts to reduce transport costs. More spending is going online. That isn't good news for rail freight as a clunky, inefficient delivery service in the middle.

Reasonable people ask: "surely we can put more freight on rail?" It's a reasonable question, and a response needs to be able to answer how realistic is it for New Zealand to put significantly more freight on rail, and how much money are we prepared to spend in pursuit of this?

The Government has indicated it may wish to spend $5 billion on rail over the next five years, without any specifics around where that might be spent and what the return on investment might be. We support investment in replacing aged assets on the existing network to allow a functioning rail freight service. However, there is such a lack of information on what goal the additional spend is pursuing that it's hard to give, or get, a coherent response.

So, how much of New Zealand's freight movement is actually even contestable by rail? We estimate it might be around 12 percent - it currently sits at 6 percent. This is probably generous. In fact, the whole notion of contestability is highly questionable.

It's easy for the Government to use negative rhetoric around "getting trucks off the road", but what the evidence and independent research says is that even if rail freight grew faster than road freight, the bulk of the future freight growth would still need to be accommodated by trucks. In 2005 rail and road carried approximately 19 and 100 million tonnes respectively. Given the magnitude of order difference, it is inconceivable that rail would have the capacity or capability to accommodate the freight growth that trucks have been managing. For example, if total freight growth was approximately five percent per annum (or six million tonnes), and all that growth was expected to be

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There is much at stake, primarily the well-being of people in communities all over New Zealand who depend on a strong economy and efficient, customer-driven freight system for their lives and livelihoods.

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moved by rail, then rail would have to near double its activity in 3 years. Would that mode shift be a realistic possibility? No, it would not. More freight equals more trucks whichever way you slice it because rail can only ever hope to be helpful for part of the freight task.

Previous New Zealand studies show that rail starts to compete with road at distances greater than 400 kilometres – inter-regionally.

Yet 80 percent of freight in New Zealand is moved within a region. You aren't seriously going to put freight on a train at the Auckland Port, shift it to a yet-to-be-built hub somewhere in Auckland, to then be put onto a truck to take it to a warehouse somewhere in Auckland. Would all that be just for the sake of saying you are "putting more on rail"? You are going to put it on a truck at the port and take it straight to its end destination. That's the most effective use of resource.

Ia Ara Aotearoa Transporting New Zealand backs the Government on the need to improve public transport through greater investment. We support the reduction of emissions as technology allows over time. Progress won't be driven by starry-eyed sales people, or ideologically captivated politicians or government officials; it will be driven by tried and tested technology.

This paper puts some evidence around our response to Government rhetoric on rail. We are a small organisation with little funding, but we hope we have brought more thinking and evidence to the table to balance the discussion and debate on rail.

New Zealand is an island nation with few people and varied often challenging terrain. We lack the scale and density needed for rail to be as successful as some wish it to be. The idea that some slogans and a few billion dollars of Government "investment" can change the trajectory of efficient and effective freight movement over the years, is a fantasy. The risk is we waste a lot of money, continue to clog our choke points in big cities, and forgo spending on other meaningful and significant infrastructure that drives our economy.

In this COVID-19 environment, with economic storm clouds gathering, and a need to transition to a lower emission economy, we cannot afford to slow our economy with politicised decisions based on fanciful rhetoric on infrastructure. There is much at stake, primarily the well-being of people in communities all over New Zealand who depend on a strong economy and efficient, customer-driven freight system for their lives and livelihoods.

Structure and content of this paper

As part of assembling evidence to bring balance and more informed views to Government's rhetoric on rail Ia Ara Aotearoa Transporting New Zealand (Transporting New Zealand), formerly the Road Transport Forum, commissioned David Greig to prepare a report on the roles of road and rail in Aotearoa New Zealand (New Zealand). David Greig is an economist who has worked on transport policies and projects in the NZ Treasury, the Victorian Treasury and Australian consulting firms including Travers Morgan, Booz Allen, PwC and ACIL Allen. He has also worked at the Te Manatū Waka Ministry of Transport, the Organisation for Economic Co-operation and Development (OECD) and the Australian Productivity Commission. Greig's work borrows heavily from the research report *The history and future of rail in New Zealand* completed by Dave Heatley in 2009. Heatley was a Research Fellow for the New Zealand Institute for the Study of Competition and Regulation while undertaking that research. Therefore, we would particularly like to acknowledge the work of these two authors in their contributions to this paper.

In addition to the above, the policy and technical teams at Transporting New Zealand have sought a diverse range of information, local and international, and have compared that information to Government policies.

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This paper starts with a deep dive into the notion of intermodal contestability and we scrutinise Government's advice on the benefits of rail. This is followed by chapters on emissions and other externalities. We have chosen this order to align with the benefits Government claims when justifying its commitment to rail, that being, *"in the long-run, shifting freight off the roads and onto rail will have significant safety, congestion and environmental benefits"*. This is followed by chapters on economics, a comparison of the road and rail networks, and the impact of government influence over time. The paper ends with chapters on overseas benchmarking and a look back over rail's history.

At the beginning of each chapter, for the ease and convenience of the reader, we summarise Transporting New Zealand's views. We then provide the evidence and rationale that underpins our views.

For the convenience of the reader, rather than refer you to other reference sources, we have reproduced that material. As a consequence, this paper includes a variety of styles and written perspectives, referencing styles, charts, figures and diagrams. We believe that substance dominates style and for authenticity we have not always edited that material.

Executive summary

In April 2021, the Government released the New Zealand Rail Plan 2021 in which it refers to the $5 billion it has committed to rail in less than three years. Its justification is: "*We need to invest to provide a resilient and reliable rail freight network that supports current services. This investment will provide a platform for future investment to support growth in rail freight. This will take time given the state of the current network and significant investment is required over the next decade, and beyond. In the long-run, shifting freight off the roads and onto rail will have significant safety, congestion and environmental benefits*".

This Transporting New Zealand paper assembles evidence to scrutinise the policy development that underpins the Government rhetoric (quoted on page 6) and in doing so, it brings greater balance and enables more informed discussion on freight movement, as opposed to passenger transport, by road and rail. Our views are:

- **We support Government investment in rail where it makes good sense:**
  - Rail has an important part to play in moving the freight task and in some cases, particularly where the inherent challenges of our mountainous terrain have been reduced by the construction of railway tunnels, such as the Remutaka Tunnel and the Kaimai Tunnel, it is a competitive alternative to road freight.
  - Where there are appropriate levels of demand, rail makes great sense as a commuter solution for passengers.
  - We are not anti-rail. The movement of freight underpins driving our economy therefore rather than pick winners or have a myopic mode focus, we support Government investment in infrastructure investment where quality business cases stack up.
- **The Government's basic strategy is fundamentally flawed because:**
  - The movement of freight is a key contributor to the economic success of the nation. Government's focus should be on supporting and improving the movement of freight. With the exception of a relatively small number of cases, road freight is undeniably the most efficient and effective means of moving freight in our country. In essence, the Government's rail strategy aims to deliver benefits to safety, congestion and the environment. We agree these are important however, they are transport externalities. Those outcomes are very much second order compared to the primary purpose of the vast majority of heavy vehicles which is to keep the economy going by moving freight. Government has mistakenly confused its priorities.
  - Generally, it is accepted there is a positive correlation between economic growth and vehicle kilometres travelled. Policy makers around the world have grappled with the challenge of decoupling the relationship between economic growth and vehicle kilometres travelled. In the absence of clear evidence that this can be successfully achieved, we are concerned that Government policies that will stifle transport movements will also adversely impact the growth of our economy and the quality of our lives.
  - We have seen no robust evidence from Government that resilience and reliability are the underlying issues to the recent decline in rail's relative contribution to completing New Zealand's freight activity. Therefore, we cannot see how the billions of dollars that Government has committed to rail will arrest that slide, let alone shift freight off our roads.
- **Government strategy appears to be deliberately vague and that creates uncertainty and risk:**
  - Government speaks of shifting freight off the roads and onto rail. Given Government considers its $5 billion commitment to be an "investment" we presume it will expect a commercial return. Generally speaking, rail's share of the freight task has been declining and road's share has been increasing over the past decade. It would therefore appear that some draconian regulatory intervention will be required to change the mode share that the market would otherwise normally determine.
  - Historically, Government has shown a strong desire to protect its existing infrastructure investment in rail from the increasing competition from road transport. However, given the efficiencies that road freight offers and for the good of the national economy, over time those Government constraints have subsided. Any return of Government intervention to artificially change modal share is a failing to learn.
- **The notion of Government determining and controlling modal share lacks rational policy sense; it is an enigma:**
  - It is implicit in a desire for "shifting freight off roads and onto rail" that the modal share at the time is incorrect, otherwise why would Government be wanting to change it? For those with that misguided belief, it must also then follow that there is an ideal modal share. It is impossible for anyone, let alone Government, to identify a meaningful ideal modal split.
  - If the Government insists on controlling modal share, then it owes it to taxpayers to define what the ideal modal shift is; and how much it will cost to achieve that both in capital and ongoing operational costs.
  - Fundamentally, for the concept of controlled mode share to work effectively, the modes need to be competent competitors. This is an ideological position based on an irrational assumption that rail can flourish without road transport support. In reality, it is the opposite that exists.
- **We have serious concerns with the way Government and its advisors are providing information to justify its approach:**
  - The information it has provided underpinning the claimed environmental benefits is emotive and unbalanced. It lacks scrutiny, context and integrity. The Te Manatū Waka Ministry of Transport (MoT) needs to acknowledge those shortcomings with its research, otherwise there is a very real risk that poor policy making will result from future benefit-cost analyses based on that data.
  - We reject the efforts being made to establish whether road is more environmentally efficient than rail, or vice-versa, because it is like comparing chalk and cheese.

- **Subsidising rail to keep it viable does not make economic sense:**
  - The rail infrastructure has not produced an economic level of return, or during some periods any return, for decades. Throughout its history, railways have needed Government subsidies. Despite several attempts from Government over the past century to intervene and shift freight to rail, the long-term trend has been a deterioration in rail's financial performance and we do not see the latest investment changing that trend. Government's failure to learn from history is deeply concerning.
  - Coastal shipping and road freight pay their own way. The only freight mode that gets continued and substantial Government financial support is rail.
  - Roads are funded on a user pays, pay-as-you-go basis which includes funding of new investments. On average trucks pay more than their share of road costs. Diverting to rail some of the road user charges (RUC) revenue paid by trucks will work against, not towards, competitive neutrality. If the Government has wider policy reasons for supporting railways it should fund that in the way it funds other general policies, from general tax revenues.
- **We are concerned with the general process and approach of Government's advisors:**
  - There is a lack of quality information and evidence being shared to underpin and justify Government policies.
  - The policies do not appear to include comprehensive analyses of: options, trade-offs, opportunity costs, and risks.
  - There is a consultation process followed however, it is typically undertaken in a way that leads and constrains feedback so there is a bias in submissions.
  - We have raised the above concerns with Government previously and we are concerned that it does not appear to be altering its course.

Nothing we have seen in Government's information on funding rail causes us to shift our industry position on the right to trade and mode neutrality. These are summarised below:

- **We believe the freight market is customer driven and ultimately, the customer, whether in New Zealand or in our export markets, will decide on price, convenience and/or time, and what is the best mode of transport for their freight.**
- **Competition between road freight companies and other modes of transport (road/rail/shipping) has served New Zealand and its economy better than Governments "picking winners" and favouring one transport mode over another.**
- **A Government giving an advantage to one transport mode over another inevitably creates unnecessary additional costs and lower overall economic prosperity, because it removes the choice to use the most cost-efficient freight solution.**

According to the MoT's freight model, about 30 percent growth in rail freight net tonne kilometres (NTK) is expected in the next 30 years, or one (1) percent per annum. Road NTKs are expected to increase by about 60 percent. We are already seeing a deterioration in the quality and condition of road surfaces and further Government subsidies to keep rail going expose the freight activity to risk of a lose-lose scenario.

We hope the information in this paper is sufficiently compelling to bring more informed debate and that it shifts Government thinking so that it leaves the choice of freight to be determined by the market.

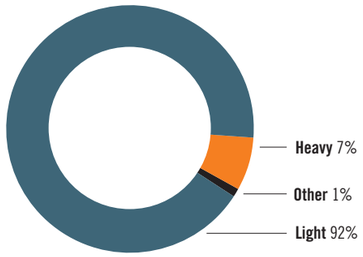
Intermodal contestability

Ultimately, the Government's justification for its $5 billion commitment to rail is: *"In the long-run, shifting freight off the roads and onto rail will have significant safety, congestion and environmental benefits"*. To enable that shift it believes, *"We need to invest to provide a resilient and reliable rail freight network that supports current services"*. In this section we look at some context, trends here and overseas, and we explore some of the issues we see with Government policy development and in particular its notion of intermodal contestability.

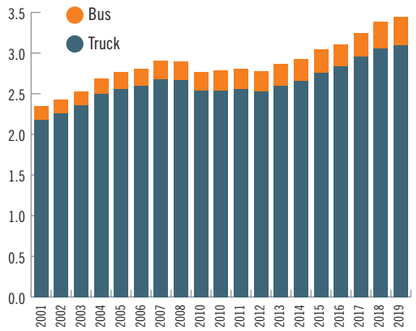
Our views are:

- We are not anti-rail. The movement of freight underpins driving our economy therefore rather than pick winners or have a myopic mode focus, we support Government investment in infrastructure investment where quality business cases stack up.
- Rail has a place to play in moving freight however, we have seen no evidence that resilience and reliability are actually the real issues underlying its failure to keep up with our growing freight task.
- In essence, the Government's rail strategy aims to deliver benefits to safety, congestion and the environment. We agree these are important however, they are transport externalities. Those outcomes are very much second order compared to the primary purpose of the vast majority of heavy vehicles which is to keep the economy going by moving freight. Government has mistakenly confused its priorities. Government's focus should be on supporting the most effective mode which is road freight because with the exception of a few isolated cases, road freight is undeniably the most efficient and effective means of moving freight in our country.
- There are major issues with Government's policy making:
  - The data it is using lacks integrity.
  - It is implicit in any desire for "shifting freight off roads and onto rail" that the modal share at the time is incorrect, otherwise why would Government be changing that split? For those that hold that misguided belief, it also then follows that there is an ideal modal share. It is impossible for anyone, including Government, to identify a meaningful ideal modal split. The notion of driving an ideal modal split lacks rational policy sense; it is an enigma.
- "Shifting freight off roads and onto rail" is an action. It is changing the environment that is currently determined by the market. That action most likely requires Government intervention, i.e. regulating to artificially promote one mode and/or constrain the other. Interventions have been tried several times before and each time they have failed and cost the economy. There has been no evidence presented to support why this proposed shift would work.
- The freight market should be left to be driven by the customer and ultimately, the customer, whether in New Zealand or in our export markets, will decide price, convenience and/or time, and what is the best mode of transport for their freight.

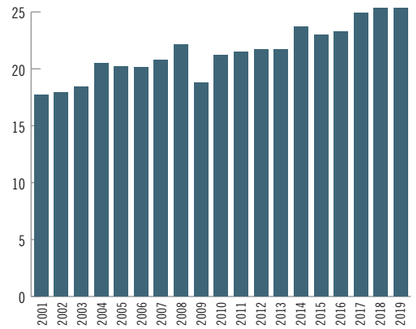
[1]**Figure 1:** Vehicle kilometres travelled by fleet size



[1]**Figure 2:** Heavy fleet travel (billion kilometres)



[2]**Figure 3:** Road freight tonne-kilometres (billions)



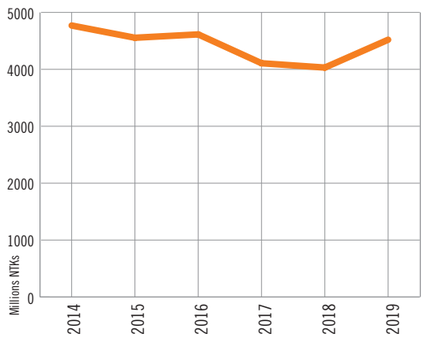
Trends in the respective freight tasks

Increasing travel by road freight

Trucks, carrying freight, are the major contributor of heavy vehicle travel. Except for the period of 2008 – 2012, which was likely affected by economic conditions, annual distance covered by the heavy fleet has increased every year since 2000. Since 2013, the trend has been increasing with every year.

Figure 1 and Figure 2 show context in terms of the share of heavy vehicle kilometres travelled in New Zealand by vehicle weight; and heavy vehicle (bus and truck) kilometres respectively. While we have not seen any analysis, we suspect that factors such as the Global Financial Crisis and the uptake of higher productivity trucks contributed to the interruption of growth in 2008 to 2012.

[3] **Figure 4:** KiwiRail freight activity (net tonne-kilometres)



Year	Total net tonne kilometres	Year- on-year growth
2015	4,555,538,933	-
2016	4,614,346,265	+1%
2017	4,107,124,092	-11%
2018	4,031,154,811	-2%
2019	4,520,177,361	+12%
Change since 2015	(35,341,572)	-1% (Total growth)

[1] AnnualFleetStatistics.pdf (transport.govt.nz)
[2] https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/sheet heavy-vehicles
[3] https://www.transport.govt.nz/area-of-interest/infrastructure-and-investment/future-of-rail/

Figure 3 shows the trend in road freight activity (tonne-kilometres) and while that does not exactly mirror the heavy vehicle kilometres travelled year-on-year, there is similarity in that both are generally increasing.

For the period 2012 to 2020 it is notable that heavy vehicle kilometres travelled (Figure 2) increases as does the road freight task (Figure 3) however, the freight task carried by rail is at best, stagnant, or declining (Figures 4 and 5).

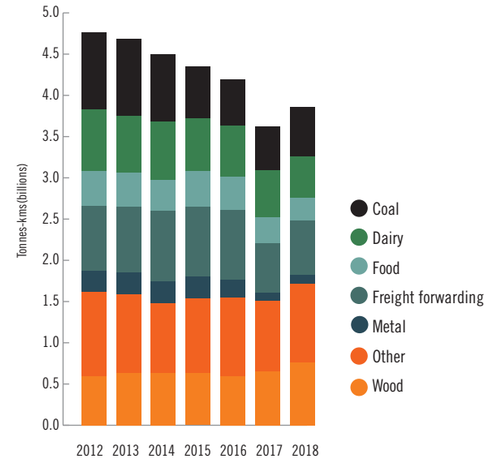
It is also notable that when the datasets in Figure 4 and Figure 5 are scrutinised further, it can be seen that the values for the respective years differ significantly. Even taking into account whether a phasing issue may have occurred with the two datasets, there still remains a significant variance in the rail data and this calls into question the integrity of the data.

Figure 6, shows KiwiRail's freight task on a tonne basis. Over the past five years the task has been relatively stagnant at about 18m tonne per annum. Bearing in mind the downward trend in tonne-kilometres shown in Figure 5 between 2012 and 2018, it would therefore appear there has also been a decline in the haul distances. Generally speaking, shorter hauls on rail are more likely to be associated with more inefficiencies, particularly if there is double handling involved. Alternatively, it could indicate that there are some routes, for example the "golden triangle" bounded by Auckland, Waikato and Tauranga where rail works well. Or, on the other hand, it could be another data integrity issue. In our view, Government and its advisors should be scrutinising the data and those trends, and it should be clear during consultation that it has a thorough understanding and explanation of the issues before making important policy decisions.

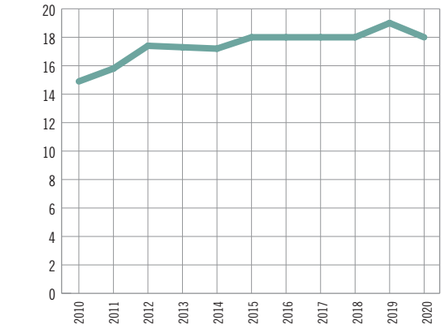
As recently as June 2021, in its consultation on the Pathways to Net Zero by 2050[4] we identified and advised the MoT of further examples of data integrity issues. Within that paper there were inconsistent references to rail carrying both 11.5 and 16 percent of the tonne-kilometres freight task.

Putting aside the discrepancies in the data, and comparing the freight activity over time of the relative modes it seems indisputable that the road activity is increasing whereas, rail has been stagnant or generally decreasing.

[5] **Figure 5**: Rail freight tonne-kilometres by commodity



[6] **Figure 6:** Rail freight task by net tonnes (millions)



[4] Hīkina te Kohupara - Kia mauri ora ai te iwi Transport Emissions: Pathways to Net Zero by 2050
[5] FIGS Freight and logistics | Te Manatū Waka Ministry of Transport
[6] KiwiRail Annual reports 2014 to 2020

We believe rail has a place to play in moving freight however, we have seen no robust evidence from Government that resilience and reliability are the underlying issues contributing to its decline.

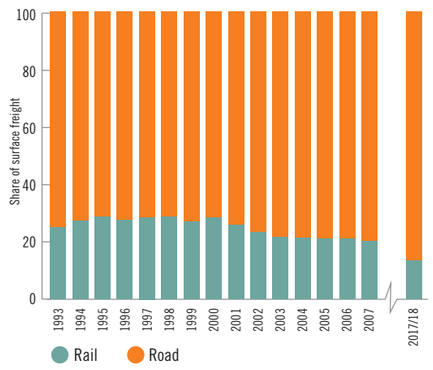
Surface freight share

Data on freight modal share is relatively sparse and difficult to find. Figure 7, below, also indicates a general trend of rail losing modal share over the past quarter of a century and this appears to align with anecdotal evidence. A similar shift is observed in Figure 8, below.

Although there is no comprehensive data on New Zealand freight transport by mode, two reports provide a snapshot of modal shares in 2002 and 2008 (Bolland et al 2005; Richard Paling Consulting 2008). Data from these reports, summarised in Figure 8, shows that road's share of the freight market increased from about 67% in 2002 to about 70% in 2008. It appears that this increase was due mainly to substitution from rail to road.

Over time there has been a decline in rail's contribution in completing New Zealand's surface freight task. We believe rail has a place to play in moving freight however, we have seen no robust evidence from Government that resilience and reliability are the underlying issues contributing to this decline. Therefore, we cannot see how the billions of dollars that Government has committed to rail will arrest that slide, let alone shift freight off roads. Government should act responsibly and clearly justify its commitment.

[7]**Figure 7:** Surface freight modal share (% net tonne-kilometres)



[8]**Figure 8:** Mode shares of freight markets by tonne-kilometre

Mode	2002	2008
Road	66.5%	~70%
Rail	17.8%	~15%
Sea	15.3%	~15%
Air	0.3	<1%

[7] Heatley Report, (Richard Paling Consulting, 2008) with 2017/2018 update by Transporting New Zealand
[8] NZTA Research Report 534

Shifting freight off the roads and onto rail

The New Zealand Rail Plan speaks to, "*in the long-run shifting freight off the roads and onto rail*".

Generally, the market and the customer determine the most appropriate mode for freight. Our interpretation of "shifting freight off the roads" is that Government aims to actively intervene and direct the mode choice, regardless of the market and customer's preference. Bearing in mind the considerable Government rhetoric, and in the absence of a clear answer about its intent, we owe it to our sector to identify the risks associated with this plan and raise awareness.

If Government is planning to actively intervene and direct mode choice, then it is implicit that the modal share at that time is incorrect. Otherwise, why would Government be wanting to make changes. Simple policy logic means that there must be an ideal modal share and presumably, Government intends to have a regime that maintains the freight task at that hypothetical ideal level. We believe this is a nonsense and furthermore, bearing in mind the issues raised above regarding the integrity of data, such an intervention is neither feasible or viable.

Our "right to trade and mode neutrality" policy is summarised below:

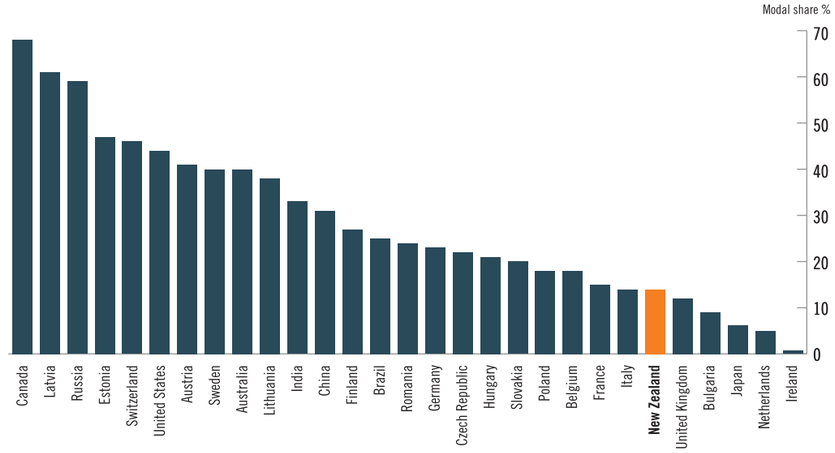
- We believe the freight market is customer driven and ultimately, the customer, whether in New Zealand or in our export markets, will decide on price, convenience and/or time, and what is the best mode of transport for their freight.
- Competition between road freight companies and other modes of transport (road/rail/shipping) has served New Zealand and its economy better than Governments 'picking winners' and favouring one transport mode over another.
- A Government giving an advantage to one transport mode over another inevitably creates unnecessary additional costs and lower overall economic prosperity, because it removes the choice to use the most cost-efficient freight solution.

It is impossible for anyone, including Government, to identify a meaningful ideal modal split. At any point in time modal share is driven by the customer and the respective mode's offer.

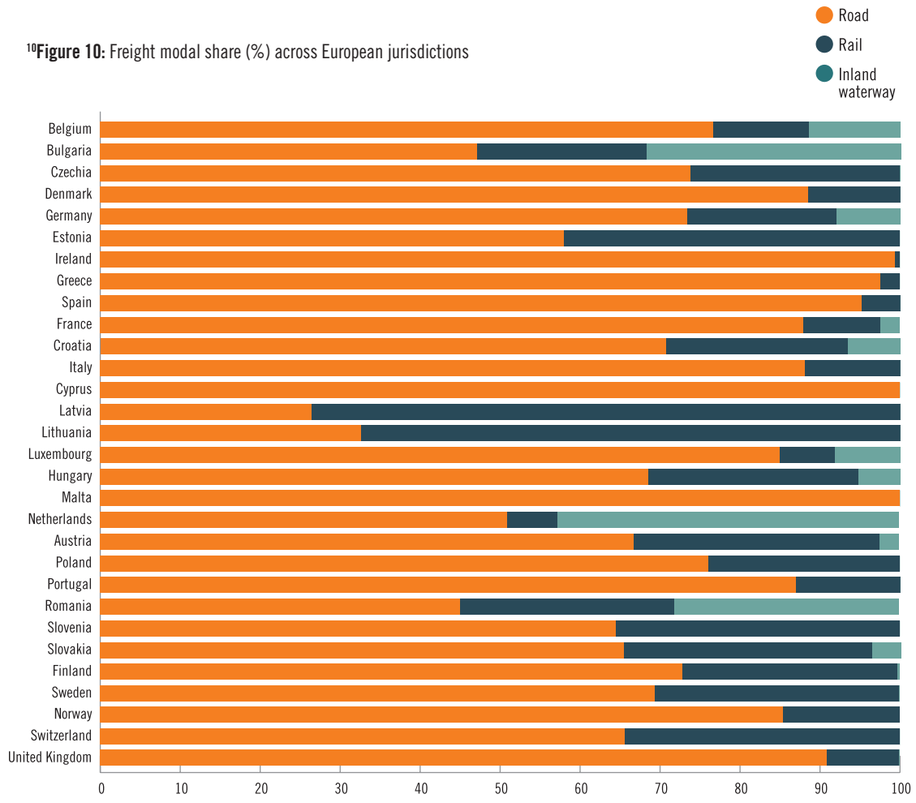
The latter will be determined by a complex set of factors, both internal and external, such as but not limited to: geography, population, infrastructure, technology, the strength of the economy, cost and culture. With that in mind, rather than consider a respective mode's share as being right or wrong, which is an inherent inference by Government and underpins its desire to intervene and drive some other hypothetical sharing, the split should simply be viewed as "it is correct at any time as determined by the market". This would require a mindset change for Government and its advisors.

If Government is planning to actively intervene and direct mode choice, then it is implicit that the modal share at that time is incorrect.

[9]**Figure 9:** Rail share of freight tonne-kilometres (%)



[10]**Figure 10:** Freight modal share (%) across European jurisdictions



[9] https://en.wikipedia.org/wiki/List_of_countries_by_rail_usage

[10] https://ec.europa.eu/eurostat

Figures 9 and 10, left, show freight modal share (tonne-kilometres) across a range of international jurisdictions. There is a diverse range of modal share respectively. In some countries that are arguably not dissimilar to us and ones that we might aspire to, road has a greater share of the modal split and in others road has a lesser share. This begs the question, what does Government think is the right share for New Zealand, and at what point does it stop shifting freight from road to rail, or between any other mode for that matter?

We demonstrate another example of the challenge for Government to identify an ideal modal share by looking at the European data.

Comparing Figures 11 and 12, right, in Europe approximately 9.5 times more freight is carried on road than rail (by weight) whereas, in New Zealand 13 times more freight is carried on road than rail. Is anyone qualified to say whether one scenario is better than the other, or is it even a useful question to consider? We don't think comparisons are that useful.

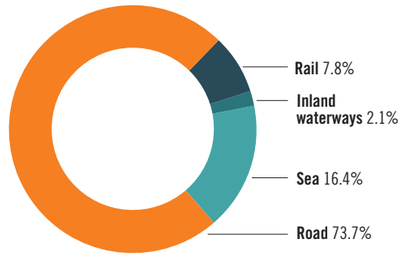
According to MoT research (National Freight Demands Study 2018) road freight transport accounted for 93 percent of the tonnes of the surface freight moved, or 87 percent of the tonne kilometres of freight activity, in New Zealand at that time.

This raises another intriguing issue in that it appears that both freight activity indicators, namely tonne and tonne-kilometres are frequently used. There is not a strong correlation between the two, and this is demonstrated above. Over a period, rail freight tonnage in New Zealand remained relatively constant but tonne-kilometres decreased. Whereas, over other periods, tonnage and tonne-kilometres may have trended similarly, in other words, they could have increased or decreased together. Any of these scenarios are possible and all are equally valid, there is no right or wrong. Therefore, there is very limited value in how these indicators can be used to compare modes and their use is problematic for good policy making. It is further evidence that the notion of an ideal modal share is a nonsense.

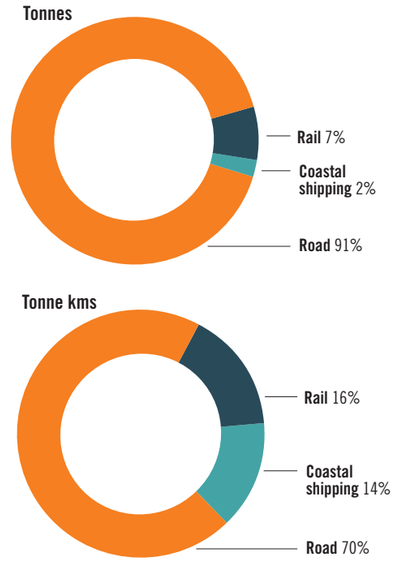
If the 93 percent of the total tonnes of freight moved by road changed to 90 percent would that be good or should it be less? For example, would any other number we might randomly select such as 83.6 percent be the magic number? Government cannot categorically state what degree of modal shift is needed. Furthermore, how much money is the Government prepared to invest in the pursuit of this shift and is it justified?

That uncertainty demonstrates the irrationality of Government's misguided obsession to direct modal share. We urge Government to stop any further thought on determining the amount of freight that can be shifted to rail or to coastal shipping and instead, leave that to the customer.

[11]**Figure 11:** European Union 27 Modal split of freight (tonnes)



[12]**Figure 12:** Modal split of freight (tonnes) and Modal split of freight (tonne-kilometres)(2012 data from Europe)



[11,12] International Road Union, Eurostat

Operational and logistical factors influencing mode choice

If our argument thus far still leaves any doubt as to why mode share should be determined by the market, in this section we discuss a range of the factors that drive choice of modes. Factors affecting choice include[13]:

- **transport costs, and therefore the pricing structure, of each mode**
- **location and capability of loading and facilities, especially for rail**
- **size of the freight task – bigger tasks suit rail**
- **length of the journey – longer journeys suit rail**
- **availability of back loads – this appears to be more important for rail**
- **time and frequency requirements – generally trucks are faster and more frequent**
- **reliability**
- **congestion on roads and railway lines**
- **availability and price of sea freight, which competes more with rail than with road**
- **environmental and safety considerations**
- **physical restrictions, such as but not limited to tunnel heights and gradients, these have a greater effect on rail as trucks can travel on almost any road.**

Circa 2002, Mackie et al constructed a matrix of origins and destinations showing which links were "rail suitable" and calculated that 42 percent of New Zealand's total freight task was transported on those routes. We understand the current picture would be similar. However Mackie's work concluded that,

"it is unlikely that rail is going to transport more than 20% of the nation's freight task. The realistic modal shift may be even less…"

The current rail mode share of land transport (i.e. not including coastal shipping) is 13-14 percent.

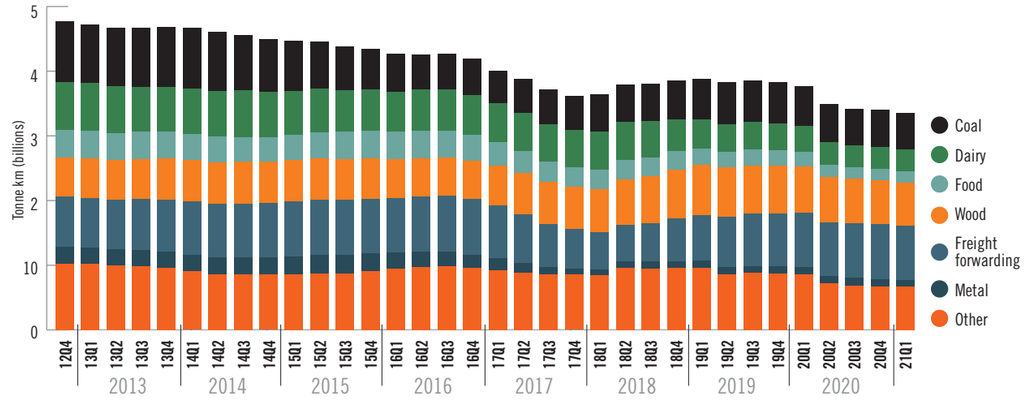
In addition to the list of factors above, another issue that is often overlooked is the ride quality of the various modes and the risks that pose to the goods being transported. Research completed in 2012[14] showed that compared to travel by sea and road, goods transported by rail experienced higher accelerations in all directions, laterally, longitudinally and vertically, and not only was the ride quality more severe but the percentage of journey time during which that freight experienced higher accelerations was also higher. The paper refers,

"This result supports the current practice of predominantly using rail to transport bulk goods, such as coal and grains, because higher dynamic loading is less problematic for such goods… When considering damage to goods, it is the severe accelerations that are of most importance".

Therefore, damage to goods is another issue to carefully consider with travel by rail.

[13] Adapted from TIERNA, H Mackie et al, The contestability of New Zealand's road freight task by rail.
[14] NZTA Research Report 497, Freight transport efficiency: a comparative study of coastal shipping, rail and road modes. PD Cenek, RJ Kean, IA Kvatch, NJ Jamieson

[15]**Figure 13:** Goods distribution of rail freight



Cost competitiveness between rail and road

As a general rule, the rail mode has a competitive advantage over road transport in carrying large quantities of goods which have a low value per unit weight - these are the so-called "bulk" goods, such as grain, coal, oil, minerals and chemicals - over a long distance with little if any pressure on urgency of delivery.

For almost all other freight services (except to some extent longer distance containerised freight), rail faces strong competition from the road mode. According to the OECD, in countries which are substantial producers of bulk commodities such as Russia, China and the United States, rail tends to have a substantially higher share of the overall freight transport market. The 2020 commodity shares within New Zealand rail freight by net tonne kilometres are 25 percent freight forwarding, 20 percent wood, 17 percent coal, 10 percent dairy products, five percent food (mainly meat) and four percent metals. Figure 13 indicates a similar trend with bulk goods making up a relatively high proportion of rail's activity.

In New Zealand, coal is the only commodity where rail has a higher modal share than road freight. Rail freight also carries a large share of processed meat and dairy products. Typically containers are used to transport goods – manufactured and agricultural – to or from ports and between cities. In other words, containers are used for most freight other than bulk (coal, logs, aggregates etc).

Figure 14, below, indicates a cost advantage for rail over road in container transport (apart from handling costs). Industry sources confirm that this data is broadly consistent with current experience and that coastal shipping has a further cost advantage over rail. As the three modes compete on this sector, it is apparent that customers and integrated logistics companies choose different trade-offs between cost, delivery times, and handling. It is also clear that the parameters for rail mean that it competes directly with both coastal shipping and road. Less competition between road and coastal shipping can be expected. This is relevant to suggestions that the Government should support coastal shipping, as the main competitive loser would most likely be rail.

[16]**Figure 14:** Freight mode costs to move container Auckland to Christchurch 2008

	Coastal shipping	Rail	Road
Days to deliver	4	2.5	1.5
Costs per tonne	$100	$150	$233
Times handled	6	4	2

[15] Ministry of Transport Freight Information Gathering System (FIGS) data
[16] Hyder Consulting, 2008

Road has an overwhelming advantage where minimal handling is important (e.g. livestock), timing is critical (concrete) or endpoints are dispersed.

General freight transported by rail usually needs roads at one or both ends to achieve door-to-door delivery. Today's reality is that rail needs road, the reverse however is not true.

Road has an overwhelming advantage where minimal handling is important (e.g. livestock), timing is critical (concrete) or endpoints are dispersed. It should also not be forgotten that the majority of rail freight journeys have to be completed by truck journeys at one or both ends. For general (non-bulk) freight, the rail network competes directly with a part of the state highway network. The state highway network is 2.7 times longer and has better connectivity with local road networks. Roads have economies of scope too, since they are also used for various purposes including private transport, buses and trucks, which all share the costs. General freight transported by rail usually needs roads at one or both ends to achieve door-to-door delivery. Today's reality is that rail needs road, the reverse however is not true.

'Intermodal' is the term used to describe a door-to-door freight service that spans more than one mode of transport. **Intermodal rail freight suffers from several competitive problems, including:**

- **longer overall transport distances**
- **slower door-to-door delivery**
- **increased handling.**

Gaballa & Cranley (2008) examined the greenhouse gas emissions from transporting items in a standard basket of food from its source in Australia, to Melbourne, by road and by intermodal transport. Heatley's re-analysis of that data showed that the weighted average distance for intermodal transport was longer than the road-only distance.

The situation is likely to be similar or more pronounced in New Zealand where railways largely follow alignments created 100 or more years ago through more difficult terrain than in Australia. There have been substantial ongoing realignments of roads in the interim, and apparently fewer realignments of rail. The main rail realignments in the past few decades include those associated with Hamilton – Palmerston North electrification and the Kaimai tunnel.

Janic (2008) reports that the road portion of intermodal transport in Europe accounts for 30-40 percent of total costs. If this ratio applied in New Zealand, then the rail mode needs a substantial cost advantage per tonne-kilometre to be evenly priced with road.

Relationship between freight value and mode of travel

Transport carries freight between end points, and the value of the transport service is indicated by what customers are willing to pay – generally the highest per net tonne kilometre for road freight, intermediate for rail and lowest for coastal shipping. The different values reflect the attributes of the modes:

- Road freight has the biggest network, is generally the fastest[17] (especially on a door-to-door basis), most reliable and most flexible (both routes and timing) and hence can both command higher freight rates and secure most of the business (over 80 percent of total New Zealand NTKs). Truck competitiveness has further improved with increases in maximum vehicle length and weight, and arguably there is a case for a further increase for trips on new motorways, notably Auckland-Cambridge.
- Rail freight is intermediate on these attributes, has lower line-haul costs than road, and generally charges a margin below the road freight rate. It has lower costs because one train is the size of many trucks, fuel consumption per NTK is usually lower, and in some cases tunnels provide the best route. The main ones are the Otira tunnel (West Coast to Canterbury), the Kaimai tunnel (Bay of Plenty to Waikato) and the Remutaka tunnel (Wairarapa to Wellington). Rail freight also suits delivery to ports, and bulk freight such as coal and dairy – and Fonterra has invested in facilities that allow it to mainly use rail freight from its factories. However, often at end points there are double handling costs: loading/unloading and road transport for the "last mile". This means that rail freight trips other than for bulk commodities and ports need to be long by New Zealand standards.
- Coastal container shipping has the lowest costs (on a port-to-port basis) but offers few routes and low frequencies. Coastal shipping has only one regular New Zealand container service (Auckland-Lyttelton, once a week) having been displaced from other routes initially by rail and later also by road freight. However, it dominates some bulk trades, notably petroleum; others include fertilizer, grain, cement and gravel. It is occasionally suggested that coastal shipping should be subsidised; if it was, the relative attributes mean the main loser would be rail freight (which in turn would seek higher subsidies).

A simplistic model

In ending this section on modal share, we suggest that rather than Government spend time developing arbitrary ideological limits for mode share, it considers the concept and risks simply demonstrated in Figure 15.

The mode freight hierarchy is commonly used among transport practitioners as a simple way to demonstrate the relationships and levels of "contestability" between the modes.

Each mode has its own inherent strengths and weaknesses and as a result the modes adjacent to each other have higher degrees of contestability than those that are further apart. For example, freight currently travelling by air is much more likely to be contested by road than it would be by coastal shipping. Similarly, there is likely to be more contestability of freight between rail and coastal shipping than there is between rail and air. Policy interventions that promote one mode over another skew those respective characteristics, and present risk to adversely impacting freight costs and meeting customer expectations.

Figure 15. The mode share hierarchy model

It is pertinent to consider this hierarchy and the concept now, particularly given the focus on climate change policies. Given the Government's recent climate change direction, it appears predictable that in time it will promote coastal shipping. Should that eventuate, there is the risk that rail could lose more share to coastal shipping than the share that shifts off road and therefore, the net result is a poor financial performance from rail. The Government would do well to consider the perverse outcomes that can result from its meddling.

We hope the reasons above are sufficiently compelling to demonstrate that the freight market should be driven by the customer and ultimately, the customer, whether in New Zealand or in our export markets, will decide on price, convenience and/or time, and what is the best mode of transport for their freight.

[17] *The contestability of New Zealand's Road Freight Task by Rail*, (2006) Mackie, Baas, Manz TERNZ

Emissions

The New Zealand Rail Plan 2021 refers to the significant environmental benefits that will result from shifting freight off roads.

Our views are:

- The data being presented by the Government is unbalanced, often factually incorrect, lacks context, and lacks sufficient scrutiny. The MoT should provide context, and use fundamental good policy-making rigour when presenting information, and particularly when making comparisons. In the absence of these factors, quality debate is near impossible.
- The MoT's use of emotive language such as "Trucks are gross emitters" indicates significant bias and prejudice and borders on acting irresponsibly.
- While theoretically one can calculate a grams CO_2(e) output per tonne-kilometre, it is a purely academic exercise of little, if any, value because each mode delivers a very different service and therefore, it is meaningless to compare them. We have raised this with Government previously and we are concerned that such flawed thinking continues.
- The MoT needs to acknowledge the shortcomings of its research, otherwise there is very real risk that poor policy making will result from future benefit-cost analyses based on its current data.
- The policies to favour rail on emissions grounds are misplaced. We reject the efforts being made to establish whether road is more environmentally efficient than rail, or vice-versa, because it is like comparing chalk and cheese.

[18]**Figure 16:** Rail and road externalities

KiwiRail steel wheels FY2021(between 1/07/21 and 30/04/21)

An example of the Government claiming the environmental benefits and in particular the fuel savings and corresponding reduced CO_2 emissions of rail over road, is the infographic above promoted on the Energy Efficiency and Conservation Authority (EECA) website.

It is often claimed that rail freight produces fewer emissions per net tonne kilometre than road freight – for example "*Freight carried by rail saves at least 70% of the carbon emissions compared to heavy road transport*"[19].

Our observation is that the data being presented by Government is unbalanced, often factually incorrect, lacks context, and lacks sufficient scrutiny.

This section demonstrates a number of examples, and we leave it to the reader to form their own view. Our concern is that these issues are material and pose significant risk to Government policy development.

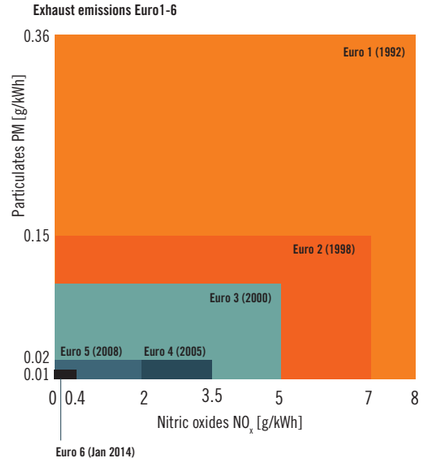
The first common issue we see is the term "emissions" being used in a broad and often confused sense. In any conversation about emissions we believe the two main types of emissions should always be included, namely harmful emissions, sometimes otherwise referred to as air pollutants, and CO_2 emissions.

Harmful emissions

There are a variety of harmful emissions associated with burning diesel fuel, the two most significant being nitric oxides (NO_x) and particulate matter (PM). Diesel vehicles make up about 21 percent of our vehicle fleet, but produce most of the pollutants of concern to human health: nitrogen oxides and particulate matter[20]. These have multiple negative health effects, especially for children. Particulates are known to be carcinogenic, and nitrogen oxides cause respiratory and cardiovascular damage, and can contribute to smog.

As shown in Figure 17 below, over the past three decades there has been considerable development of international standards and the implementation of regulatory requirements to reduce these emissions (NO_x and PM), namely the exhaust emission thresholds (Euro 1-6).

[21]**Figure 17:** EU Emission Standards



[18] Steelwheels-July-20-April-21.pdf (kiwirailfreight.co.nz)
[19] Ministry of Transport *The New Zealand Rail Plan 2021* and kiwirail.co.nz.
[20] Reducing harmful vehicle emissions from road transport | Ministry of Transport
[21] https://www.greenoxsolution.co.uk/AdBlue/Legislation

Over the past decade or so, second-hand imported trucks entering the fleet have been required to meet Euro 4 and new model vehicles have been required to meet Euro 5. There are some challenges with truck suppliers providing Euro 6 technology in New Zealand however, where available a number of leading truck operators are now voluntarily introducing Euro 6.

Line haul trucks, that is those regularly undertaking long distance freight movement that are most likely to be contesting freight activity with rail, are almost certain to be at least Euro 5.

Trains have not been required to do similar and despite best efforts we were unable to find information on the locomotive fleet other than we believe the Class DL fleet introduced about a decade ago meets Euro 3. It is generally acknowledged that given much of the locomotive fleet have engines decades old, that the PM and NO_x emissions of those locomotives would be significantly greater than 8 grams per kilowatt hour (g/kWh) and 0.36 g/kWh respectively.

A closer look at Figure 17, demonstrates that there is a significant difference in the Euro levels and that the best trains will likely be emitting 2.5 times the amount of NO_x, and five times the amount of PM emissions that the Euro 5 trucks emit. Older trains, which are still in the fleet, are likely to be emitting NO_x and PM levels four and 18 times greater respectively than Euro 5 trucks. We are concerned that these facts seem to be overlooked in Government advice.

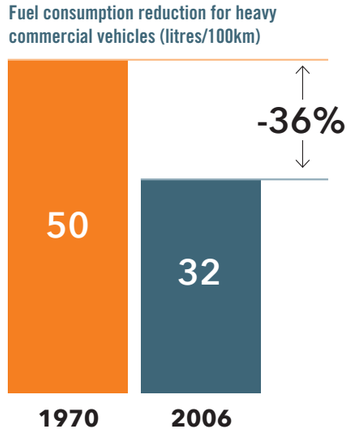
Fuel consumption

Following a significant in-house analysis, MoT released its findings on Real-world fuel economy of heavy trucks (2019)[22]. Its presentation included the following statements about trucks:

- It appears heavy trucks' fuel economy in terms of litres/100 kilometres does not change with year of manufacture
- Heavy trucks are gross emitters
- They used a lot more fuel for every kilometre travelled (compared to light vehicles)

With the exception of the last finding, these statements were a surprise to us. The first of the above findings is not consistent with international literature as shown in Figure 18, below, which indicates that modern trucks are more fuel efficient that older trucks.

[23] **Figure 18:** Fuel consumption reduction over time



Other supporting evidence of there being a relationship between vehicle age and fuel consumption can be found in:

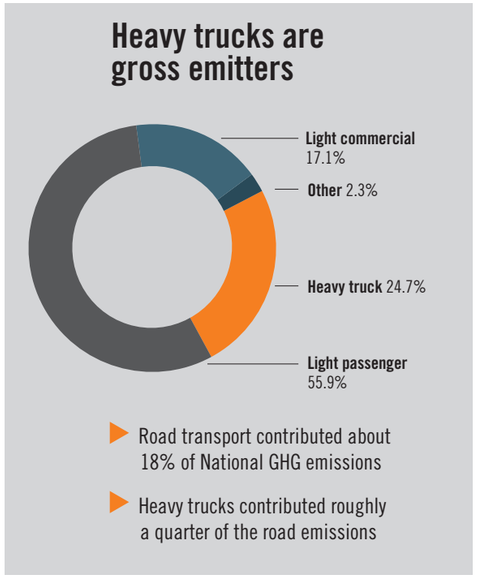
- Research of Factors Affecting Trucks Fuel Consumption: Review which refers, "*The main factors affecting fuel consumption are: linear fuel consumption rate, gross vehicle weight, load factor, vehicle age, and technical speed as a summing factor of driving conditions*" [24]
- The Future of Trucks Implications for energy and the environment, a study prepared by the Directorate of Sustainability, Technology and Outlooks (STO) of the International Energy Agency (IEA)[25]
- Emissions: Energy, Road Transport[26].

[22] Real-world fuel economy of heavy trucks (2019), Wang, McGlinchy, Samuelson. Presented at Transport Knowledge Conference
[23] International Road Union, VDA, German Association of the Automotive Industry
[24] N K Goryaev, Kh Kh Khabibullozoda, F H Faizalizoda
[25] The Future of Trucks - Implications for Energy and the Environment (zemo.org.uk)
[26] Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, S. Eggleston and M. Walsh

It would also appear that the MoT did not take into consideration the fact that the task undertaken by newer vehicles is often likely to be significantly different to that of older vehicles. Furthermore, there has been a trend that replacement vehicles have larger engine capacity and are operating at higher combination mass limits than their predecessors. Factors like this make meaningful understanding of fuel efficiency difficult. Given the international evidence we have presented, and considering the anecdotal evidence from our members, we find it difficult to accept the MoT's findings as credible.

The MoT finding that, "trucks are gross emitters", was a misleading headline in its presentation as Figure 19, below, shows.

[27] **Figure 19:** New Zealand fleet emissions



The way the MoT displayed this information worries us. A common understanding of the adjective gross is something defined as: *glaringly noticeable, usually because of inexcusable badness or objectionableness*. We saw nothing then, and we have seen nothing since, to support this emotive language from the MoT and in our view it indicates significant bias and prejudice which borders on the MoT acting irresponsibly. We have seen, that in terms of harmful emissions, trucks perform considerably better than trains and we look further into the last MoT point, "*They [trucks] used a lot more fuel for every km travelled [than light vehicles]*".

Rather than spending the considerable effort it used to develop its conclusion, the MoT could have simply looked at independent and reputable literature sources. For example, the report *Improving Fuel Economy in Heavy Duty Vehicles*[28], was completed by the Center for Energy Economics and Policy at the independent, non-profit research institution Resources for the Future, in Washington, DC, in the United States. That report refers,

"as gross vehicle weight increases, fuel consumption rates in gallons per 100 miles increases, but gallons per ton-mile decreases, partly because the loads increase faster than fuel economy falls".

Most people would have already realised that it is quite likely trucks use more fuel than cars, mainly because they are bigger and heavier. In our view, the MoT's failure to add any context to that finding is worrying. We believe it would have been much more valuable to an informed debate to show information on what is achieved with the fuel, and one simple way of illustrating this is to consider the fuel burn and work typically achieved by another vehicle and a so called "gross emitter" (truck).

Taking one of the most popular selling new vehicles in the light fleet we see that this utility vehicle weighs 2,212 kilograms and has fuel consumption of 8.3 litres/100 kilometres[29]. A typical journey for such a vehicle would be a trip carrying two occupants namely, the driver and passenger, which is a payload of about 160 kilograms.

Compare this to a typical truck and trailer combination which has a combined unladen vehicle weight of 17,000 kilograms, fuel consumption of 50 litres/100 kilometres and a 29 tonne payload.

Granted, the truck burns six times the amount of fuel however, it moves 181 times more in payload weight. We think it is vital going forward that the MoT provide context and use fundamental good policy making rigour when presenting information, particularly when making comparisons. In the absence of these factors, quality debate is near impossible.

[27] https://www.knowledgehub.transport.govt.nz/assets/TKH -Uploads/TKC-2019/Real-world-fuel-economy-of-heavy-trucks.pdf
[28] Improving Fuel Economy in Heavy Duty Vehicles, March 2012, RFF DP 12-02, Harrington & Krupnick
[29] https://www.ford.com.au/commercial/ranger/models/4x4-xlt-double-cab-pick-up-3-2-diesel/

Figure 20, below, shows the MoT's calculations on truck emissions. As mentioned earlier, we are disappointed that the MoT limited this to CO_2 emissions and it did not mention the air pollutants for which trucks perform vastly better than the other modes on a g/kWh basis. However, that criticism aside, it was pleasing to see that effort was being made to introduce some rationality to this research by comparing emission intensity, in other words the CO_2 output per tonne-kilometre, of the respective modes.

[30]**Figure 20:** Vehicle kilometres travelled by truck size (kilometres millions)

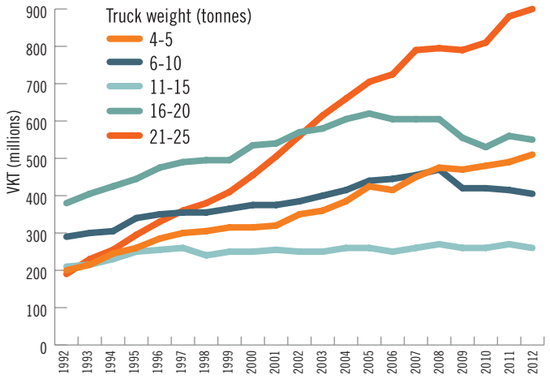


Figure 20 above, shows the distance travelled by vehicle weight and it is important context when considering Figure 19. It should be appreciated that large trucks (21 to 25 tonnes) are the minority in the fleet, and only a proportion of these will likely be carrying freight that MoT would consider to be contestable with rail. This means that in the event Government does drive a shift of freight from road to rail, the area of impact will only apply to a small portion of the 24.7 percent segment currently attributed to heavy truck CO_2 emissions.

It should also be appreciated that while urban trucks have relatively high emissions per gram CO_2/tonne kilometre, they are doing a task that simply cannot be completed by rail. Other important context is that while the heavier trucks travel a disproportionately higher share of the distance travelled, they will also generally have a much better energy intensity.

The trucks typically completing the urban activity are almost certainly the part of the heavy fleet that will be replaced by cleaner electric trucks and we have seen this with some electric trucks entering service in 2020.

[30] NZTA Research Report 534

[31]**Figure 21:** Heavy truck emissions vs. other NZ freight modes

Mode	Typical g CO_2/tkm
Coastal shipping (oil products)	16
Coastal shipping (oil bulk)	30
Coastal shipping (container freight)	46
Rail (electric)	7
Rail (diesel)	29
Rail (NZ average)	28
Long-haul heavy truck	105
Urban delivery heavy truck	390

We were pleased to see that the analysis attempted to assign different values based on truck size however, there are risks with what appears to be its presumption that truck size is a proxy for activity type, and hence its resulting split into urban delivery and long haul.

Based on the numbers in Figure 21, it could be argued that a truck's emissions could in the case of urban delivery be 13 times worse than rail, or in the case of long haul 3.6 times worse. Given the tenor of the MoT research, it was not surprising to us that its main conclusions stated, "*Compared to road, emission intensity of freight transported by rail and coastal shipping is significantly lower*".

While we have no doubt that the research was well intended, it is worrying that MoT did not consider wider findings because had it done so, we believe it would not have gone down this path. The concept of comparing the emissions performance of the respective modes is not new and the wide range of values seen across international literature is indicative of the shortcomings with this approach and the low level of confidence in making meaningful comparisons.

To demonstrate that wide variability, we compare the MoT ratios of 13 and 3.6 with findings from the American Trucking Association report[32] which refers,

"More recent energy efficiency studies confirm the earlier suspicions about 'common sense'. All conclude that for comparable service offerings, the energy efficiency ratio of rail to truck is less than 2 to 1. In fact, with fuel efficient equipment, it is comparable".

Another example of the variability in energy density analyses is the work completed on energy efficiency by the Centre for Advanced Engineering, at University of Canterbury which refers to the energy intensity in megajoules/net-tonne-kilometre of general freight trains being 0.6 and articulated trucks being 1.0[33]. Granted the units of measure are slightly different however, there is a direct relationship between fuel burn (CO_2/tonne kilometre) and energy. This work suggests that heavy road vehicles that are likely to undertake a similar long haul activity to rail use only 1.67 times more energy than a train. This is considerably less than the factor of 3.6 that MoT has stated.

In its main conclusions the MoT noted that this was the first time that CO_2 emissions per tonne kilometre have been studied. On the one hand, it could be seen as admirable that the MoT would undertake such an exercise. On the other hand, we think the MoT should have considered why such a study had not been done before and been more upfront on the risks of undertaking it.

Yet another demonstration of the challenges related to using energy intensity and the variety of stories that can be told based on that data to promote one mode over another is shown in Figure 22, below. We won't waste our time and effort, but we are positive that data could be found that shows diesel trains provide better energy intensity than diesel buses, which is a very different story to this table.

[34]**Figure 22:** Energy density of different modes

	CO_2 emissions/ passenger km
Average car	0.20
"Aging" (current) diesel train	0.16
Diesel bus	0.10
Hybrid car	0.09
(Planned) Auckland electric train	0.06

[31] Real-world fuel economy of heavy trucks (2019), Wang, McGlinchy, Samuelson.

[32] Truck/Rail Comparative Fuel Efficiency, Lana R, Batts. Energy and Economics Dept, Research and Economics Division, American Trucking Associations, Inc. Washington, D.C Report TSW-81-13.

[33] Energy Efficiency, A guide to current and emerging technologies, Volume 1, Chapter 7, Centre for Advanced Engineering, University of Canterbury (1996)

[34] Auckland Regional Transport Authority (2006)

[35]**Figure 23:** Rail carbon intensity 2011-2014

Environmental performance	2011-12	2012-13	2013-14
Carbon intensity (gms CO_2-e per NTK)	32.51	32.49	31.13
Energy used (TJ)	-	4,194	3,982
Carbon emissions - scope 1 and 2 (tonnes of CO_2-e)	-	289,915	276,418

Before ending this section it is also worth scrutinising KiwiRail's data on its emission (GHG) intensity as shown in Figure 23 above.

Page 21 of KiwiRail's 2015 Annual Report refers to a five percent improvement in locomotive fuel burn efficiency FY15, and content on that same page refers, "*Our energy intensity is decreasing as a direct result of a new diesel locomotive fleet and implementation of other energy miser fuel optimising technology in locomotives*".

Page 80 of the same report, refers to greenhouse gas (GHG) emissions per net tonne kilometre to be 31.5g CO_2 per net tonne-kilometre. It is intriguing to us that despite the claimed five percent improvement in fuel burn, it appears the carbon intensity actually increased (worsened) from 31.13 reported in 2014 to 31.5 in 2015. It would appear there are other impacts adversely effecting KiwiRail's energy intensity and these are signifcantly greater than the benefits of the new locomotive technology.

In June 2021 an EECA press release refers to how it has worked with KiwiRail since 2016 to identify innovative opportunities to reduce their energy use[36]. One of the pillars of KiwiRail's Carbon Zero Programme is the Driver Advisory System (DAS). The press release goes on to refer, "*Whereas GPS tells you to turn left or right, the DAS tells us to accelerate or slow down, and take into account terrain so we can drive our trains more efficiently*". It claims, "*this small bit of kit has contributed to a 13.5 per cent reduction in fuel use to date".* However, improvements of that order do not appear to be showing up in KiwiRail's overall carbon performance as shown in Figure 24, below.

[37]**Figure 24:** Rail carbon intensity FY2016- FY2020

Carbon performance	FY16 2015-16	FY17 2016-17	FY18 2017-18	FY19 2018-19	FY20 2019-20
Rail freight carbon intensity (CO_2-e emissions per net tonne km)	28.83	28.82*	27.32*	27.51*	28.13
Carbon footprint - scope 1 and 2 (tonnes of CO_2-e emissions)	272,345*	235,498*	277,116*	240,094*	230,046

* These figures differ to those reported in FY19. This is due to an Adjustment in how our fuel consumption figures are now calculated

It does not appear that the Government rhetoric around the ongoing improvements in KiwiRail's energy intensity are reflected in actual overall performance outcomes.

However, rather than saying any particular party or study is right or wrong, we think that the wide variance shows that there are inherent challenges with telling meaningful stories about environmental performance. It is difficult enough to draw insights from energy intensity data within a given mode, let alone comparing across modes.

The statements such as "rail saves at least 70% of the carbon emissions compared to heavy road transport" are misleading.

These types of comparisons are also fundamentally flawed in that they compare average, not marginal benefits. The averages for rail are dominated by things it does well, such as bulk freight. Similarly, the averages for road are dominated by things it does well, such as fast, point-to-point delivery which cannot be done by rail. At the point where the two compete the choice is typically between intermodal (rail plus road) and road alone. The competing trucks are atypical of the road fleet, and the roads on which they travel (a subset of State Highways) are atypical of the road network.

[35] KiwiRail Annual Report 2014
[36] GPS for trains slashes fuel use and emissions | EECA
[37] KiwiRails Annual Report 2020

Other factors that must also be considered include:

- **Trucks are typically kept in long haul operation for five to seven years before being moved to less intense work, whereas locomotives in New Zealand are kept for much longer. Hence, new and more efficient engine technology is more likely to be found in long distance trucks than in railway locomotives.**
- **Trucks can usually operate door-to-door – that is, directly from origins such as factories, farms, forests and import ports, to destinations such as shopping centres and export ports. Rail freight (apart from minerals) usually needs double handling which often produces CO_2 emissions – lifting equipment moves freight between trains and trucks, and trucks are used for the last part of the journey, as few of the customers have rail sidings on the delivery properties. Automated loading, by saving costs and time, will reduce this disadvantage to rail freight[38].**
- **There has been talk of further electrification of rail lines, but it would be expensive (e.g. deepening tunnels to provide clearance) and it is not clear whether that would generate additional freight movement by rail to create a favourable benefit-cost.**

While theoretically one can calculate a CO_2(e) output per tonne-kilometre, in our view it is a purely academic exercise of little, if any, value when comparing modes because they each deliver a very different service and therefore, it is meaningless to compare them. We have raised this with Government previously and we are concerned that such flawed thinking continues.

It is important that the MoT acknowledge the shortcomings of its research, otherwise there is very real risk that benefit-cost analyses use that data and incorrectly underpin future policies.

Our view is that policies to favour rail on emissions grounds are misplaced.

Furthermore, we think the general policy of reducing New Zealand's greenhouse gas emissions is best addressed by applying the Emissions Trading Scheme[39] broadly so that the least cost means of abatement reduction are favoured.

Carbon dioxide emissions are a negative externality of burning fossil fuels. To internalise this externality (that is, to make the emitter pay), a sensible solution is to impose a carbon charge, combined with a cap, on overall emissions. New Zealand does this with a cap-and-trade scheme.

A carbon tax, or an economically-equivalent emission-trading system (ETS), should be set at the level which reduces carbon emissions to the level at which the marginal benefits of further reduction equal the costs of achieving them. The New Zealand ETS "is the government's main tool for meeting domestic and international climate change targets"[40]. Specific measures such as subsidising rail will not affect New Zealand's overall emissions when as, since 2020, there has been a cap in place[41].

The policy reason for choosing a carbon tax over setting limits via regulation is that it encourages and enables least-cost emission reduction. If emissions can be reduced at the least cost then reduction targets are more likely to be met.

If rail is more fuel efficient than road, then anything that increases fuel costs should increase the price of road transport relative to rail. Having committed to an emissions trading system, there is no need for the Government to invest in rail as an emissions-reduction strategy, rather it should enable the economic settings for least-cost abatement and allow those instruments to work.

We reject the efforts being made to establish whether road is more environmentally efficient than rail, or vice-versa, because it is like comparing chalk and cheese. The wide range of values seen across international literature is indicative of the shortcomings with this approach and the low level of confidence in making any meaningful comparison.

[38] A recent example: NSW Ports and Patricks Terminals, Sydney.
[39] environment.govt.nz
[40] Ministry of the Environment Marginal abatement cost curves analysis for New Zealand - Potential Greenhouse Gas Mitigation Options and their Costs
[41] For a discussion, see https://www.nzinitiative.org.nz/reports-and-media/opinion/new-opinion-24/

Other externalities

Externalities are costs or benefits caused by a party that are not directly financially incurred or received by that party. Emissions were discussed in the previous chapter and this chapter looks at a range of other externalities.

Our views on each of the economic externalities are:

- **On safety:** We reject the MoT's views on rail being safer than road, or vice-versa. The data is skewed because it includes passenger train journeys therefore, a comparison is invalid. We think the externalities of accidents may be better addressed by increasing total charges to cover their costs and by design and regulation to improve safety standards.
- **On congestion:** Congestion within the rail system and road congestion avoided by commuter rail are already internalised. There is limited scope for rail freight to reduce city congestion. The net externality due to rail freight is likely to be small.
- **On regional development:** With perhaps the exception of the potential for Northport, we are not aware of any regional development project being held up through lack of rail capacity.
- **On option value**: Rather than relying on central funding, we suggest that interested regions be given the opportunity to provide an ongoing subsidy or to purchase non-commercially viable sections of railway network.
- **On resilience:** We are not aware of any time in our history where rail has actually added substantive resilience to road.
- **On existence good:** There are sections of both road and rail that likely come under the scenario where in strict financial terms the benefits do not justify the cost.
- Taken together, the externalities above do not offer a significant offset to the negative contribution to New Zealand's economic performance by heavy subsidies for the existing rail network. They are either relatively small, or best dealt with via other mechanisms.
- In the context of freight externalities, it would be better to replace the Government's misguided obsession to subsidise one mode of freight over another with a more sensible approach like that of the Australian Productivity Commission which in essence promotes an optimal level of the externalities and encourages opportunities for lower abatement alternatives.

Safety of people on the networks

There is a perception in New Zealand that rail is safer than roads and certainly there are more deaths related to incidents with trucks than with rail. On an exposure basis this would likely be expected: the higher volume and multiple-use of roads has economic-efficiency benefits but raises the probability of accidents.

In our view, a direct comparison is not valid as trucks perform a wider range of functions and shift more freight than rail. Using freight task as the denominator, average fatalities per billion net tonne kilometres over 1998-2007[42] were:

- Truck-related road deaths: 5.4/year
- Rail-related deaths: 5.3/year

Rail injury rates appear lower than those for trucks, but it would be premature to draw conclusions from this as the figures are not directly comparable because the definitions of 'injury' for the two datasets are different.

We expect most people would see some degree of irrationality in arguing that coastal shipping has less deaths than road or rail, so if all freight was shifted to coastal shipping, then the savings would be considerable. In essence, the road-rail argument used by the MoT uses the same flawed logic.

There are a number of potential criticisms of this analysis that would challenge the perception that rail is safer than road. The implication of such a finding is that a modal shift of freight from truck to rail will not lead to a change in overall safety, unless the marginal risk of the task actually transferred is different to its average risk.

The degree to which accident costs are externalities depends on the extent to which they are already being internalised. In 2005 Booz Allen Hamilton (BAH) calculated total road system accident costs of $2.87b for 2001/02, of which $2.2b are covered by user charges, leaving a negative externality of $670m. BAH made the assumption that rail system accident costs are fully internalised. This is a questionable assumption: while it may apply to railway staff affected by accidents (where costs are presumably covered by ACC levies), the costs of rail accidents affecting third parties will most likely to be borne by society as a whole (or shared with road users for those accidents that also involve road vehicles).

Discussions of the respective safety of the modes should also take into consideration that road freight safety has improved over time due to factors such as:

- **improvements in truck design**
- **improved roads**
- **safety research**
- **electronic monitoring such as telematics that allows individual vehicles and drivers to be monitored.**

While there has yet to be a study undertaken on the safety performance of New Zealand high productivity motor vehicles (HPMV), studies in Australia and Europe indicate that on a tonne-kilometre freight movement basis, these vehicles have significantly lower crash rates than standard sized freight trucks.

The cost of policies to support rail freight on safety grounds should be weighed up against the cost and effectiveness of other ways of achieving truck safety outcomes, such as improved roads.

In February 2019, the MoT commissioned the Domestic Transport Costs and Charges study and this is expected to be completed in 2021. It will provide a basis for further analysis of accident costs.

We understand that, in spite of the arguments here, there is some thinking from Government that trucks should pay a safety externality tax. If that is the case, we would remind Government that RUC are already higher than justified by road costs[43]. A less controversial approach is that RUC should continue to be used to fund better and safer roads.

We reject the MoT's views on rail being safer than road, or vice-versa. The data is skewed because it includes passenger train journeys therefore, a comparison is invalid. We think the externalities of accidents may be better addressed by increasing total charges to cover their costs (and doing so in a way that incentivises safe behaviour at the margins) and by design and regulation to improve safety standards.

[42] Derived from data in Ministry of Transport (2005b, 2008a, 2008f) and Richard Paling Consulting (2008).
[43] MoT, Regulatory Impact Statement for the 2020 increase in RUCs.

Road and rail congestion

The vast majority of road congestion occurs during peak commuting periods and it is typically limited to urban areas. Road freight contributes to this congestion, and it also suffers from it. However, there is usually no alternative to road freight – even rail freight typically relies on road freight for the last part of the journey, particularly in urban areas. Rail freight itself is scarcely relevant to urban congestion as it does not operate much within urban areas. Rail does most of its haulage in non-urban areas, where less congestion is incurred and, where it arises, can be addressed by constructing additional passing lanes. The operators of the larger trucks that compete with rail want to avoid congestion too, and so typically use off-peak scheduling to reduce fuel costs and driver time.

The operators of the larger trucks that compete with rail want to avoid congestion too, and so typically use off-peak scheduling to reduce fuel costs and driver time.

Rail also has congestion issues. It creates congestion where it intersects with the road network, i.e. at level crossings and at intermodal transfer points. As rail typically has the right-of-way, such congestion is a negative externality of rail imposed on road users. The intersections themselves raise joint costs.

Rail also has congestion issues. It creates congestion where it intersects with the road network, i.e. at level crossings and at intermodal transfer points.

There is railway congestion in the Auckland and Wellington areas because of the impact of increased urban passenger train frequencies on lines that are also used by freight trains. Due to the current condition of the assets, neither network can accommodate additional freight or passenger services. These key networks should, and will most likely be, the focus of a large proportion of the additional rail capital spend. This issue is being addressed by Government-financed track improvements: the "third main" line south of Auckland, and improved junctions in Auckland and Wellington. More modern signalling, in particular replacement of wayside signals by European-type in-cab communications, will also allow more trains to safely operate on existing tracks.

If infrastructure investment is required to reduce congestion costs, then the specific context will determine whether it is more cost effective to make that investment in the road or the rail system (or for roads to apply congestion pricing).

In 2018 a report The Value of Rail[44] estimated the cost of congestion to be $1.47-1.54 b per year and used that to justify general expenditure on railways. However, about 85 percent of the estimated value was due to urban passenger rail services' impact on road congestion, not rail freight.

In summary, congestion within the rail system and road congestion avoided by commuter rail are already internalised. There is limited scope for rail freight to reduce city congestion. The net externality due to rail freight is likely to be small.

[44] The Value of Rail in New Zealand, Ernst & Young 2016

Regional development

The development of New Zealand's regions was originally made possible by coastal shipping and by railways.

However, given the relatively demanding nature of our geographic terrain, there was demand for access to areas not serviced by either and therefore, over time the road network grew to the mature level it is now.

Road freight has since become the main transport mode for most regions and the networks are now mature.

It is sometimes suggested that investment in upgrading rail lines is needed for regional development. The NZ Rail Plan (MoT 2021) refers, "*…investment in rail underpins current and future areas of economic opportunity in the regions*". However, we take the view that given there is transport capacity available everywhere there is economic activity, that any thoughts of further investment in rail faces significant risk in suffering from diminishing returns.

If regional economic activity expands, there is either enough capacity on existing transport networks, or the ability to upgrade them. In some cases this has involved rail investment, such as new Bay of Plenty timber lines in the middle of 20th century, and potentially additional passing loops on the Hamilton-Tauranga line. In most cases, it involves routine upgrading of roads as traffic levels increase (thus producing a positive cost-benefit result to justify the investment). With the exception of what might occur at Northport, new regional developments on the horizon are generally of modest scale from a freight point of view and can readily be accommodated this way.

Option value

Option Value is the value held by a non-user to pay for preserving and maintaining an asset, to ensure its availability as an option in the future. A lightly used railway line may be seen as having option value. Examples include:

- A potential option for more intensive use in an emergency, such as the Manawatū Gorge railway line presented during the closure of State Highway 3 through the gorge. However, even in this particular case, road freight was diverted over the alternative route north and the intensification of rail freight, if any, was insignificant.
- It may enable a new development project.
- In contrast, if West Coast coal mining were eventually to cease in response to wider climate change policies, the railway line would become redundant and the Otira tunnel would then become an option to create a road connection.

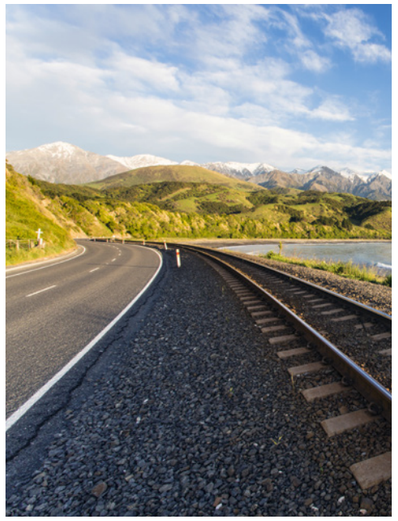
Roads also have option value - for example, the inland road SH70 provided an alternative option to Kaikoura coast rail and road freight and was heavily used after the Kaikoura earthquake in 2016.

Even if a railway line is mothballed, there are still opportunity costs and direct costs to consider. The line may have value in an alternative use, such as a road or improved farm access. However, there are costs associated with retaining unused or infrequently used assets for their potential value. Examples include:

- preserving a closed line requires construction of safety barriers to prevent access to bridges, creosote or other protection of sleepers, and periodic weeding and drain clearing
- track maintenance and accumulated operational losses.

It is also notable that the option is more likely to be of higher value to its region, despite the costs being borne centrally. The only costs borne by the regions in keeping the option open are lobbying costs.

In the event there is a discrete section of railway that is not commercially viable and a region places a high valuation on that section as an option, then we believe there is merit in Government advisors considering an alternative funding mechanism to keep that section alive. Rather than relying on central funding, we suggest that interested regions be given the opportunity to provide an ongoing subsidy, or to purchase non-commercially viable sections of the railway network. Given the role of rail in serving ports, this might also be an optimal ownership scenario for regionally owned ports.



Resilience

There is some overlap between this externality and option value however, for completeness we have included commentary on both. If an earthquake, flood, tsunami, or other natural disaster destroys a certain piece of transport infrastructure, another mode or route can sometimes be used. Examples are the Manawatū Gorge (road destroyed, rail intact); Kaikoura coast (where the railway was restored months before the SH1 road could be, coastal shipping helped, as did heavy use of the road alternative SH70 and via Lewis Pass); Gisborne (railway line washed out, road intact).

Notwithstanding the cases above, we are not aware of any time in our history where rail has actually added significant resilience to road. When the road network has suffered major disruptions of national significance, such as damage from natural disaster, then typically rail has been affected similarly and even when rail has not been affected, rather than freight transfer to rail, the freight simply travels on an alternative road route, albeit with added inconvenience and cost.

Existence good

Some people find it desirable to have facilities available regardless of whether or not those facilities would be justified under a typical cost-benefit analysis.

There are sections of road and rail that likely come under the scenario where in strict financial terms the benefits do not justify the cost. This is arguably part of the current rhetoric advocating high expenditure on lightly used railway lines, such as in Northland.

It is not our role to judge those peoples' desires of existence good however, as part of good policy-making we have included it as one of the associated externalities to consider.

Policy response to externalities

We believe there is considerable merit in taking a similar approach to manage the above externalities as that followed by the Australian Productivity Commission. That Commission suggests the management of the externalities should use a system that follows a set of principles. The system should:

- address the externality directly; and
- promote an optimal level of the externality; and
- encourages opportunities for lower cost abatement alternatives.

In the context of freight externalities, the Government's misguided obsession to subsidise one mode of freight over another does not meet the sensible approach of the Australian Productivity Commission. Subsidised products are likely to be over-consumed. A subsidy to one mode will not create an incentive for either mode to reduce the level of its externalities. Lastly a subsidy to one mode is untargeted: it works against all other current (and potential) modes, including those with lower-cost abatement than the subsidised mode.

Summary of externalities

The externalities considered in this section and the Emissions section of this report are summarised in the table below, Figure 25.

Externality	Effect of rail freight	Best addressed via
Accidents	Unclear. Need to compare like with like.	Regulation
Road congestion	Minor – urban freight is by truck anyway	Commuter rail subsidies and road congestion charging
Regional development	Minor – trucks more relevant	Improved regional roads if needed
Option value	Minor	Consider cost of maintaining the option
Resilience	Can be rail or road	Consider when designing
Existence good	Positive	Political decision – compare with alternatives
Greenhouse gas emissions	Not clear – many angles	Carbon tax or emissions trading scheme
Pollution/ particulates	Little net effect – an urban issue, and urban freight is by truck	Regulation

Figure 25: Summary of externalities

Taken together, these externalities do not offer a significant offset to the negative contribution to New Zealand's economic performance by heavy subsidies for the existing rail network. They are either relatively small, or best dealt with via other mechanisms.

Furthermore, the difficulties in the measurement of externalities led Glaeser and Gottlieb (2008)[45] to conclude that transport infrastructure should be decided on the basis of its primary benefits and not externalities. We believe that advice seems most appropriate in this context.

[45] Glaeser, E. L., & Gottlieb, J. D. (2008). *The Economics of Place-Making Policies.*

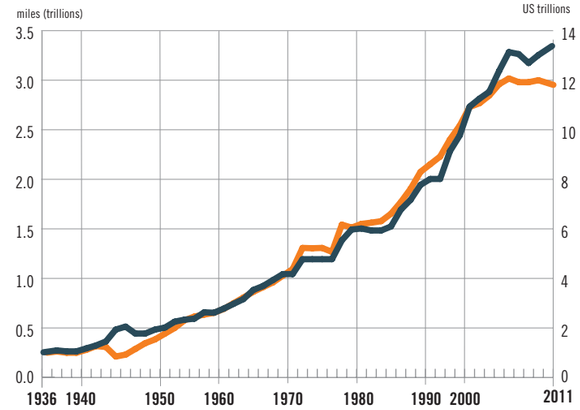
Economics of road and rail

This section looks at the economics of the systems underpinning and factors affecting our road and rail systems.

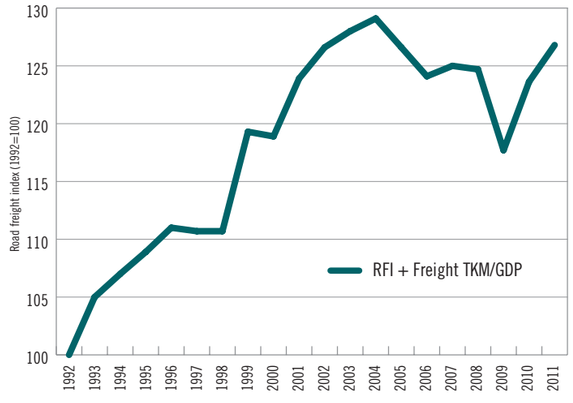
Our views are:

- Generally, it is accepted there is a positive correlation between economic growth and vehicle kilometres travelled. Policy makers around the world have grappled with the challenge of decoupling the relationship between economic growth and vehicle kilometres travelled. In the absence of clear evidence that this can be successfully achieved, we are concerned that Government policies that look to stifle transport movements will adversely impact the growth of our economy and the quality of our lives.
- On average, trucks pay more than their share of road costs, whereas New Zealand railways have needed Government support for decades.
- The rail infrastructure has not produced an economic level of return (or indeed, sometimes any return) for decades. Roads are funded on a user pays, pay-as-you-go basis which includes funding of new investments.
- Coastal shipping and road freight pay their own way. The only freight mode that gets continued and substantial Government support is rail. Diverting some of the RUC revenue paid by trucks to rail will work against, not towards, competitive neutrality. If the Government has wider policy reasons for supporting railways it should fund that in the way it funds other general policies, from general tax revenues.

[46]**Figure 26:** Relationship between vehicle distance and gross domestic product



[47] **Figure 27:** Road freight index



Generally, it is accepted there is a correlation between economic growth and vehicle kilometres travelled and while the size of that ratio may vary across international jurisdictions, the two indicators typically track similarly.

In other words, generally over the long term when there is an increase in vehicle distance travelled that reflects growth in the economy. This is evidenced in Figure 26 and Figure 27.

For some time, particularly over the last two decades, policy makers around the world have grappled with the challenge of decoupling the relationship between economic growth and vehicle kilometres travelled and in the absence of evidence that this can be achieved, we are concerned that Government policies that look to stifle transport movements will adversely impact the growth of our economy and the quality of our lives.

[46] https://www.fhwa.dot.gov/policy/otps/pubs/vmt_gdp/vmt_gdp.p
[47] Frontier Economics (using data from Ministry of Transport and Statistics New Zealand)

Rail

Fixed and variable costs

Rail infrastructure is a relatively long-lived asset. Most lines today follow formations built over a century ago. Maintenance and renewals get more costly as the network ages. Fixed infrastructure accounts for more asset value than rolling stock.

Most of the fixed assets of New Zealand rail are sunk – that is their value cannot be recovered if they can no longer be used for railways. For example, most railway tunnels have little use for other purposes and so tunnelling costs are typically regarded as sunk. Excluding land, around 75 percent of total rail assets are sunk.

Most rail infrastructure costs are fixed – they do not change with changes in volume. Examples include the costs of providing railway formations and maintaining tunnels, drainage, and signalling equipment. Some costs are semi-fixed: there is a minimum cost level and once a certain level of activity is exceeded, the cost starts rising above that (example: the rails). Without enough freight or passenger revenue it is impossible to cover the fixed costs.

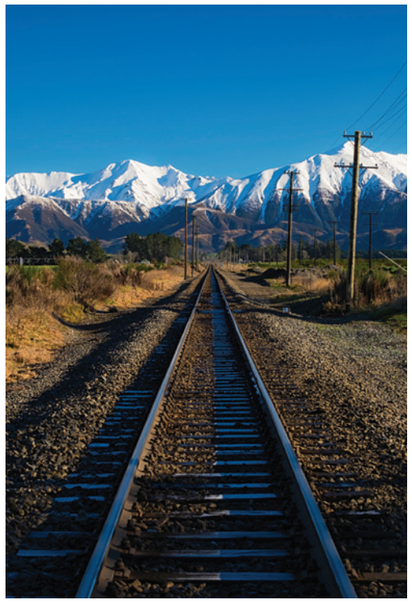
Good management seeks to make fixed costs variable. There is some scope for this with railways in that they are long-life heavy engineering and can be kept going for a long time with minimal maintenance – especially if freight volumes are commercially inadequate and there is a decision (whether actual or de facto) to slowly run the line down. Tunnels, track formations, and the rails themselves (on straight sections of track) can last indefinitely (unless destroyed by natural disasters). The better types of sleepers last for decades. However, periodic maintenance is needed for drainage, bridges, and (if there is any) signalling. Asset lives are shown in the Table in Figure 28 left.

In parts of Australia and the United States, notably for lines that carry grain, there is minimal maintenance, no signalling, the tracks are uneven, and the trains have to run very slowly (e.g. five miles (eight kilometres) an hour). Even then there are derailments, but it can be cheaper to live with those (i.e. bring cranes in to put the trains back, and do minimal repairs) than to upgrade the track. Even with these measures, closure is sometimes unavoidable if, for example, a bridge becomes unsafe to use and there is not enough revenue to justify building a new one.

New Zealand's terrain and climate generally limit the scope for such marginal operations, though some low-use branch lines are deliberately kept to a lower standard than the main lines. New Zealand examples include the closure of the Wairoa-Gisborne line after a major washout which was too expensive to repair, and the current upgrading of the Wairarapa line which had minimal maintenance and on which operating speeds were reduced for safety reasons.

[48]**Figure 28:** Asset lives – average depreciable lives by category

Category	Useful life
Tunnels and bridges	75-200 years
Track and ballast	40 – 50 years
Overhead traction	20 – 80 years
Signals and communications	15-50 years
Wagons and carriages	5-30 years
Locomotives	20 years
Containers	10 years



[48] KiwiRail Annual integrated Report 2020

Economies of scale

High proportions of sunk fixed costs, together with relatively low variable costs, means that the average cost faced by rail operators declines sharply in response to additional sales. This means that railways exhibit economies of scale.

However, a distinction needs to be made between *economies of density* (making increased use of an existing network) and *economies of network size* (increasing the size of a network). In his review of the major themes in the evolution of railway economics, Waters (2007) reports there is good evidence of economies of density in rail, but a lack of empirical support for economies of network size.

The density of use of a freight rail network can be calculated in terms of the average number of tonnes of freight transported per kilometre of track. Comparative data for other countries are shown in Figure 29, right. The freight density of the New Zealand network is very low by international standards.

Factors contributing to this low density include:

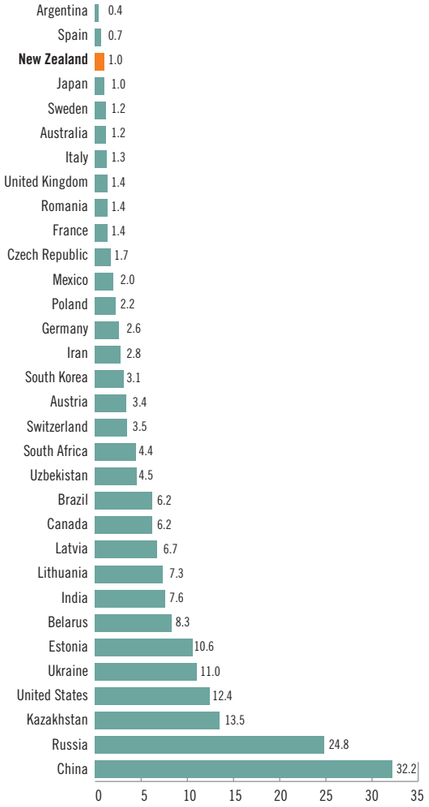
- geography (e.g. lack of interconnection with other countries' networks, population centres close to ports, difficult terrain)
- low population density
- volume of freight
- competition from other freight transport modes
- types of freight available
- technical and operational limitations of the rail infrastructure, such as the number of passing loops.

A reduction in network size from closure of lightly used lines, and/or an increase in total freight, is required to benefit from economies of density.

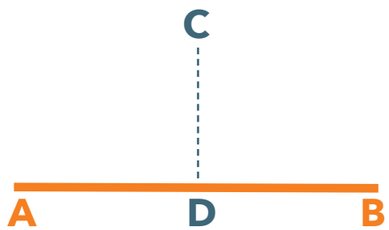
KiwiRail[49] and customer sources report that KiwiRail does not have enough rolling stock capacity to meet demand. New locomotives and wagons on order will help, and will improve the economies of scale as the fixed costs (largely infrastructure) have already been covered.

Scale effects become relevant when considering changing the size of an existing network. In the simplified network depicted in Figure 30, right, the traffic on branch line CD may be insufficient to cover the cost of operating that line. A simplistic analysis might recommend the closure of that branch line. However, if the existence of CD creates traffic on the main line segments AD and/or DB, and the profits on that traffic exceed the losses on CD, then branch line retention would be indicated. Such effects are significant in New Zealand. Some of the freight on the relatively profitable Tauranga – Hamilton – Auckland line moves onto it from the relatively unprofitable Hamilton – Palmerston North Line.

[50]**Figure 29:** International comparison of rail freight densities



[51]**Figure 30:** A simplified rail network, AB is the main line and CD is a branch line



[49] Press release accompanying the Government's 2021 Budget.
[50] Central Intelligence Agency 2009, and Richard Paling Consulting 2008
[51] Heatley, 2009

Economies of scope

Railways offer economies of scope when infrastructure can be jointly used to produce different products. For example, both passenger and freight trains can travel along the same lines rather than building separate lines for each. Economies of scope of this type are only realisable up to the point where congestion becomes a problem. In particular, the practice of giving priority to passenger trains over more productive freight trains can mean that the overall productivity of railways actually falls when passenger numbers increase. In New Zealand this is relevant to the line south of Auckland and is being addressed by the construction of an additional "third main" track. It was also relevant at the time a Tauranga-Auckland passenger train was being proposed.

Roads also benefit from economies of scope: costs are shared between cars and other light vehicles, and trucks.

Is rail a natural monopoly?

Markets with significant economies of scale are often characterised by dominant leaders. A single firm in such a market is called a natural monopoly – it is in a position to extract monopoly profits.

A monopoly also has to be the single supplier of a product for which there is no close substitute. Close substitutes exist for almost all of the freight products offered by New Zealand railways except arguably for West Coast coal, for which there is a "bilateral monopoly". A dominant coal producer and KiwiRail both need each other – the coal producer needs rail services to get its product out, and the rail line would be highly uneconomic without coal. The natural solution is a long-term contract between the parties or common ownership.

A further test of a monopoly is the exercise of market power. New Zealand railways have not been able to exert market power in recent times (Rail Development Group, 2008) or in the past (ISCR, 1999). Instead, in order to get business, they have to charge a margin below the road rate. It is reasonable to conclude that New Zealand railways are not a natural monopoly.

Economic performance

Heatley (2009) examined New Zealand rail around the period it was privatised, when more commercial data was available than now. Some of his conclusions (in Chapter 4, together with definitions of terms) were:

- The economic profit of the ferry business could be presumed to be non-negative in the long term
- Tranz Rail performed very poorly for shareholders as a publicly-listed company
- It would appear that the NZ Railways Corporation is nowhere close to earning an acceptable return compared to other State Owned Enterprises (SOEs)
- It is clear that neither private nor public owners have maintained the economic position of rail
- Rail is unable to pay the opportunity cost of capital employed
- The rail system is not viable, nor likely to become viable, simply as a result of a change in its funding model to the pay-as-you-go one used for roads
- The history of rail in New Zealand has been one of enormous taxpayer and social cost entailed in retaining rail, regardless of its ownership
- Rail has performed poorly since at least the 1920s, and since at least the mid-1980s its social cost (due to subsidies) has substantially outweighed its social benefit. The rational response is a gradual rundown of long-lived infrastructure
- To justify maintaining rail in its present form requires "heroic assumptions" about its future economics. Until such a time as these conditions eventuate, rail will require huge subsidies.

Rail performance problems are not only a consequence of low demand. Some within the transport industry consider that KiwiRail's costs are unduly high, but there is not enough public data to explore this.

There is a view that railways are disadvantaged because a return on capital is required from rail infrastructure but not from roads. But rail infrastructure has not produced an economic level of return (or indeed, sometimes any return) for decades. Roads are funded on a user pays, pay-as-you-go basis which includes funding of new investments. There is no logic in having a return on investment for which the investor (the road user) already receives the return in the form of improved roads[52].

[52] For further discussion, see Australian Productivity Commission 1996

Road

It is sometimes asserted that trucks do not pay their way because the Government, through Waka Kotahi NZ Transport Agency (Waka Kotahi), provides the roads whereas KiwiRail has to provide its own infrastructure. In other words, a lack of competitive neutrality is said to favour road freight over rail freight. However, the opposite is the case.

Trucks pay RUC which, together with fuel excise, largely funds Waka Kotahi's road programme.

The shares of road costs attributed to different types of road vehicle are calculated in accordance with a Cost Allocation Model which is based on engineering, accounting, and economic principles. The Heatley report, section 4.8.1, states that heavy vehicles are allocated all the costs of damage to road structures due to their high axle weights. Other road costs are shared between light and heavy vehicles[53] according to their size and numbers[54]. No such sharing happens with rail infrastructure costs because there is no one to share with; there is only one type of vehicle (trains) involved. In practice, a process of averaging means that trucks using well-built highways – the type of road that competes with rail freight – tend to pay more than their allocated costs.

For ease of administration there is a degree of averaging of costs across different truck types and loads, which means that individual trucks may pay more or less than the costs they cause.

Overall, trucks more than cover their road costs, and also contribute, through the National Land Transport Fund (NLTF), to Waka Kotahi management, police traffic enforcement, public transport subsidies and road safety campaigns.

In future, it will be possible to further refine cost allocation with information technology (e.g. telematics) that identifies a truck's position, its total weight and axle weights, the distance it travels, and the types of roads it uses. It will be possible to combine this with technology used for urban congestion pricing also.

None of the freight transport modes are charged for the external costs that they impose on others (though, to the extent that heavy vehicles pay more than their allocated road costs, they can be seen as contributing towards externality costs).

In the past, the external costs have been estimated as small compared with the costs of providing infrastructure – as in the present report. It will be possible to produce new estimates once the MoT-commissioned *2021 Domestic Transport Costs and Charges Study* is published.

The Table in Figure 31, shows the levels of recovery for a number of common vehicle types. It demonstrates that on average trucks pay more than their share of road costs, whereas New Zealand railways have needed Government (i.e. general taxpayer) support for decades.

In conclusion, there is irony in the suggestion that rail suffers from a lack of competitive neutrality. The only freight mode that gets continued and substantial Government support is rail. Coastal shipping and road freight pay their own way. Diverting some of the RUC revenue paid by trucks to rail will work against, not towards, competitive neutrality. If the Government has wider policy reasons for supporting railways it should fund that in the way it funds other general policies, from general tax revenues.

[53] Respectively below and above 3.5 tonnes. Heavy vehicles comprise trucks and buses.
[54] https://www.transport.govt.nz/about-us/what-we-do/queries/methodology-used-for-road-user-charges-rates/

[55]**Figure 31:** Comparison of Road User Charge (RUC) recovery rate of road costs for common vehicle types. Note trailer types are shown in their typical combination configuration.

Vehicle type	Description	Recovery Rate (%)
	Car (less than 3.5 t)	94
	3 axle truck (12 to 18 t)	120
	4 axle truck (all weights)	125
	Trailer with 3 close axles	155
	Trailer with 4 axles	169
	Trailer with 5 or more axles	162
	3 axle Towing vehicle that is part of combination with at least 9 axles	122
	4 axle Towing vehicle that is part of combination with at least 8 axles	130

[55] Ministry of Transport, Regulatory Impact Statement for the 2020 increase in RUCs, Appendix. (Vehicle type pictures and definitions have been simplified by Transporting New Zealand)

Road and rail networks

This chapter provides a short commentary on the comparative networks. Given this report is predominantly about the contestability of inter-regional freight we have predominantly limited the comparisons to the respective modes in terms of regional connectivity and links to ports as shown in Figures 32 and 33 on the next pages.

Our views are:

- Rail has an important part to play in moving the freight task and in some cases, particularly where the inherent challenges of our mountainous terrain have been reduced by the construction of railway tunnels, such as the Remutaka Tunnel and the Kaimai Tunnel, it is a competitive alternative to road freight. We are not anti-rail. The movement of freight underpins driving our economy therefore rather than pick winners or have a myopic mode focus we, we support Government investment in infrastructure investment where quality business cases stack up.
- There is a noticeable difference in the levels of connectivity the respective networks offer. These are key factors in logistics planning and freight efficiency and must be carefully considered in any meaningful discussion on competition and modal shift.
- We do not subscribe to the Government's notion of modal shift which in effect requires creating additional factors to change the contestability between road and railway networks. Such intervention introduces risk that the inherent benefits of those different levels of connectivity are not fully realised and ultimately become an additional and unnecessary cost to the nation.

[56]**Figure 32:** State highway network

[56] https://oag.parliament.nz/2010/nzta/appendix1.htm

[57]**Figure 33:** Rail network

[57] https://www.kiwirail.co.nz/assets/KiwiRail-Half-Year-Report-2021_210226_LowRes.pdf

Overseas studies consistently find that intermodal rail is competitive with road alone only over relatively long distances.

- Kreutzberger (2008) finds intermodal competitive in Europe for distances over 600 kilometres (a bit more than the Auckland-Palmerston North distance).
- Gorman (2008) finds intermodal competitive in the US for shipment distances above 500 miles (805 kilometres), assuming the road portion is 50 miles (80 kilometres).
- Janic (2008) reports that in Europe for corridors up to 900 kilometres, intermodal transport has only a two percent market share. As this segment accounts for 90 percent of freight by volume, this relegates intermodal transport to a minor player.
- In Australia, industry sources indicate that rail gets only 20-30 percent of freight on the Melbourne-Brisbane run (over 1700 kilometres) and only a few percent on Melbourne-Sydney (1020 kilometres).

The problem for rail freight in New Zealand is that transport distances are generally below these thresholds. The average rail freight distance is around 230 kilometres[58].

Trucking typically achieves faster deliveries than rail or coastal shipping because double handling at the end points is often avoided. Customer requirements mean that rail can compete for only a relatively small proportion of intermodal freight. Trends towards increased product variety, just-in-time (JIT) supply chains, the use of couriers and internet ordering, are favouring road transport at the expense of other modes. It is frustrating for transport businesses that customers often overstate urgency, as shown by their not promptly picking up freight at its destination. In New Zealand competitive pressures have limited the use of surcharges for urgent freight.

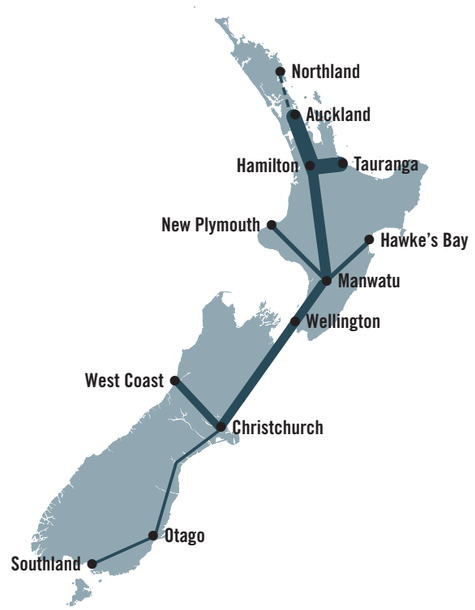
Logically, rail is already doing the tasks for which it is most competitive. In order to gain market share from other modes (where it currently suffers from a relative cost or service disadvantage) rail must pursue custom of increasingly marginal value to it. Without draconian regulation or extreme (and persistent) price changes, very high levels of investment would be required to achieve minor growth in modal share.

Networks

New Zealand's roads and railways form networks. Trucks and trains go from one road or railway line to another – though there are also non-network links such as West Coast export coal going only on one railway line, to Lyttelton. Coastal shipping is now less of a network industry than it was; there is little transfer between ships except where overseas shipping is also involved.

The network aspect complicates discussions about whether particular railway lines should be closed in response to high KiwiRail losses. Most of the lightly used branch lines were closed last century, including branches in Northland, the central North Island, Nelson, West Coast, Canterbury Plains, Otago and Southland. More recent closures include Dargaville and Gisborne. Since 1950 newer lines have been built to Kinleith, Mt Maunganui, and Murupara/Kawerau[59]. Figure 34 below, shows that some lines get far less freight than others. Losses by line are not published but it may be inferred that the lines with low levels of freight make the greatest losses per net tonne kilometre and that the most economic line is Auckland-Hamilton-Tauranga.

[60]**Figure 34:** Map of main KiwiRail lines weighted per NTK (Northland line negligible).



[58] Calculated from Ministry of Transport FIGS 2020 tonne and tonne-kilometre data.
[59] *Going by Train*, Graham Hutchins, 2019
[60] https://www.transport.govt.nz/statistics-and-insights/freight-and-logistics/sheet/figs-rail

[61]**Figure 35:** Main train route freight tonnage in New Zealand

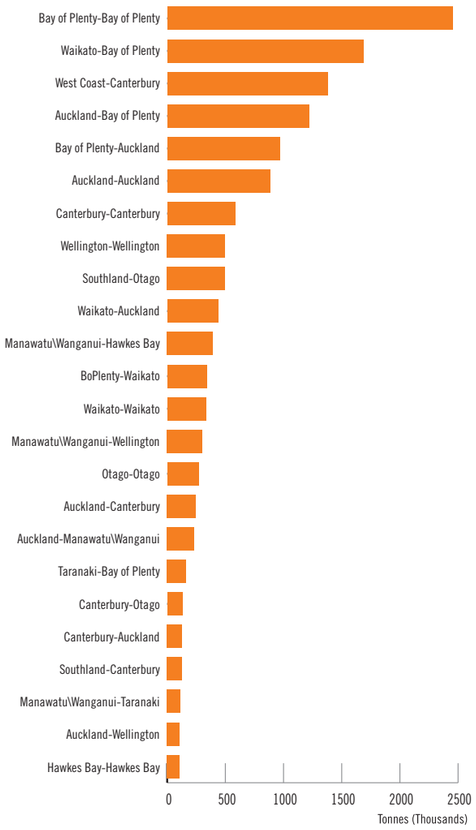


Figure 35, shows the respective origin-destination traffic.

The data does not bring out differences in freight rates, nor the directional imbalance on some of the lines. Generally, there is more freight travelling south than north, so some of the freight containers are empty in one direction. This reflects the overseas shipping pattern that brings most of our imports to Auckland, which functions as a large distribution centre both for Auckland and for the rest of the country. The Port of Tauranga is mainly an export port. Logistics companies, specialist intermediaries such as Netlogix, and customers (e.g. in the Kotahi arrangement between Fonterra, the Port of Tauranga and KiwiRail) have responded to lower northbound freight rates and worked to even the imbalances somewhat.

Some freight uses both the less economic lines and more economic ones, notably the reorientation of North Island dairy products freight in recent years. Dairy products move over less economic lines in the southern part of the North Island up north to the more profitable line to Tauranga to take advantage of cheaper northbound freight rates and of large efficient ships that call at Tauranga.

In other words, some of the revenue on the most profitable line depends on feeder traffic from less profitable lines. If the latter were closed, the Hamilton-Tauranga line would get less use and itself become less economic.

Another problem with uneconomic lines is that closure might reduce total revenue more than total costs. This is because the costs that can be clearly attributed to a particular line may be just those of maintaining it, and railway lines are heavy engineering and can last a long time with minimal maintenance. Also, if one line in part of a network was closed and freight had to be carried by road instead, it would be unlikely to switch back to rail for the remaining part of the network because of extra handling and delay.

In short, a policy of closing a few of the worst lines would not save much, yet there would still be lines that do not earn enough to cover their longer-term costs. A tougher approach might see whole chunks of the network mothballed, such as everything south of Hamilton and/or most of the South Island. After a difficult transition that would remove most of the need for subsidies, with negative consequences for some customers but positive consequences for opportunities for other Government priorities, such as social policies. Many rail branch lines were closed in the middle part of last century as road freight became competitive; some are now used for cycle trails or farm tracks. Likewise, a few roads have been abandoned through disuse and others deliberately downgraded, e.g. Southland where it was found that if the traffic level is low it can be cheaper to maintain a gravel road than a sealed one. There had also been plans to close the Northland railway line because its current and potential freight revenue was low and it was one of the least economic however, that line has recently received substantial Government spending. In our view the expenditure would have been better used on upgrading Northland roads, and the busier rail lines elsewhere.

[61] https://www.transport.govt.nz/statistics-and-insights/freight-and-logistics/sheet/figs-rail

The road and railway networks are seen by some as competing with each other. Recently this has led to moves to integrate road and rail infrastructure investment decision-making through Waka Kotahi. However, low level coordination, such as access to freight hubs, has occurred organically and most investments are incremental, e.g. upgrading part of a rail line or road in response to increased use, or maintaining at a level appropriate to the amount of use. Outside urban areas there is hardly ever an either/or decision about whether to upgrade a road or a nearby railway.

An integrated view may help in taking a big picture view of a region – for example, the heavily used rail freight service through the Kaimai tunnel means that constructing a road tunnel, which local interests propose from time to time, is not needed. On the other hand, in the purely hypothetical situation of the Tauranga-Hamilton railway line being closed, the capacity of the current highways in that area could be challenged by the increased number of trucks to move that freight. Likewise, as long as coal is exported from the West Coast, there will be a case for the railway line as State Highway 73 over the Southern Alps (Arthur's Pass) is unsuitable for large numbers of coal trucks. Although if that line was closed, the Otira tunnel could potentially be used by trucks. In less extreme scenarios, roads could cope with railway line closures through the construction of additional passing lanes especially on hills, paid for by the extra RUC revenue from the extra trucks.

The trade-offs are a matter of common sense and analysis, and hardly need new institutional arrangements. It is better to keep rail decision-making integrated because of the interfaces between train operation and infrastructure provision. A separate arrangement for infrastructure is justified only where there is competition between train operators, which is unlikely in New Zealand.

Network overview

New Zealand's surface freight travels over approximately 3,700 kilometres of rail track and some 11,000 kilometres of State Highway road network. There is a noticeable difference in the levels of connectivity the respective networks offer. This demonstrates the inherent constraints that must be considered in any meaningful discussion on competition and modal shift.

As is referred in the Intermodal contestability section of this report, we believe there are a relatively small number of cases where a customer finds it difficult to choose one mode over another. Given there are significant differences in the respective strengths and weaknesses of each mode, in the vast majority of situations the customers' demands, such as but not limited to, the type of freight, the departure and destination points, and sensitivity to time, will make their choice of mode a simple decision. This is yet another reason why we reject Government's notion of manipulating modal shift, which in effect is artificially creating additional factors to change the contestability between road and railway networks.

Bearing that in mind, we are very concerned about the Government rhetoric to shift freight from road to rail and similarly concerned at the recent move to integrate road and rail infrastructure investment decision-making through Waka Kotahi.

Included in Waka Kotahi's value proposition[62], is a focus on "providing one integrated land transport system that helps people get the most out of life and supports business", and "innovating to make sure the system is efficient and sustainable, unlocking opportunity and keeping New Zealand moving".

Given the differences in the respective networks of each mode and the different offers they provide, we cannot see how Government interventions will improve efficiency, keep New Zealand moving or, with the exception of KiwiRail, support business.

In fact there is considerable risk that instead of helping achieve Waka Kotahi's value proposition, those interventions lead to perverse outcomes. For example, freight moved on the less optimal mode, in other words, freight that would have been best transported on rail moves on road instead and vice versa. Perverse outcomes did eventuate during the periods when Government limited the distance that road freight could travel.

We urge Government to respect each mode's strengths and weaknesses and leave it to the market to determine mode choice.

[62] Waka Kotahi NZ Transport Agency (nzta.govt.nz)

Government influences

In this section we discuss the history of Government influence over the modes and suggest learnings.

Our views are:

- Compared to rail, the road transport sector is much more heavily regulated with a complex plethora of rules and there is significant enforcement effort from the likes of Police Commercial Vehicle Safety Team and Waka Kotahi NZ Transport Agency.
- The new competition made possible by deregulation reduced freight rates.
- There is some irony in the fact that some changes to truck size and weight limits were key to rail's viability as it enabled intermodal freight however, unlocking these freight efficiencies has also increased road's advantage over rail.
- Historically, Government has shown a strong desire to protect its existing infrastructure investment in rail from the increasing competition from road transport. However, given the efficiencies that road freight offers and for the good of the national economy, those Government constraints have subsided. Any return of Government intervention to artificially change modal share is a failure by them to learn.
- Given Government's funding and rail's performance over the past 150 years, we disagree with the recent budget allocations being described as investment. At best, these are misguided subsidies, and in reality, it is poor use of public funds to prop up a system that bar a few exceptions, is not commercially viable.
- We suggest that a business model that would offer more transparency and could be more successful is one based on the Australian Community Service Obligation (CSO) model. Under that model, KiwiRail would be a commercial entity paid by the Government for clearly defined obligations the Government imposes on behalf of the community, such as running particular uneconomic services, or investing in particular uneconomic projects.

Railways construction, circa 1900s.
Ref: 1/2-051892-F. Alexander Turnbull Library

Rail

Construction of New Zealand's railway network started in 1860 and was generally undertaken by provincial governments. Following the abolition of the provinces in 1876, the provincial railways came under the central Government control. From 1880, the network was operated by the New Zealand Railways Department. Lines were constructed by the Public Works Department and then handed over to the Railways Department for operation. The Railways Department funded maintenance, but made no direct contribution to the capital cost of construction.

Under Government ownership of the railways, political processes set construction priorities and affected route choice, timetabling and freight rates. These political outcomes were in tension with profitable operation (Le Rossignol & Stewart, 1909).

Throughout our history, governments have typically shown a strong desire to protect existing infrastructure investment from the increasing competition from road transport, therefore, since the 1930s the Government has imposed legislative restrictions on the transport of goods by road.

Since the early days, railways were seen as a hybrid between a public service and a commercial one. The Public Works Department built the lines and the Railways Department operated the trains. At various times governments have determined what services should be run and what rates should be charged, and it appears there was no expectation of a profit; instead there is a history of declining profits from the 1920s and losses from the 1970s.

In a further repeat of the cycle described by Orr [63], the Railways Department was again corporatised in 1982, privatised in 1993 and bought back again by 2008. For details, see Heatley (2009), chapter 2.

In addition to protection from competition, periodically the Government has provided financial bailouts.

In essence the rail freight network is operated by two state owned enterprises (SOE), KiwiRail Holdings Limited trading as KiwiRail and New Zealand Railways Corporation. The latter owns the land under which the KiwiRail network operates on behalf of the Crown. The principal objective of every SOE is to operate as a successful business and to be as profitable and efficient as comparable businesses that are not owned by the Crown.

Therefore, the SOE model could be seen to be a strategic milestone towards becoming privatised, rather than ongoing Government ownership. Given the demographics of New Zealand and the historic performance and learnings over the past 150 years with rail we believe it is unrealistic that the railway ecosystem can operate profitably.

[63] Orr, S. (1981). *New Zealand Railways Corporations. A Short History of Previous Experiences with New Zealand Railways as a Corporation.* Economic Division, Ministry of Transport.

A normal business knows it must make an economic level of profits (that is, enough to cover a cost of capital that reflects the level of risk) and that if it does not, it becomes financially unsustainable and eventually fails.

The Government's interventions, either by way of direct financial or other incentives to artificially skew freight demand towards rail, create a risk of de-incentivising normal private business practices and behaviours that might otherwise be implemented to drive profitability. We contend a recent example of that is the politically motivated upgrade of the Northland line, which a normal profit-oriented business would not have undertaken.

The recent decision to change the distribution of the National Land Transport Fund so that tax collected from road users could be directed to rail, and Government's talk about shifting freight from road to rail and changing the modal share, continues this concerning trend of regulatory interventions.

The Government has allocated $1.3 billion in Budget 2021, $1.2 billion in Budget 2020, a $1b in Budget 2019, to rail. The Government says, rather like previous governments did, *"over the next decade we need to invest to retain the current level of service… and achieve a reliable and resilient national freight rail network"*[64]. It is also again toying with a version of separating train operation from infrastructure provision.

According to KiwiRail's press release, "*The government's investment allows us to continue with our locomotive replacement programme and raise the standard of our rail lines, bridges and tunnels across the country" and "this will attract more customers and get more freight on rail"* [65]. However, we are not aware of any substantive evidence that the locomotives, bridges or tunnels are major factors underpinning customers' current preference to move their freight by road. It is our view that the improvements that funding delivers to rail will not be sufficient to overcome the inherent advantages that road has over rail.

Throughout rail's history, in addition to the current SOE structure, governments have discussed and experimented with various business models including trading departments, Corporations, and Crown Entities. There have also been experiments with "vertical separation" of railway operation and infrastructure management.

Despite best efforts and intent, the fact that so many business models have been tried and none have proven successful tends to support our view that it is unrealistic that the railway ecosystem can operate profitably.

We suggest that a business model that would offer more transparency and could be more successful is one based on the Australian Community Service Obligation (CSO) model. Under that model KiwiRail would be a commercial entity paid by the Government for clearly defined obligations the Government imposes on behalf of the community, such as running particular uneconomic services, or investing in particular uneconomic projects.

The obligations would be clearly defined and the amount of payment would be based on independent analysis. The payments would be a revenue item, written off when received, rather than being added to the balance sheet. KiwiRail would be expected to be "as profitable and efficient as comparable businesses", but would have two types of customer – normal paying customers and the wider community through the Government CSO payments.

This is broadly similar to the current arrangement for urban passenger rail services. The Government would have three roles:

- As a policy maker, deciding on the CSOs it wants to pay for on behalf of the people, and explaining to the people why it wants to spend on them instead of on other things, such as childhood poverty, housing, etc. The explanations would clearly state the well-being outcomes the Government expects. For example, how will the upgrade of the Northland line improve the well-being of people in Northland compared with spending on improved roads?
- As a purchaser of services, to ensure that the services were indeed supplied to the previously agreed standard of reliability, etc. The NZ Rail Plan makes a start with "measuring the benefits of investment", a section on monitoring of performance such as improvements in resilience and reliability, achievement of an asset management plan (for example axle load and line speed), and other operational measures.
- As owner, to press KiwiRail to perform according to the SOE standard, in the way the Treasury already does for other SOEs.

In the absence of more transparency and a different approach, it appears the lessons of history are doomed to repeat themselves. Given Government's funding and rail's performance over the past 150 years, we disagree with the recent budget allocations being described as investment. At best these are misguided subsidies, and in reality it is poor use of public funds to prop up a system that bar a few exceptions, is not commercially viable.

[64] *Draft New Zealand Rail Plan 2019.* Ministry of Transport.
[65] $1.2 billion investment another major step in rebuilding rail for New Zealand | KiwiRail

Trucks

Today, the road transport sector is heavily regulated with a complex plethora of rules covering every aspect of the activity including, but not limited to, requirements for:

- **Licencing to carry goods for hire or reward**
- **Vehicles such as:**
  - **Entry and in-service inspection**
  - **Build certification**
  - **Repair**
  - **Equipment such as: lighting, brakes, exhaust emissions and steering**
  - **Size and weight**
- **Operating conditions such as:**
  - **Driver licensing**
  - **Work time hours**
  - **Load security**
  - **Transport of livestock**
  - **Transport of dangerous goods.**

The rules are enforced by either the Commercial Vehicle Safety Team (CVST) of New Zealand Police, or one of the several compliance teams at Waka Kotahi, or in the case of transport of livestock, the Ministry for Primary Industries. It is normal that road freight drivers expect to be stopped by Police, either at roadside weigh stations or anywhere on the route as they go about their business. Given that context, and bearing in mind that the vast majority of people working in New Zealand do not expect to be stopped by Police during a routine day of work, we believe the heavy transport sector is heavily regulated and enforced.

Looking back over the past century, the Government has had a strong desire to protect its existing rail investment from the increasing competition from road transport. There have been successive restrictions legislated on the distance that goods can be transported by road including: a 30 mile (48 kilometre) limit in 1936; a 40 mile (64 kilometre) limit in 1961; and a 150 kilometre (93 mile) limit in 1977.

In addition to distance limits, there were restrictions on the parties that could transport goods for hire or reward and freight prices were controlled.

Following a major consulting report (the Wilbur Smith 1974 report) and mounting pressure from the Manufacturers' Federation and Federated Farmers, along with wider moves to reduce regulation in the economy, restrictions on road freight were removed under Minister of Transport George Gair from 1983. Quantitative restrictions were replaced by qualitative licensing that, from 1989, has underpinned the road safety regime. Clarity and simplicity were improved by covering the whole transport fleet, instead of the previous split between ancillary operators carrying their own product, e.g. fuel, and the general licensed fleet.

The pressure for change reflected dissatisfaction with the railways and the obligation to use them, and awareness of missing out on efficient road freight services. The authority that determined who could get exemptions from the regime was the Railways Department itself, and the Government became aware of some of its more extreme decisions. There were some truck operators, notably the Railway Department itself (which had many trucks and trailers), farmers, and other "ancillary" operators (producers who use their own trucks to carry their own goods), who in practice had more freedom than the general hire-and-reward road carriers. The economics and convenience of efficient point-to-point road freight were well-known. Enforcement of the restrictions was uneven, and they were sometimes avoided with tricks such as placing warehouses just under 150 kilometres from each other.

The new competition made possible by deregulation reduced freight rates (anecdotally by 30 to 40 percent) and the railways, already in financial difficulty, lost market share. Likewise some truck firms did not cope well with the demise of the licensing system on which they had relied and they struggled with the transition to determining their own transport charges and which customers to serve. Others quickly grew to dominate sections of the transport market and build up logistics management skills.

Freight deregulation was part of New Zealand-wide removal - around that time - of Government interventions that had been imposed mainly in the Depression of the 1930s, such as import licensing, high customs tariffs, bus and taxi regulation, a complex tax system, and farming subsidies. In particular, the Employment Contracts Act of 1989 reduced the statutory protection of trade unions and encouraged individual employment contracts. Road freight companies generally changed to such contracts and there was fast growth in numbers of owner drivers (most of whom ended up being committed to one principal). The Railways remained unionised, which reduced their ability to change to more efficient work practices.

Deregulation provided the basis for the strong freight industry that New Zealand now has. It is dominated by road freight which suits our low and dispersed population. The road freight industry has a competitive, efficient and flexible mix, ranging from small local firms that are socially integrated with their communities, to specialised firms and large nationwide companies.

Some road freight companies have broadened into integrated logistics companies that are agnostic between modes – they use trucks, trains and ships depending on the opportunities and the customers' needs. No one is obliged to use any particular mode – the choice depends on what mode has the best mix of attributes in the eyes of the customer.

There was further significant regulatory influence starting in the 1990s. Truck gross combination mass limits (GCM) increased from 39 tonnes to 44 tonne GCM, and tractor semi-trailers that supported the container transport export trade, were able to apply for permits to operate for payloads in excess of 30 tonnes to facilitate international trade, while most other types of combination operated at the 44 tonne GCM.

In 1996, Transit NZ commenced a review of the network capability and proposed a new initiative called the heavy limits project. The purpose was to better align heavy vehicles with the geometric design characteristics of the road, and to optimise axle weights with bridge loading capacity. It heralded the possibility of a significant increase in vehicle payload capacity under two vehicle size and weight scenarios, namely Scenario A and Scenario B, the latter taking GCMs to 62 tonnes on approved routes. Scenario B, or a refined version of it was introduced in 2010 as full high productivity motor vehicles (HPMV), followed by Scenario A two years later (2012) as 50 MAX, (a subset of full HPMV), a 9 axle pavement neutral 50 tonne combination that loaded the pavement no greater than the prevailing 44 tonne 8 axle combination.

The new generation HPMV vehicles were based on a design concept termed *proforma*s which ensured that even at their longer lengths of 23 metres, they were able to adequately fit the network. The proformas designs have been refined from time to time over the past eight years. HPMV vehicles are also operated pursuant to permits, are expected to meet a menu of additional specific safety attributes, and are routinely confined to specific state highway networks when laden. These routes and networks have been updated and amended over time to support the first and last mile concept. 50 MAX has had the benefit of a wider more generous network and this combination has become the baseline vehicle displacing a significant number of the 44 tonne vehicle combinations.

[66]**Figure 36:** Intermodal freight, a swing-lift ISO Container Truck

Meanwhile truck design and reliability have continued to improve, and maximum vehicle dimensions and mass (VDAM) were most recently increased in the 2016 VDAM review. A slight increase in maximum width to an international standard of 2.55 metres opened the New Zealand market to a range of off-the-shelf models of truck. The change also enabled New Zealand manufactured refrigerated trailers to adopt the thin wall insulated designs prevalent in the European market, which could accommodate additional pallets also sized to international specifications. The maximum weight for a standard truck plus trailer was increased in 2017 to 46 tonnes. This change was a reflection of the fact that operators had for many years utilised the *Offences and Penalty's Regulations* weighing enforcement tolerances of 1.5 tonnes for commercial gain when operating at what was the legal limit of 44 tonnes. The solution was to reset the tolerance for the 46 tonne vehicles to 500 kilograms making the weighing enforcement tolerance consistent across all vehicle types. The upside was improved compliance and enforcement consistency and no loss of national productivity.

The additional categories of HPMV, allowing up to 62 tonnes (but more commonly the mid-50s due to the RUC cost impact) and 23 metre length on specified routes (and subset, 50MAX, allowing 50 tonnes on a wider network with specific limitations), have helped the New Zealand economy by allowing more efficient road freight, but have added to the competitive challenge faced by rail freight.

In addition to VDAM limits, changes were also made to the mass distance road tax pricing regime, RUC, and to operator licensing. RUC was reviewed, culminating in the Road User Charges Act 2012, that recalibrated the RUC attribution for standard vehicles by removing the incremental charge rates, that operators could previously self-select, to a banded system with mass thresholds to reduce both compliance and administrative costs, and minimise evasion. This new scheme also embodied specific rates (again in mass bands) for the new HPMV vehicles and their various derivatives.

Transport service licencing has also evolved and the baseline for licencing rose from operating any vehicle for hire and reward to a new threshold mass of 6 tonnes GVM for formal transport service licences (TSL), leaving the lessor weight hire and reward operation of vehicles, such as couriers etc, subject to general road safety requirements, as well as specifics such worktime and dangerous goods compliance.

There is some irony in the fact that some changes to truck size and weight limits, such as the overweight permit regime for export containers, and the changes to allow truck mounted cranes (swing-lifts) to move ISO containers, were key to rail's viability as it enabled intermodal freight however, unlocking these freight efficiencies has also increased road's competitive advantage over rail.

[66] Transporting New Zealand File Photo

Overseas rail freight benchmarking

This chapter provides a short commentary on rail freight in a number of international jurisdictions and we explore some of the issues we see with Government policy development which supports our view.

Our views are:

- There is no right or wrong answer in regard to what the modal share or tonnage carried by a given mode is. This is supported by the fact that some countries we aspire to mirror, have higher or lower freight tonnages and/or higher or lower modal shares.
- The variances in respective modal contributions across countries further demonstrates the irrationality of Government thinking to shift freight from one mode to another. Rather than consider the modal split as right or wrong, which is an inherent inference by Government and underpins its desire to intervene, we should simply accept whatever that modal split is at any point in time.

Freight experience overseas generally confirms that railways are at their best with bulk products travelling long distances. Furthermore, those bulk goods are relatively low value-added goods, and the transport component comprises a relatively high percentage of the product price. Examples of low value bulk goods are coal and iron ore whereas, an example of a high added-value good that is less likely to be rail freighted is cell phones. Rail activities undertaken overseas include:

- **North America**
  - Railroads dominate trans-continent freight in North America, with distances similar to those in Australia. There is a relatively limited role for shipping because of the detour via the Panama Canal. Trucks dominate short and some medium hauls in North America.
- **Australia**
  - From the east coast of Australia to Perth (around 4000 kilometres), rail freight dominates long haul, mainly of containers, with about 65 percent of the market by NTK. The rest is split between coastal shipping and road. Except for niche markets, road does not suit on that route – the length of the journey means that two drivers are judged to be needed for each truck. Trains also have two drivers but are up to 1800 metres long with containers double stacked.
  - Rail is the only form of freight used between the iron ore mines in the Pilbara in Western Australia and the ports. However, bauxite in the south of the state is mainly transported out of the mines by conveyor belt. Freight from ports, whether to overseas destinations or to Australian smelters and steelworks, is by ship.
  - Rail is used to carry coal between the large New South Wales and Queensland coal mines and the ports. For shorter distances road vehicle are used to move relatively small quantities of coal between older mines and ports, and it is not unusual for trucks to transfer the coal from the face to the respective mine rail head.
  - Rail freight is used to carry limestone to a port in Northern Tasmania. The distance is only 28 kilometres but the tonnages are large and there are specialised loading facilities at each end.
  - The modal share between truck and train differs on the east coast of Australia (Adelaide-Melbourne-Sydney-Brisbane). The distances are shorter than those to Perth and the competing roads are excellent motorways that are ideal for efficient operation of large trucks. As it does not usually need double handling, road freight offers a faster and more flexible service, and rail freight has to compete on price.
  - In Tasmania, it appears the haul length and topography, freight type and customer demands typically favour road over rail.
- **Western Europe**
  - Despite some long distances and potential high tonnages, rail freight has struggled against road freight and canals in much of Western Europe because of competition for track capacity from passenger trains, and inefficiencies at borders that can result in slow unreliable services. These problems are gradually being addressed.

Figure 37 shows tonne-kilometres of rail freight for a range of countries. Given the size of the variance between the four super-powers and the remaining countries, Figure 38 is a zoomed in view using a different vertical scale with those super-powers' activity truncated.

For the convenience of the reader, Figure 39 is repeat of Figure 9 shown earlier.

Comparing the data in Figures 37, 38 and 39, the numbers may be interesting, whether it be the respective country's tonnage of the freight task completed by rail or the modal share. However, in our view, being casually interesting is the limit of its usefulness. As with modal share, some countries that we might aspire to be like have a lower rail freight tonnage than us, and some have a higher tonnage. There is no right or wrong answer, therefore, the value of comparing modes for policy setting is of little value. This once again demonstrates the irrationality of any Government thinking to shift freight from one mode to another.

Our view is that at any point in time, modal share is driven by the customer and the respective mode's offer. The customer demand and the potential transport provider's offer will be determined by a complex set of factors, both internal and external, such as but not limited to: geography, population, infrastructure, technology, the strength of the economy, and culture. With that in mind, rather than consider the modal split as right or wrong for a respective mode, which is an inherent inference by Government and underpins its desire to intervene and drive some other hypothetical sharing, regardless of what that modal split is at any point in time, it should simply be accepted as being the correct split for the circumstances at the time.

[67]**Figure 37**: Rail freight carried by country (full view)

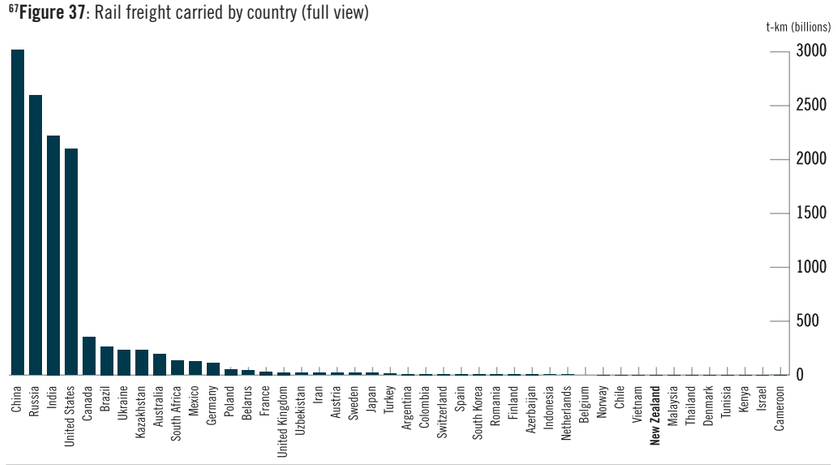
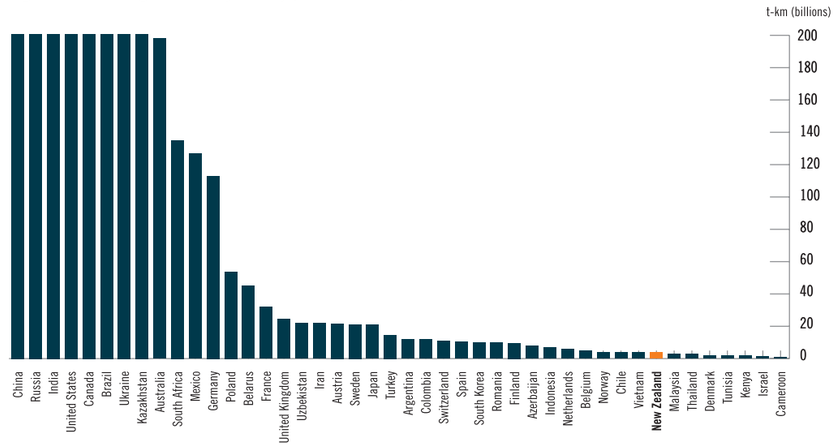
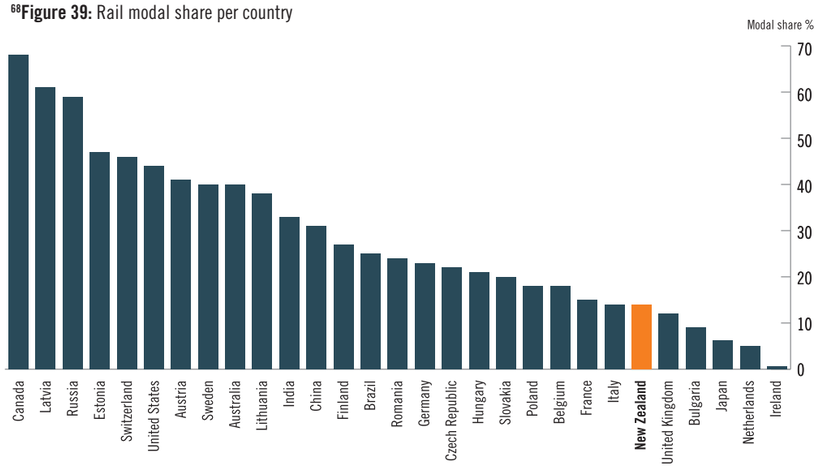


Figure 38: Rail freight carried by country (zoomed in view)



[68]**Figure 39:** Rail modal share per country



[67] https://en.wikipedia.org/wiki/List_of_countries_by_rail_usage and https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Freight_transport_statistics
[68] https://en.wikipedia.org/wiki/List_of_countries_by_rail_usage and https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Freight_transport_statistics

Look back

Apart from some minor additions, in terms of the content this section is largely a reproduction of the recent work completed by David Greig. For convenience of the reader, some of the content below is also referred in other sections of this report such as in the Government influences and the Road and rail networks sections. Throughout the section we have suggested a number of insights and learnings that could be taken from that history.

Our views are:

- It is frustrating to see that on occasions, contrary to the advice of independent reviews such as those by Royal Commissions, Governments continued to allocate funding to rail.
- Despite several attempts from Government over the past century to intervene and shift freight to rail, the long-term trend has been a deterioration in rail's financial performance.
- One of the perverse outcomes of that Government protection was rail expanding beyond its optimal range of tasks and economic size and ultimately that has resulted in unnecessary costs due to delaying the closure of uneconomic rail lines.
- Deregulation provided the basis for the strong freight industry that New Zealand has now. No one is obliged to use any particular mode – the choice depends on what mode has the best mix of attributes in the eyes of the customer. Our freight task is dominated by road because that is what best suits our low and dispersed population.
- The rail infrastructure has not produced an economic level of return (or indeed, sometimes any return) for decades. Railways have needed Government subsidy for decades and we can see no evidence to suggest that will change. Despite several attempts from Government over the past century to intervene and shift freight to rail the long-term trend has been a deterioration in rail's financial performance and we do not see the latest $5b investment changing that trend. This failure to learn from history is deeply concerning.

Overview of history

New Zealand settlement began with coastal Māori and then European settlements, connected to each other by coastal shipping and to their hinterlands by tracks. Land transport, other than merely local, was minimal until well into the 19th century when railways were introduced. Initial short lines were extended, most notably by the debt-financed works programmes of Sir Julius Vogel in the 1870s and shortly after by the privately financed Wellington-Palmerston North line. Much of New Zealand was opened up to farming by the extension of railway lines up the main valleys and by "main trunk" connections between the cities: 1908 for the North Island, 1879 for Christchurch-Invercargill, and 1945 for Picton-Christchurch. Railways were in their heyday, for passenger travel and freight, from the late 19th century until the mid-20th century, and displaced much of coastal shipping (just as, overseas, they displaced some canals). In the early days of New Zealand railways there were no such things as trucks. Generally it is accepted that the first truck was built by Daimler in Germany in 1897 and it was considerably later that trucks would make their way to New Zealand.

Therefore, rail freight had about half a century of dominance before better trucks started appearing, and roads improving, from the 1920s. Early trucks were primitive and not suited to long hauls. Ongoing incremental improvements to roads and to truck designs gradually changed the competitive balance. There are now 23 kilometres of road for every one kilometre of railway (94,000 vs 4000)[69]. Chapter 3, Road and rail networks, compares the current road and rail network.

The Depression of the 1930s interrupted the competitive shift to road freight. In order to protect the railways the Government responded to the Depression with restrictions on road freight for runs longer than, firstly 30 miles (48 kilometres), then later 40 miles (64 kilometres) and lastly, from 1977, 150 kilometres, but this led to business distortions and monopoly behaviour at the expense of customers. Road carriers were also required to be licensed in order to limit competition and protect incumbents.

It became increasingly clear that road transport particularly suited most types of freight in the small dispersed New Zealand market. Customers became aware that the obligation to use rail freight meant they were forgoing the convenience, reliability and efficiency, and sometimes lower total cost, of point-to-point truck services.

Pressures for change culminated in deregulation (removal of quantitative restrictions) in 1983, and according to the MoT's National Freight Demand Study, in 2018 road freight completed approximately 93 percent of the surface freight market by net tonne kilometres.

Public Works train at the Skinner Road ballast pit, near Stratford. *Alexander Turnbull Library, James McAllister Collection (PAColl-3054) Reference: 1/1-012575-G*

[70]**Figure 40:** Early truck manufactured by Daimler

[71]**Figure 41:** Garrity hay truck circa 1930s in New Zealand

[69] Infrastructure Commission, *Developing the Freight Sector Elements,* September 2020
[70] https://media.daimler.com/
[71] Transporting New Zealand File photo

Early days - 19th century development of rail

Construction of New Zealand's railway network started in 1860, with the first line opening in 1863 (see the Heatley paper for extensive references). The earliest lines were generally constructed by provincial governments. The desire for fast expansion overrode fiscal caution, and provincial governments borrowed very large amounts to fund the development. By the end of 1863 provincial debentures had become un-saleable, except at a heavy premium compared with General Government debentures.

On the abolition of the provinces in 1876, the provincial railways came under central government control. From 1880, the network was operated by the New Zealand Railways Department. Lines were constructed by the Public Works Department and then handed over to the Railways Department for operation. The Railways Department funded maintenance, but made no direct contribution to the capital cost of construction. In the early days of the network, maintenance would have been relatively cheap as the average age of the network was low.

Narrow gauge rail was mandated in 1871 as the national standard. It was chosen in preference to standard gauge in order to reduce construction costs, particularly in mountainous terrain. The mountainous countries of Japan and Indonesia and Tasmania, in Australia, made the same decision. Narrow gauge is also used in South Africa, Western Australia, Queensland, and elsewhere. At the time, this choice made a trade off against speed and freight capacity – sharp curvatures (enabled by the narrow gauge) and cheap construction made speed unsafe and limited the weight of locomotives. However, now there are narrow gauge trains that are large, e.g. for Queensland coal, or fast e.g. Perth commuter and Queensland tilt passenger trains.

A notable exception to Government construction was the 140 kilometre Wellington and Manawatu Railway; it was privately built and operated as a successful business from 1886 until its nationalisation in 1908, in order to join it to the newly connected line from Auckland. The investors were largely Wellington businesses that used the line to develop economic activity and serve passengers between Wellington and Palmerston North. Part of the revenue came from the sale of the land near the lines which had been granted by the Government and whose value depended on the existence of the line. A similar approach was taken with land grants for the trans-continental railroad for the United States.

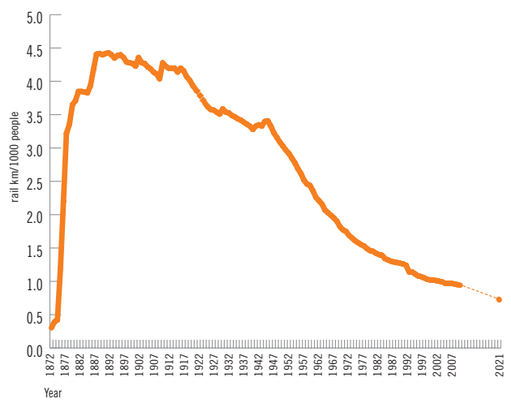
The Public Works Policy of Treasurer Julius Vogel gave a substantial impetus to railways construction in the 1870s. Figure 42 shows that between 1870 and 1878, £7.6m of borrowed money was spent on railways construction, dwarfing expenditure on other activities in the colony.

[72]**Figure 42:** Public Works Policy expenditure 1870-1878

Work	Expenditure (£)
Railways	7,638,135
Roads and Bridges	976,083
Water races	465,626
Public buildings	449,676
Telegraphs	328,220
Land purchases	705,039
Immigration	1,782,520
Lighthouses	81,240
Coal mines	10,835
Miscellaneous works	215,395
Total	**12,652,769**

Vogel's ambition was a transport network that linked the nine far-flung settlements of the colony into one nation (Woods, 1935). For this reason, the policy concentrated on the building of trunk lines. However, it was quickly found that branch lines were essential to generate the traffic to make railways worthwhile. The initial purpose of rail was to connect ports to the agricultural hinterland - "opening up the country". Branch lines were built up every major valley.

[73]**Figure 43:** Rail length per 100 people 1872 to 2007



[72] Woods, N. (1935)

[73] Railways Department Annual Reports, Ontrack annual reports, New Zealand Long Term Data Series

As the country industrialised, railways connected ports to mines, freight and forestry hubs, and industrial sites. The initial explosion of track building meant that by 1879 New Zealand had 1762 kilometres of railway, a substantial amount for its then population of 458,000. This equated to over three kilometres per 1000 people. This ratio had increased to nearly 4.5 kilometres of railway per 1000 people by 1888 and has been declining slowly ever since to the current 0.7 kilometres per 1000 people. The trend is shown in Figure 43.

By 1879 concerns about the economic performance of rail were surfacing (Neale, 1938; Orr, 1981). The operating railways were earning 2.25 percent per annum on capital but the cost of capital at the time was estimated at over 5 percent.

A Royal Commission was instigated which reported in 1880. It found that:

- stations were over-staffed
- train services were too frequent
- wages were too high
- political interference in response to pressure from sectional and regional interests was affecting capital expenditure and operational decisions
- excessive railway construction had occurred in advance of demand.

Early 20th century

The Royal Commission also recommended that many of the plans to further expand the network be deferred or cancelled, but despite this, the network continued to expand rapidly until around 1930. The rate of construction then slowed, with the network reaching its peak length of 5695 kilometres in 1952. A series of branch line closures reduced the network length to approximately 4000 kilometres by the early 1990s (the length first reached in 1908). The network length has since further declined slightly.

While the North Island main trunk was completed in 1908, it took until 1945 to finish the Picton to Christchurch section and complete the South Island main trunk. These two networks were independent until inter-island rail ferry services were introduced in 1962. Vogel's vision of an integrated rail network spanning the whole country was finally realised, nearly 100 years after the first railway line was opened.

The rail ferries, which also take trucks, cars and passengers, started in 1962. They were subsequently branded Interislander. A competitor, for trucks, cars and passengers, emerged in the form of Bluebridge in 2002.

Under Government ownership of the railways, political processes set construction priorities and affected route choice, timetabling and freight rates. These political outcomes were in tension with profitable operation (Le Rossignol & Stewart, 1909). A recent parallel has been the politically inspired upgrade of the Northland line. Governance of the railways cycled between periods of corporatisation – attempts to place the railways beyond political control in order to improve their finances – and periods of direct ministerial control responsive to political pressures (Orr, 1981).

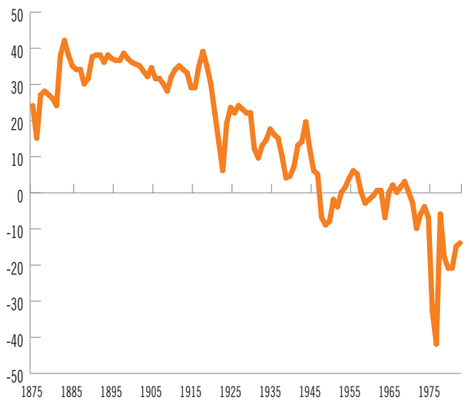
Public and commercial interest demanded better connectivity, flexibility and economies of scope than what the railways offered and this led to rapid expansion of New Zealand's road network in the early 1900s. By 1930 New Zealand had 78,960 kilometres of formed roads, approximately 90 percent of the network that exists today.

New Zealand now has 11,000 kilometres of State Highway and some 80,000 kilometres of local roads linking our communities and providing the level of connectivity that our country is heavily reliant on.

The flexibility and agility that road deliveries offered over rail resulted in most of the rail branch lines closing. Figure 44, on the next page, shows the current extent of the complete road and rail networks, and the difference in the respective levels of connectivity demonstrates the inherent constraints that must be considered in any meaningful discussion on "competition and modal shift".

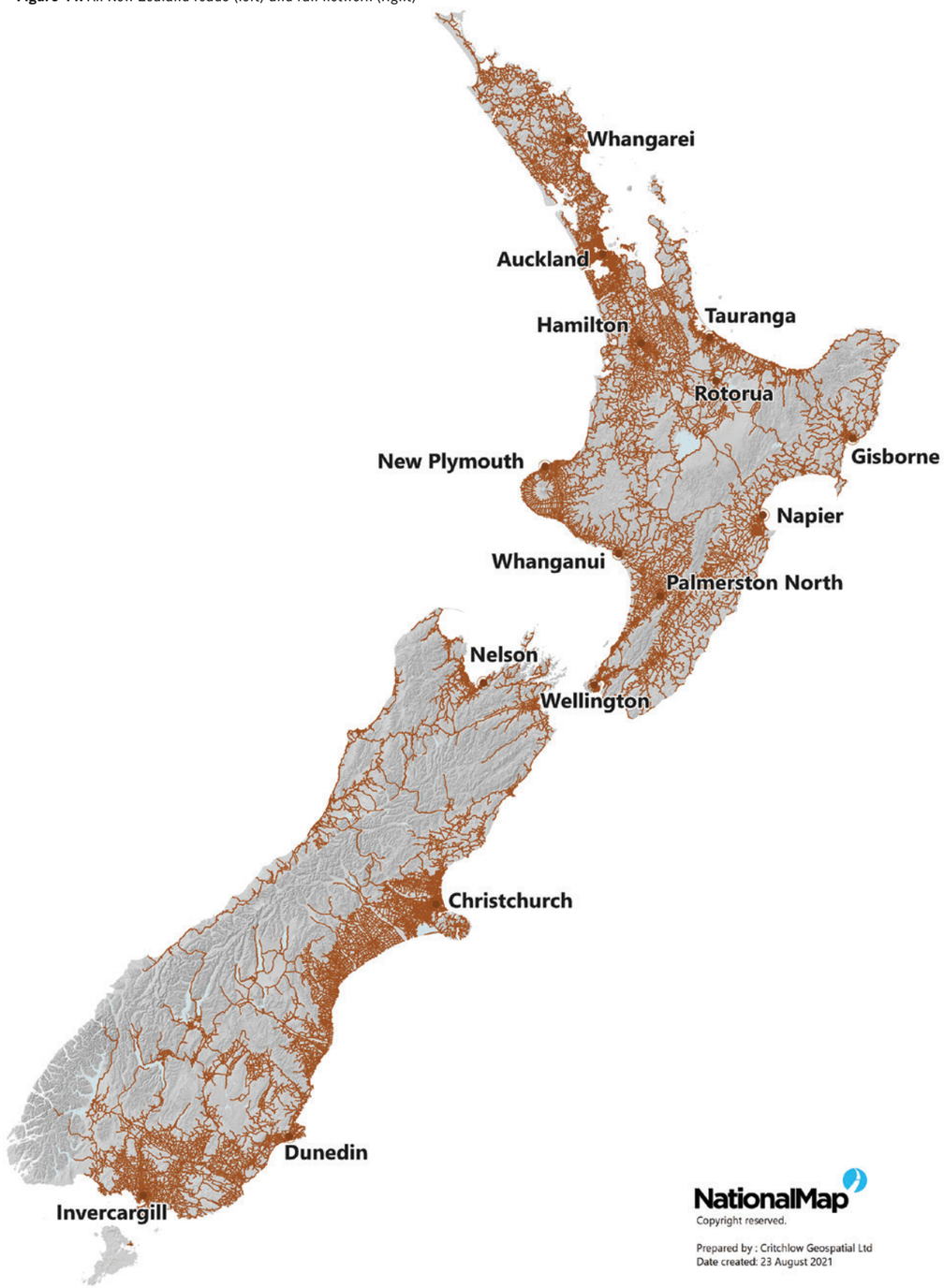
Figure 45, shows the deteriorating financial performance of the railways started from circa 1920. This coincides with the time when private motor transport became widespread in New Zealand, suggesting that competition from road transport was the major cause of this deterioration.

[74]**Figure 45:** Financial performance 1875 -1982



[74] Orr (1981) and Annual Reports

[75]**Figure 44:** All New Zealand roads (left) and rail network (right)



[75] Mapscaping.com

Government interventions to limit road transport and protect rail

The Government had a strong desire to protect its existing infrastructure investment from the increasing competition from road transport, therefore, legislative restrictions on the transport of goods by road were imposed in the 1930s. Road transport of most goods was limited to 30 miles (48 kilometres) from 1936, increasing to 40 miles (64 kilometres) in 1961 and 150 kilometres in 1977. Entry to the road transport business was also restricted and freight prices were controlled.

However, as can be seen from Figure 45 on page 59, despite several attempts from Government over the past century to intervene and shift freight to rail, the long-term trend has been a deterioration in rail's financial performance.

Furthermore, it appears that one of the perverse outcomes of that Government protection was rail expanding beyond its optimal range of tasks and economic size and ultimately, that resulted in unnecessary costs due to delaying the closure of uneconomic rail lines.

Reductions in the size of the network started in 1953, and steam engines were replaced by more efficient diesels, coinciding with the start of two decades during which financial performance stabilised. A further deterioration in performance is apparent from 1970 onwards.

Ultimately, even the combined effects of regulatory protection, line closures and technological improvements were insufficient to arrest the ongoing decline in financial performance. In a further repeat of the cycle described by Orr (1981), the Railways Department was again corporatised in 1982, privatised in 1993, and bought back again by 2008. For details, see Heatley (2009), chapter 2.

During this period a report by consultants Booz Allen Hamilton in 1983 drew attention to the railway's poor labour and asset productivity. The report found that two-thirds of the wagon fleet, half the locomotive fleet, and 40 percent of staff were unnecessary to achieve current and expected future levels of demand. Its recommendations included:

- reducing staff numbers
- re-orienting freight services towards bulk commodities
- increasing the length and weight of freight trains
- rationalising the locomotive and wagon fleet
- rationalising railway workshops[76].

Changes implemented in the 1980s led to dramatic improvements in productivity. The 1989 Annual Report of New Zealand Railways Corporation reported that:

- staff numbers had been reduced by 54 percent over seven years
- staff productivity had increased by 94 percent over six years.

However, none of the governance changes and efficiency improvements fundamentally affected the difficult position of rail freight in New Zealand (see Heatley chapter 2.2 and 2.3).

Even the involvement of a successful United States "short line" rail operator, Wisconsin Central, was able to change the trend for a few years only. It started well with targeted investment, operating improvements, and a focus on customer service, but later a subsequent owner resorted to "harvesting" the assets, or managed decline.

Until circa 1970s and 1980s Governments saw railways as being needed to provide a freight service (even though trucks could also provide it on most routes) and as a source of employment (even though subsidies diverted resources from the wider economy, thus hurting employment). However, it also appears that another perverse outcome of that Government protection was a rail service that built itself a poor reputation for customer service, e.g. damaged or lost goods, delays, wastefulness, resistance to change (e.g. a slow switch from steam to diesel engines) and overstaffing (a peak of around 20,000 compared with about 4000 now). These weaknesses, combined with inherent unsuitability of rail freight for some tasks, left the railways ill-equipped to cope with increased competition when it came.

With the exception of the relatively small customer demand with freight that suited rail, such as long-distance bulk, the remaining customers enjoyed the better flexibility, reliability and speed that road freight could offer, leading to increasing demand for road transport.

In light of the benefits that road freight presented to customers, there was a cost suffered by customers associated with the disadvantages of rail, for example the damaged or lost goods, or travel time. That unnecessary cost was reflected by a drop in transport rates following deregulation of road transport in 1983.

[76] Bob Stott (1984), Booz Allen Report in Summary.

Deregulation of road transport 1983

The earlier section of this report on Government influence, and in particular the sub-section on Trucks, discusses the period when the movement of freight by road was restricted to various distances, otherwise generally known as the "regulated" period.

Since deregulation the road freight industry has gone through waves of adaptation to the removal of protection, new truck technologies, and new IT applications including integrated logistics and telematics.

Integrated logistics encompasses a whole supply chain from point of origin, such as a factory or port, to destinations such as another factory or a warehouse. Telematics and similar technologies provide real-time information to management about each of their trucks including, where it is on the road network, the load and axle weights, speed and other aspects of driving, fuel consumption etc. Some of the road freight companies have broadened into integrated logistics companies that are agnostic between modes – they use trucks, trains and ships depending on the opportunities and the customers' needs.

The road freight industry is a competitive, efficient and flexible mix, ranging from small local firms that are socially integrated with their communities, to specialised firms and large nationwide companies.

As a quid pro quo for protection, the railways were expected to carry goods that were uneconomic for them to handle, such as parcels. A consequence of deregulation was that structurally, the railways moved from being a universal service provider to focussing on narrower niche markets which align with its comparative strengths, such as coal, aggregates and longer distance container transport.

The rail network has stayed much the same since 1991. The competitive environment in which rail operates has continued to evolve, raising the question of whether to keep operating the most marginal lines. If it is thought that new roles for those lines may emerge in future, they could be mothballed in their present state. The railways also underwent a turbulent experience with corporatisation, privatisation, re-nationalisation and, for a period, the separation of train operation from infrastructure provision (OnTrack).

However, financial troubles continued as evidenced by Government's $1 billion "Turnaround Plan" in 2010, which was intended to make the railway financially self-sufficient. These experiments failed, showing that the underlying problem – the unsuitability of the rail mode for most freight in this small country – is deeper.

Parts of coastal shipping declined (there is now only one regular local container service, Auckland-Christchurch) but it appears to be in a steady state with ferries, the container ship, and specialist bulk services. That decline appears to be a result of modal shift to rail freight.

Railways and coastal shipping now concentrate on types of freight that suit them. Railway's roles include transporting large amounts of non-urgent bulk goods and containers. Coastal shipping is still competitive for petroleum products, aggregates, cement, container services from Auckland to Christchurch, and ferry services.

Deregulation provided the basis for the strong freight industry that New Zealand now has. No one is obliged to use any particular mode – the choice depends on what mode has the best mix of attributes in the eyes of the customer. Our freight task is dominated by road because that is what best suits our low and dispersed population.

Worryingly, despite none of the attempts over the past 150 years being able to make rail operate in a commercially successful way, in April 2021 Government committed another $5b to rail with New Zealand Rail Plan 2021.

Glossary

Term	Full name	Role
Above rail	Trains	*Rolling stock and locomotives, train operations*
AT	Auckland Transport	*Subsidiary of the Auckland Regional Council responsible for Auckland Transport including commuter rail*
Below rail	Rail infrastructure	*Despite its name this includes the rails, as well as land, track formation, tunnels, bridges, ballast, sleepers and signalling*
Carbon intensity g CO_2/t km	Carbon intensity	*A measure of the greenhouse gas emissions for the fuel used to complete a unit of freight task. Grams CO_2 per tonne kilometre*
FIGS	Freight Information Gathering System	*New Zealand freight statistics*
GHG	Greenhouse gas emissions	*GHG emissions are often measured in carbon dioxide (CO_2) equivalent*
Interislander		*Brand name for the Cook Strait ferries run by the rail operator since 1962. One of the three ferries is rail-capable*
Intermodal		*Freight that travels by more than one mode (rail, road, shipping, air)*
JIT	Just in time	*A logistics system that aligns deliveries closely with demands, thus reducing inventory costs*
KiwiRail	KiwiRail	*State-owned operator of railways and rail ferries since 1 July 2008*
NLTF	National Land Transport Fund	*A ring-fenced fund that receives revenue from petrol excise duty, road user charges, registration and licensing fees*
NTK	Net tonne-kilometres	*A measure of the weight of freight transported multiplied by the distance travelled and commonly used as measure known as the freight task*
NZTA	Waka Kotahi New Zealand Transport Agency	*An arm's-length government agency whose main role is planning and managing road maintenance and construction*
ONTRACK	ONTRACK	*ONTRACK owned and managed New Zealand's rail network on behalf of the Government*
PAYGO	Pay as you go	*An asset funding model widely used for road transport, including New Zealand. User charges are set so that maintenance and capital works for each year are funded from the revenue collected in that year*
RUC	Road user charges	*Distance and weight based tax paid by diesel powered vehicles used on roads*
SOE	State-owned enterprise	*An enterprise owned by the state but managed with the objective of being a successful business*
VDAM	Vehicle dimensions and mass	*Rules that govern the size and weight of vehicles that can travel on New Zealand roads*

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