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OF COMPETITION AND REGULATION INC.

The history and future of rail in New Zealand

Research Report

Prepared by

Dave Heatley

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The history and future of rail in New Zealand

Did the 2002-08 re-nationalisation of New Zealand railways represent the end of a failed experiment in the privatisation of essential infrastructure and herald the renaissance of socially-desirable, environmentally-friendly rail? Or was it a misguided attempt to stem the inevitable decline of a 19th century technology that has no place in a modern transportation infrastructure?

This report examines the economic viability, structure and role of New Zealand's rail network since 1863. Rail has become increasingly economically unviable over time. Reflecting this, it has been largely unresponsive to changes in governance and ownership arrangements. Technological change in rail has been minor when compared with the changes in sea, road and air transport. The role of rail has changed as it has adapted to competition from these substitutes.

Also examined are various arguments proposed as to why the future may be a break from the past, including externalities (e.g. greenhouse gas emissions and congestion), together with government policy to induce modal shift towards rail and predicted increases in freight demand. These factors do not appear to be sufficient to make the current rail network economically viable in the long run. Rail is strategically and economically vulnerable to pressures on one side from more environmentally-friendly sea transport and on the other side from more flexible road transport.

Closure of at least part of the rail network appears socially desirable if not inevitable. The analysis considers whether there is a viable subset of the current rail network. There is evidence that such a subset exists, and compelling arguments to move towards that goal.

Dave Heatley
Research Fellow
New Zealand Institute for the Study of Competition and Regulation
dave.heatley@vuw.ac.nz
+64 4 463 7496

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1 Introduction

In 1999 the New Zealand Institute for the Study of Competition and Regulation (ISCR) published a study of the economic history and performance of New Zealand railways (ISCR, 1999a, 1999b). It noted that rail had not been covering its cost of capital for many years. It examined the positive externalities attributed to rail and concluded that they were relatively small and insufficient to cover the economic deficit.

The study concluded that “the history of rail in New Zealand has been one of enormous taxpayer and social cost entailed in retaining rail as a state-owned enterprise” (1999b, p. 2). The study postulated that appropriate decision-making would be more likely with rail in private ownership.

Rail was privatised in 1993 after 130 years in public ownership. After a short period of operating surpluses the rail operating company struck financial difficulties in the early 2000s. The company desired to reduce the rail network to a commercially viable size, but this was at odds with the government’s vision. Between 2002 and 2004 the government repurchased the rail track network and transferred it to the state-owned enterprise ONTRACK. Continuing difficulties in negotiating track access fees was a factor leading to the repurchase of the rail operating company by the government in 2008.

This study updates the previous work of the ISCR, looking at the performance of rail during the period of private ownership and what might be expected under state ownership.

Section 2 sets the background with a history of rail, looking at the factors that have influenced its development and how it has adapted to its changing environment.

Section 3 examines the position of rail today, including the economic characteristics of railways, and the markets that New Zealand rail serves.

Section 4 contains an economic analysis of the performance of rail. Economic analysis that assesses costs and benefits is important because it is a measure of the net benefit to society. The analysis finds that rail continues to be a significant net economic cost to society. If that situation cannot be changed, and those costs are not offset by net externalities, then New Zealand would be better off without rail.

Section 5 asks the question of whether the economic performance of rail can be improved by changing governance or ownership. A wide variety of models have already been tried in New Zealand. While the rail sector has undergone significant structural reform in virtually all OECD countries over the past 25 years, no clear best model has emerged from that experience. It is unlikely that changing governance or ownership will be sufficient to overcome the economic problem.

Section 6 considers the externalities associated with rail in New Zealand. It concludes that the externalities are small, the benefits unclear or they are better dealt with by other mechanisms.

Section 7 considers arguments why the future environment for rail might be different from that in the past. It fails to find those arguments persuasive, and therefore concludes that future performance is likely to be no better.

Taken together, Sections 4 to 7 lead to the logical conclusion the rail network, at least in its present form, should be closed. That leaves an open question: is there a viable subset of the network? This question is considered in Section 8, which finds that such a subset may exist and recommends a planned transition to that state.

1.1 Glossary

This report covers the actions of many organisations, some of who have changed their names over time. Table 1 provides a reference to these organisations and provide definitions of acronyms and industry jargon used in the text.

Term	Full name	Role
Above rail		Used to describe the railways infrastructure that travels on the rails, i.e. rolling stock and locomotives.
ARTA	Auckland Regional Transport Authority	Subsidiary of the Auckland Regional Council responsible for Auckland commuter rail since 2004
Below rail		Used to describe the railways infrastructure that does not travel on the rails. This includes land, track formation, tunnels, bridges, ballast, rails, sleepers and signalling systems.
CCMAU	Crown Company Monitoring Advisory Unit	Agency that the government on the performance of Crown-owned companies including state-owned enterprises.
DRC	Depreciated replacement cost	A method of asset valuation.
EBIT	Earnings before interest and tax	
EBITDA	Earnings before interest, tax, depreciation and amortisation	
ETS	Emissions trading system	
Freight task		The weight of freight transported multiplied by the distance travelled. Typically measured in net tonne kilometres (NTK).
Gt	Gigatonne	1×10^9 tonnes.
Interislander		Brand name for the Cook Strait ferries run by the rail operator since 1962. Two of the three ferries are rail-capable.
Intermodal		Freight that travels by more than one mode. Typically used in this report to describe rail plus road.
ISCR	New Zealand Institute for the Study of Competition and Regulation	An independent, non-profit research institute located at Victoria University of Wellington.
KiwiRail	KiwiRail Holdings Limited	State-owned operator of railways and rail ferries since 1 July 2008. A business unit of NZRC.
KiwiRail Group or KRG	KiwiRail Group	Trading name for NZRC adopted late 2008.
MJ	Megajoule	A unit of energy measurement.
Modal shift		Any shift of passenger or freight volume between the various competing modes, i.e. coastal shipping, rail, road and air.
NPAT	Net profit after tax	
NTK	Net tonne-kilometres	A measure of the weight of freight transported multiplied by the distance travelled. Also known as the freight task.
NZ Rail	New Zealand Rail Limited	Created in 1990 with the rail, ferry and trucking businesses from NZRC. Privatised 1993. Renamed

		Tranz Rail in 1995.
NZRC	New Zealand Railways Corporation	In its first life NZRC was created from the Railways Department in 1982 and became a state-owned enterprise in 1986. The ferry, rail and trucking businesses were split out into NZ Rail in 1990. NZRC continued as a holding company for other Railways Department assets including the land under the railways. With the transfer of ONTRACK and subsequently KiwiRail to NZRC, it has entered a second life as a railway operator.
ONTRACK		Business unit of NZRC. Created in 2004 to own and manage below-rail assets and land.
PAYGO	Pay as you go	An asset funding model widely used for road transport. User charges are set so that all maintenance and capital works for each year are funded from the revenue collected in that year.
RDG	Rail Development Group	A group tasked with identifying issues and making recommendations on behalf of the ONTRACK and KiwiRail boards in July 2008.
ROE	Return on equity	Return (after corporate tax) on equity.
RTFNZ	Road Transport Forum New Zealand	National organisation created in 1997 to promote and advance the interests of the road transport industry
SOE	State-owned enterprise	An enterprise owned by the state but managed with the objective of being a successful business.
Toll Group	Toll Holdings Ltd	An Australian transport and logistics company. Became majority owner of Tranz Rail in 2003 and full owner from 2007.
Toll NZ	Toll NZ Limited	Formerly Tranz Rail. Privately owned operator of ferry, rail and trucking businesses from 2003. Ferry and rail businesses sold to KiwiRail in 2008.
Tranz Link		Brand for the trucking and logistic business of Tranz Rail (and subsequently Toll NZ). Split from railways in 2008 and now owned by Toll Group.
Tranz Metro		Brand for urban commuter rail operations of Tranz Rail (and subsequently Toll NZ and KiwiRail).
Tranz Rail	Tranz Rail Holdings Limited	Privately owned operator of ferry, rail and trucking businesses from 1993 to 2003. Formerly NZ Rail and subsequently known as Toll NZ.
Tranz Scenic		Brand for the long-distance tourist rail operations of Tranz Rail (and subsequently Toll NZ and KiwiRail).
TRH		Stock code for Tranz Rail and subsequently Toll NZ on the New Zealand Stock Exchange.

Table 1. Glossary

2 History

2.1 Government ownership (1863-1993)

Construction of New Zealand's railway network started in 1860, with the first line opening in 1863 (Neale, 1938a). 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 (Neale, 1938a).

On the abolition of the provinces in 1876 the railways came under central government control. From 1880 the network was operated by the New Zealand Railways Department. Tracks 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 was mandated in 1871 as the national standard to resolve emerging technical incompatibilities between the provincial railways. It was chosen in order to reduce construction costs, particularly in mountainous terrain. The mountainous islands of Japan, Indonesia and Tasmania made the same decision. This choice made a longer-term trade off against speed and freight capacity, but those considerations had little relevance given the technological superiority of rail over other land-transport alternatives at the time. The 25 kilometres-per-hour design speed of the railways was substantially faster than the competing road (or sea) transport of the time.

Nearly all lines were built and operated by the central government. A notable exception was the 140km Wellington and Manawatu Railway; it was privately built and operated as a successful business from 1886 until its nationalisation in 1908 (Blake, 1927).

The Public Works Policy of Treasurer Julius Vogel gave a substantial impetus to railways construction in the 1870s. Table 2 shows that between 1870 and 1878 £7.6m of borrowed money was spent on railways construction, dwarfing expenditure on other activities in the colony.

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

Table 2. Public Works Policy expenditure 1870-1878.
(Source: Woods, 1935)

Vogel's ambition was a transportation 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 key function of rail in this era was to link the hinterland with ports. Rail performed a similar role in the US in the 1840s (Haines & Margo, 2006).

The initial explosion of track building meant that by 1879 New Zealand had 1762km of open rail, a substantial amount for its then population of 458,000. This equated to over three kilometres of rail per 1000 people. This ratio had increased to nearly 4.5km rail per 1000 people by 1888 and has been slowly declining ever since (see Figure 1).

By 1879 concerns about the economic performance of rail were surfacing (Neale, 1938b; Orr, 1981). The operating railways were earning 2.25% p.a. on capital but the cost of capital at the time was estimated at over 5%. 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; and
- excessive railway construction had occurred in advance of demand.

Amongst its recommendations, the Commission recommended an independent Railways Board. This was put into place in 1889. The Commission also recommended that many of the plans to further expand the network be deferred or cancelled. However, as shown in Figure 2, the pace of construction barely slowed.

The network continued to expand rapidly until around 1930. The rate of construction then slowed, with the network reaching its peak length of 5695km in 1952. A series of line closures reduced the network length to approximately 4000km by the early 1990s (the length first reached in 1908). The network length has stayed constant for the past 15 years, over the period of private ownership of rail operations.

While the North Island Main Trunk was completed in 1908, it took until 1945 to 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 — subsequently branded *Interislander* — have always been operated by the rail network operator.

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

New Zealand's road network expanded rapidly in the early 1900s. By 1930 NZ had 78,960km of formed roads, approximately 90% of the network that exists today (Statistics New Zealand, 2008). The quality of roading has improved dramatically, and New Zealand now has 10,905 km of State Highway (Land Transport New Zealand, 2009). These highways are the class of road that competes with rail today.

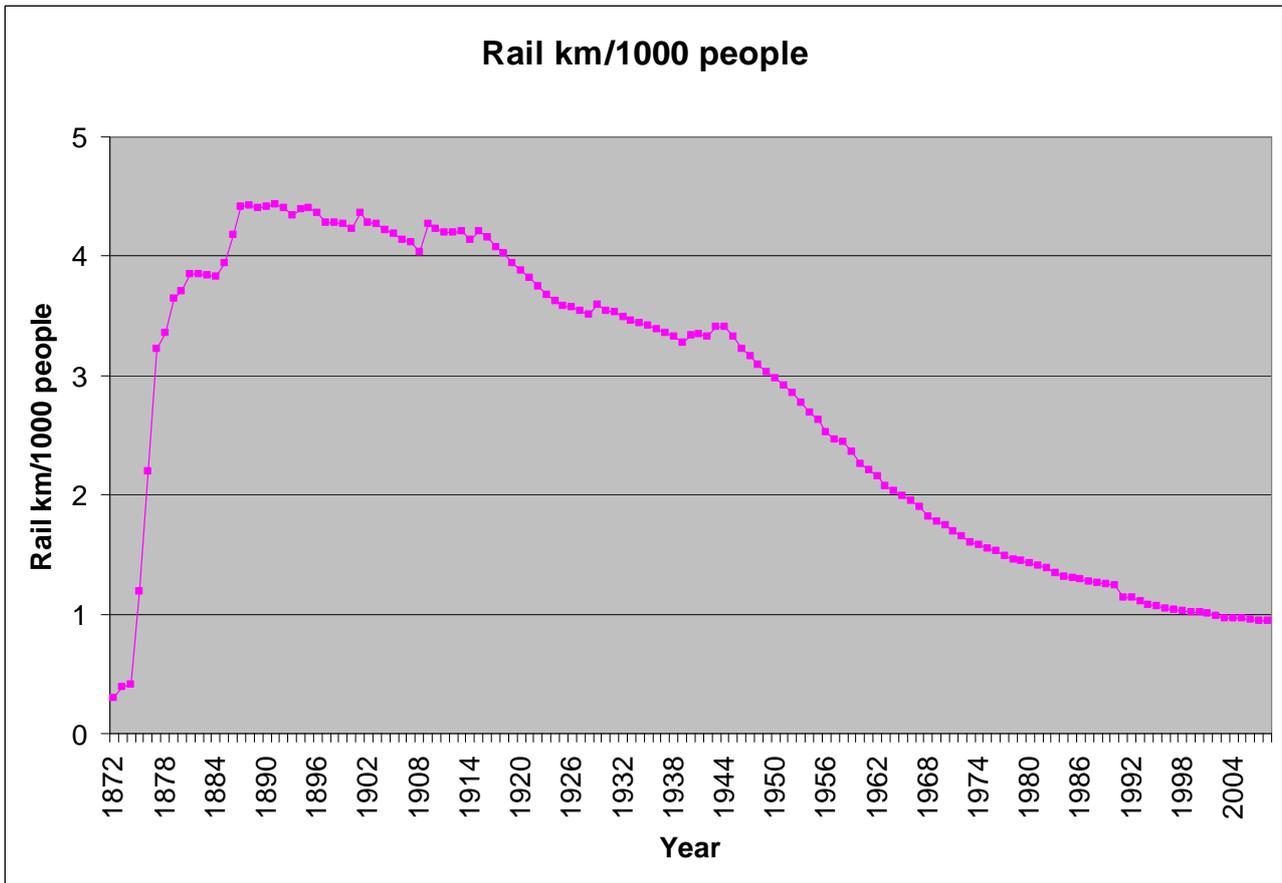


Figure 1. Open rail line per 1000 people.
 (Source: Annual Reports and Statistics New Zealand. Some data interpolated)

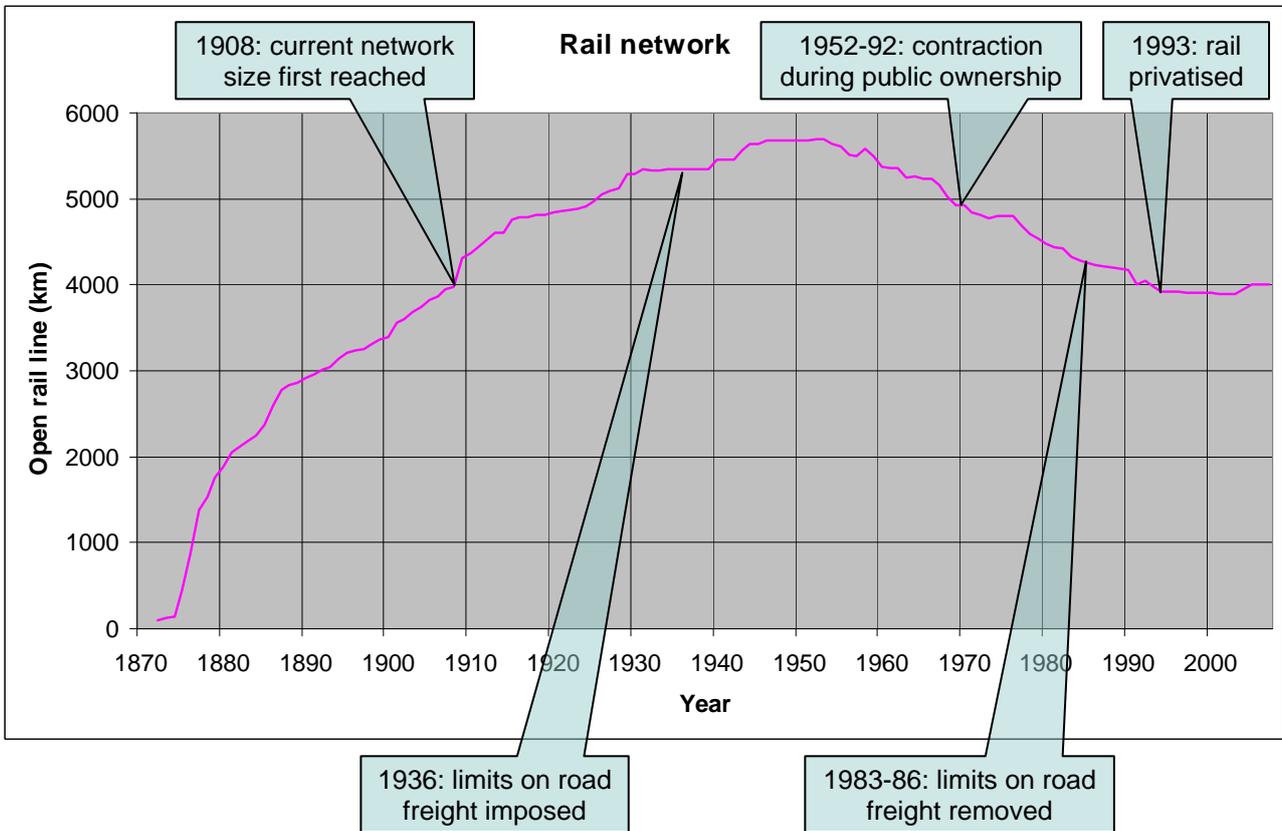


Figure 2. Length of open railway lines in the New Zealand railway network.
 (Source: Annual Reports, some data interpolated.)

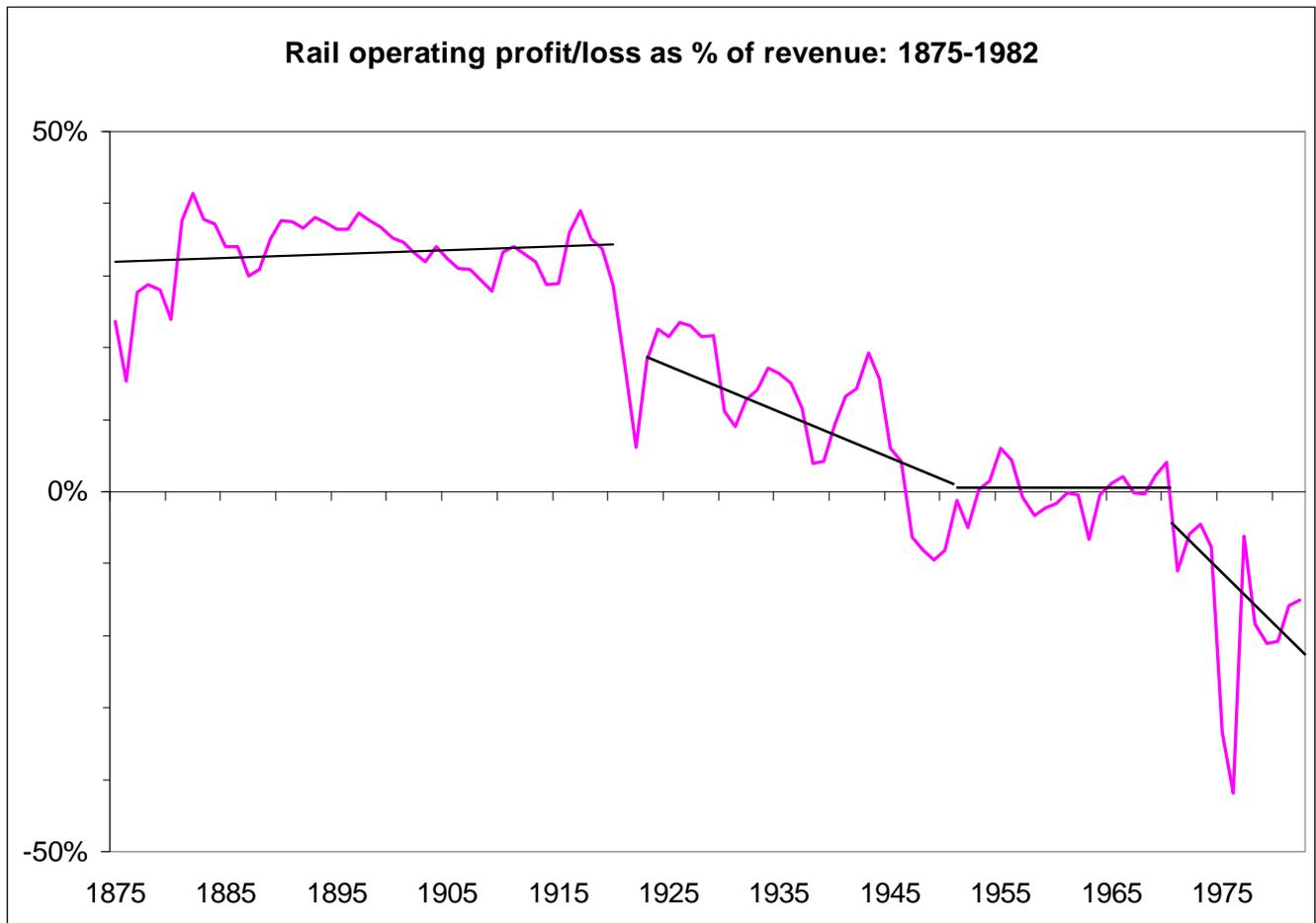


Figure 3. Financial performance 1875-1982
(Source: Orr (1981) and Annual Reports)

The financial performance of rail started deteriorating after 1920 (see Figure 3). This was approximately the time when private motor transport became widespread in New Zealand, suggesting that competition from road transport was the major cause of this deterioration.

In response to increasing competition from road transport, legislative restrictions on the transport of goods by road were imposed in the 1930s (ISCR, 1999a). Road transport of most goods was limited to 30 miles from 1936, increasing to 150km in 1977. Entry to the road transport business was also restricted and freight prices were controlled.

State discouragement of a new transport mode to protect an existing infrastructure investment is not unique to New Zealand. Having invested heavily in canals, the state of Ohio tried to discourage railways in the 1830s (Atack, Bateman, Haines, & Margo, 2009). In Australia, certain freight tasks were reserved for rail between the 1930s and 1980s (Wills-Johnson, 2007b).

It can be seen from Figure 3 that the regulatory protection for rail starting in 1936 was insufficient to halt the decline in financial performance.

It is likely that these competitive restrictions on road transport allowed rail to expand beyond its optimal economic size and delayed the inevitable closure of uneconomic rail lines (see Figure 2). Reductions in the size of the network started in 1953, coinciding with the start of two decades during which the decline in financial performance stalled; however a further deterioration in performance is apparent from 1970 onwards (see Figure 3).

Wills-Johnson (2007b) identified significant productivity improvements in Australian railways from the switchover from steam to diesel traction. The replacement of steam traction by diesel in New

Zealand between 1951 and 1972 offered substantial productivity improvements (see, for example, Williams, 1989). This technological changeover provides an alternative explanation for the identified reduction in the decline in financial performance over this period.

Ultimately even the combined effects of regulatory protection, line closures and technological improvements were insufficient to arrest the ongoing decline in financial performance.

A society-wide move to deregulation saw the regulatory protection of rail removed between 1983 and 1986.

In a further repeat of the cycle described by Orr (1981), the Railways Department was again corporatised in 1982 as the New Zealand Railways Corporation (NZRC). The NZRC became a state-owned enterprise after the passage of the State-Owned Enterprises Act 1986.

A report by consultants Booz Allen Hamilton in 1983 (BAH, 1983; cited in ISCR, 1999a) drew attention to railway's poor labour and asset productivity. The report found that two-thirds of the wagon fleet, half the locomotive fleet and 40% of staff were unnecessary to achieve current and expected future levels of demand. Changes implemented in the 1980s led to dramatic improvements in productivity. The 1989 Annual Report of NZRC reported that:

- staff numbers had been reduced by 54% over seven years; and
- staff productivity had increased by 94% over six years

BAH also recommended that NZRC operate its own truck fleet in order to be able to offer door-to-door delivery to general freight customers. This fleet was integrated with rail operations until July 2008¹.

The prevailing orthodoxy of the 1980s suggested that rail would be more productive in private ownership. In preparation for privatisation New Zealand Rail Limited (NZ Rail) was established as a Crown Transferee Company under the provisions of the New Zealand Railways Corporation Restructuring Act 1990. Unlike NZRC, NZ Rail was not a state-owned enterprise

The core rail and ferry operations were transferred from NZRC to NZ Rail on 28 October 1990. NZRC retained ownership of the land under the rail corridors, and other non-core businesses including property, buses and parcels (ISCR, 1999a).

NZ Rail was sold to a private consortium for \$400m in 1993².

2.2 Private ownership (1993-2008)

Significant events since 1993 are shown on the timeline in Figure 4.

¹ Trucking operations were retained by Toll after their rail and ferry assets were sold to the government on 1 July 2008.

² \$400m was the enterprise value of NZ Rail Limited. It consisted of the \$328m received by the Crown for the sale and \$72m of debt held by NZ Rail at the time of sale.

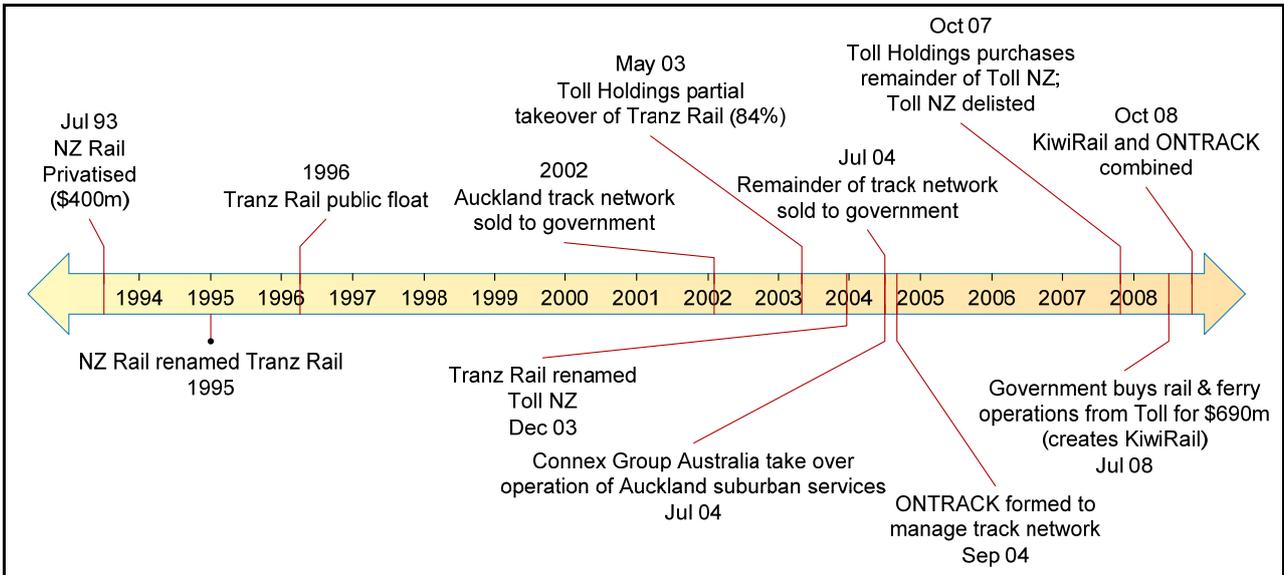


Figure 4. Timeline 1993-2008

2.2.1 Privatisation

Gaynor (2008) outlines the sale of NZ Rail in 1993, the profits made by the purchasing consortium and losses made by the shareholders who bought into the public float in 1996 (summarised in Section 4.1). Private ownership in the period 1994-1997 led to higher operating profits than during prior state ownership, but profits remained insufficient to cover capital costs (ISCR, 1999b). This is illustrated in Figure 10 (page 29).

Rail freight volumes increased during the early period of private ownership, peaking in 2000. Since then they have been roughly static, while road freight has grown (see Figure 5).

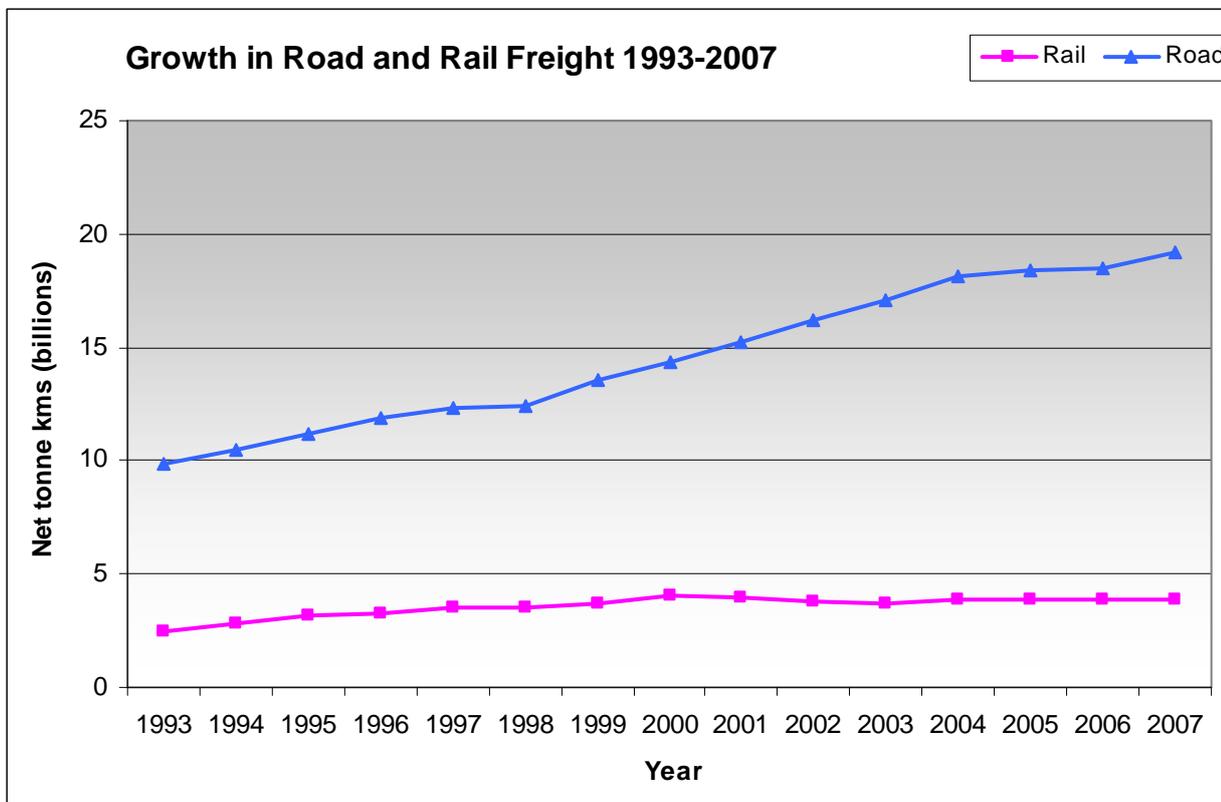


Figure 5. Growth in road and rail freight 1993-2007. (Source: Richard Paling Consulting, 2008)

The rail share of the total freight task has declined and is now approximately 6% when measured by weight and 15% by net tonne kilometres (NTK). The growth in road transport has been at the expense of rail as can be seen in Figure 6.

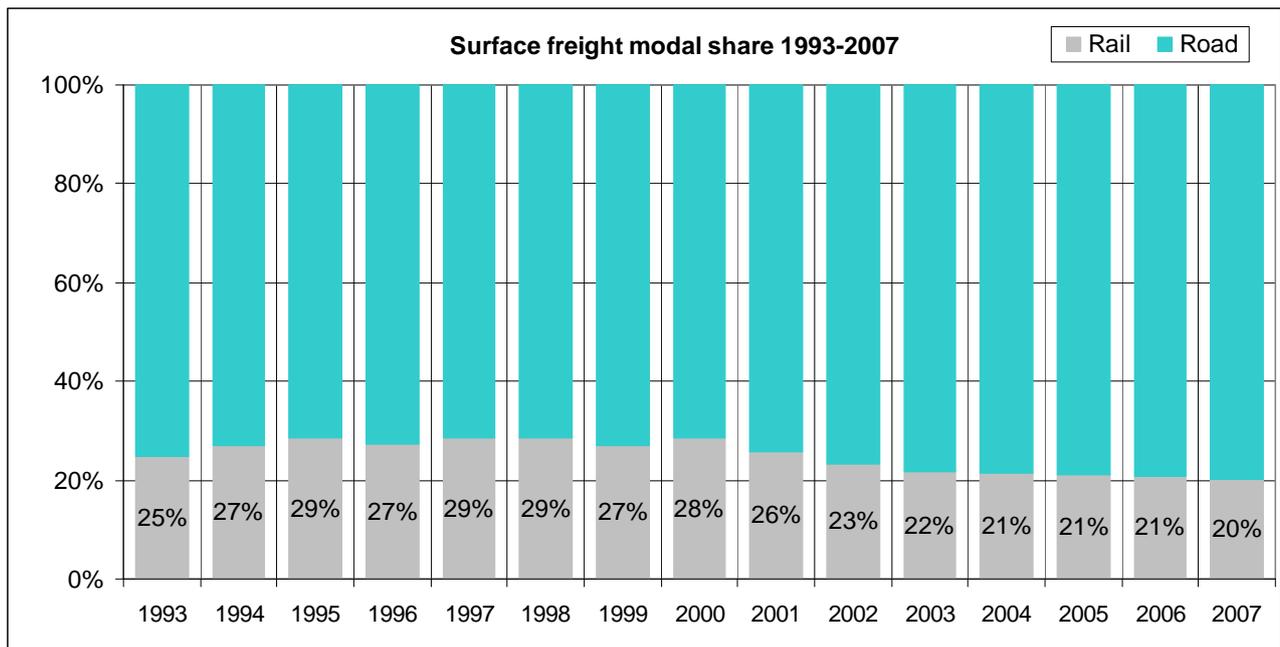


Figure 6. Surface freight modal share 1993-2007 (% of net tonne kilometres).
(Source: Richard Paling Consulting, 2008)

In 2004 an infrastructure audit by PriceWaterhouseCoopers brought attention to low and declining levels of asset replacement over the preceding eight years (PriceWaterhouseCoopers, 2004). Like ISCR (1999b) they noted that the financial performance of Tranz Rail and NZ Rail had resulted in the rail business failing to cover the replacement cost of its capital. (Section 4.3 explores asset replacement issues in more detail.)

2.2.2 Government track buyback (2002-2004)

In 2002 Tranz Rail decided not to re-tender for the operation of Auckland’s commuter rail system, instead selling the Auckland metropolitan rail network to the Crown for \$81m. Operation of the commuter trains became the responsibility of the Auckland Regional Transport Authority (ARTA), a subsidiary of the Auckland Regional Council. These were subcontracted to Connex Group Australia (now know as Veolia Transport Auckland) from July 2004. Ownership of the track network itself was transferred to state-owned enterprise NZRC, which adopted a new trading name *ONTRACK*.

Figure 7 illustrates that the share price of Tranz Rail declined steeply in 2002, eventually dropping to \$0.39 (from an historical high of \$9.00 in 1997).

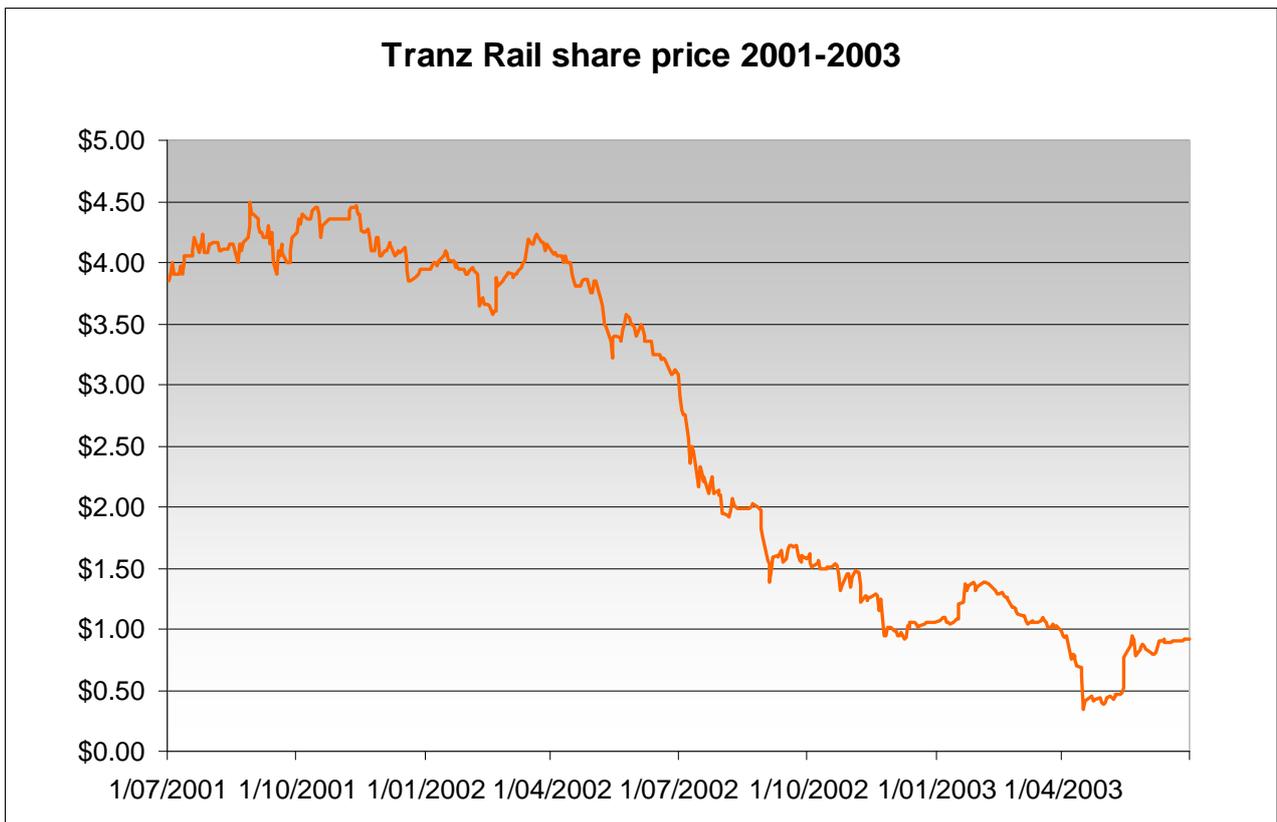


Figure 7. Tranz Rail raw share price July 2001 to June 2003.
(Source: NZX Deep Archive)

Facing a difficult financial situation, Tranz Rail began negotiations with the government in 2002. A draft agreement that included the government buying back the below rail assets was negotiated in March 2002 (Peet, 2002). This became a Heads of Agreement signed in July 2003.

An agreement for the government to purchase the rail network for \$1 was signed on 30 June 2004. By this stage Tranz Rail had been renamed Toll NZ. The government committed \$100 million on upgrading the network, and \$100 million over 4 years on replacement capital (e.g. line and sleepers). Neither of these sums was to be recovered from Toll NZ. Toll committed to spend \$100 million on new rolling stock. Toll would pay an annual track access charge for exclusive access³ to the rail network.

Even with government ownership and significant capital grants from 2004/05, asset replacement levels have been significantly below the long-term asset replacement rate (see Section 4.3; Figure 14; Figure 15). The average rate for 2005-2008 falls short of the average rate for the period 1994-1999 when the rail network was in private ownership.

2.2.3 Toll takeover (2003-2007)

Negotiations with the Crown over the track buyback were drawn out by a takeover bid launched by the Toll Group to buy Tranz Rail on 29 May 2003. The Toll Group saw Tranz Rail's operations as complementary to their existing New Zealand business, and in line with their strategic aspirations for the region (McInerney, 2003).

Toll gained an 84% shareholding but fell short of the 90% required to activate the compulsory purchase provisions of the Takeovers Act 1993. Tranz Rail was renamed Toll NZ in December 2003.

³ Exclusive access was subject to use-it-or-lose-it provisions. See Section 5.1.5.

Toll Group came to agreement to buy out the minority interests in 2007. Toll NZ was de-listed and became a wholly-owned subsidiary of the Toll Group in October 2007.

2.3 KiwiRail: government rail and ferry buyback (2008)

The track access charge paid by Toll for the rail network became the focus of an ongoing dispute between 2004 and 2008. The government wanted a higher payment to fund its network upgrade plans, but Toll objected on the basis that they would lead to substantial losses or higher prices, encouraging its customers to transfer to road (Gaynor, 2008). Under the terms of the 2004 agreement Toll had exclusive access to the network. Both parties need the other one to make use of their assets. In economic terms, this is a classic holdup problem with co-specialised assets (Milgrom & Roberts, 1992). A typical resolution for a holdup problem is for one party to purchase the other, and the government initiated negotiations with Toll to that end.

An agreement was struck in May 2008 which led to a change of ownership on 1 July 2008. The government purchased the ferry and rail operations of Toll NZ, re-branding them *KiwiRail*. Toll retained the Tranz Link trucking and logistics business.

There is general agreement that the purchase price of \$690m was too high. At the launch of KiwiRail the government admitted it paid a premium price (Young, 2008), and wrote off \$242m of the purchase three months later (The Treasury, 2008). According to Treasurer the Hon. Michael Cullen: “in the end roughly half of the price the Crown paid was to buy Toll out of its long term monopoly right... We paid a reasonable and fair price” (Bridgeman, 2008).

Toll made an estimated book profit of \$235m on the sale (Vaughan, 2008). The market capitalisation of Toll increased by A\$408m in the two days following the announcement of the sale, providing further evidence of overpayment.

According to Swann (2009), the \$690m purchase included \$200m of debt and other costs which push the actual cost of acquisition even higher.

Government justifications for the purchase included a preference to subsidise a state-owned enterprise rather than a “foreign-owned” private company (Bailey, 2008). From an economic point of view the government should be indifferent to ownership as long as equivalent economic performance is achieved.

Another stated reason was to “prevent rail-line closures”. Rail was seen as essential for regional development. This issue is examined in Section 6.1.

The other reasons cited by Prime Minister Helen Clark were primarily environmental (Clark, 2008). The environmental performance of rail is examined in Section 6. Clark’s case for public ownership was based on the need for ongoing subsidy:

“Our government has bought back the rail business for strategic reasons.... it also has become clear that our rail system cannot survive without substantial government subsidies into the future. That, together with the need to develop a more sustainable and integrated transport system for our country, makes the case for public ownership compelling in the 21st century.” (Clark, 2008)

KiwiRail has not had a very promising start financially:

“In the seven month period to 31 January 2009, revenue earned by KiwiRail Holdings Limited of \$393 million and an operating surplus of \$4 million...” (The Treasury, 2009)

This surplus can be compared to an EBIT of \$56m in 2007/08 while still in private ownership (Toll Holdings Limited, 2008b).

Possible factors contributing to the low level of profitability since the buyback include:

- The continuing recession in New Zealand⁴;
- Ownership transition costs;
- Possibly lower levels of productivity of in public ownership; and
- The loss of captive business from the trucking firm Tranz Link.
- Discounted freight rates charged to Toll Tranz Link in the ten months following the sale (Swann, 2009).

There are insufficient data to indicate which, if any, of these factors are significant.

In July 2008 the Treasurer the Hon. Michael Cullen asked the boards of ONTRACK and KiwiRail Holdings Ltd to consider the key issues facing the rail industry and make recommendations. The “Rail Development Group” (RDG) headed by ex-Prime Minister Jim Bolger reported back to the Treasurer in August 2008. The group found that “on a pure financial basis rail is not commercially sustainable without a significant reduction in the size of the existing network” (Rail Development Group, 2008a, p. 2) and that the freight business was directly threatened by current moves to introduce larger and heavier trucks and by coastal shipping. It identified deferred capital expenditure as a significant present issue for rail, but noted that “relieving the business of the deferred capital expenditure will only go some way to enabling it to be financially sustainable on a stand alone basis” (Rail Development Group, 2008b, p. 6).

The RDG’s recommendations⁵ included:

- operating subsidies be used to maintain the rail network at its present size;
- substantial capital injections to deal with a maintenance and renewal backlog and to improve the fuel efficiency and capacity of the network;
- policy changes to limit competition from road and sea transport; and
- a vertically-integrated structure with a single board.

The extent to which the government has accepted these subsidy and policy recommendations is unclear at the time of writing. The Treasurer did accept the RDG’s recommendation for a vertically-integrated structure and in September 2008 announced the “final” governance arrangements for the rail industry. The New Zealand Railways Corporation became the single entity responsible for both rail and ferry services and the rail infrastructure. Under the new structure KiwiRail and ONTRACK are separate operating units reporting to the NZRC board (Cullen, 2008b). The board is chaired by Jim Bolger. It was his government that privatised rail in 1993. Acknowledging the situation, Bolger said “my life is full of ironies” (Young, 2008).

2.4 Changes in the function of railways over time

The evolution of the rail network has been driven by a combination of competition and policy issues. The rail network has evolved over time as it adapted to external conditions.

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. The majority of these branch lines were eventually unable to compete with roads and closed.

As the country industrialised, rail connected ports to mines and industrial sites. Rail still has this role for transporting large volumes of non-urgent bulk goods.

⁴ New Zealand entered a recession in the March 2008 quarter (Reserve Bank of New Zealand, 2009).

⁵ The RDG’s report and recommendations are considered in Section 8.1.

Moving people between urban centres was the primary motivation for connecting into one national network. Rail took over from sea travel, but was itself eventually supplanted by road and air travel. Today the role of rail in moving people is limited to urban commuting and providing tourist experiences.

Moving general freight was a complementary use of the rail network. As the road network grew, it offered better connectivity, increased flexibility and much better economies of scope⁶ than rail. Rail has struggled to compete with road since at least the 1930s.

Poor economic performance and low patronage of the railways led to significant line closures from the 1950s to the 1980s.

Structurally, rail has moved from being a universal service provider to focussing on narrower niche markets which admits its comparative strengths, such as the transport of large quantities of relatively homogenous material over longer distances, e.g. coal.

Figure 2 (on page 11) shows that adaptation of the rail network has stalled since 1991, with the network length staying constant at 4000km since that time. Given that the competitive environment in which rail operates has continued to evolve, there is a risk that the rail network is now out of step with that environment and significant further realignment is required.

⁶ *Economies of scope* exist when it is cheaper to produce two or more products or services together than to produce them separately (Khemani & Shapiro, 1993). Roads offer economies of scope because it is cheaper to build and maintain a single road for joint use (e.g. private cars, buses and short- and long-haul freight) than separate roads for each purpose.

3 Rail in 2009

The study of railroad economics has developed over the past 150 years and has contributed much to the science of applied economics (Waters, 2007). This section examines the economics of rail in New Zealand, with the aim of informing the analysis in subsequent sections.

3.1 Economic characteristics of rail

Rail infrastructure is a very long-lived asset. Most lines today follow formations built over a century ago. Maintenance and renewal are expensive, and get more costly as the network ages. Fixed infrastructure is more expensive than rolling stock. In 2000/01 fixed infrastructure represented about 93% of the total assets when land was excluded⁷.

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, railway tunnels have little use for other purposes and so tunnelling costs are typically regarded as sunk. Excluding land, around 75% of total rail assets are sunk⁸.

The majority of costs are fixed⁹. Without high (freight or passenger) volume that generates a profitable margin it is impossible to cover the fixed costs.

3.1.1 Economies of scale

High proportions of sunk fixed costs together with relatively low variable costs means that the average cost function faced by rail operators declines sharply in response to additional sales (Shy, 2001). This means that railways enterprises exhibit economies of scale.

However, the 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 32 countries is shown in Figure 8. It can be seen that 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 interconnectivity with other countries' networks, population centres close to ports, difficult terrain), low population density, competition from other freight transport modes, and technical and operational limitations of the rail infrastructure.

A reduction in network size and/or an increase in total freight volume are required to increase the freight density and benefit from economies of density.

⁷ Land was excluded from these calculations due to the issues surrounding the valuation of land under railways (see Appendix 1). The calculations are based on the data in Table 3.3 of Booz Allen Hamilton (2005).

⁸ Ibid.

⁹ Fixed costs are those that do not change with changes in volume, e.g. the costs of providing of railway tracks and signalling equipment.

Rail Freight Density: international comparison

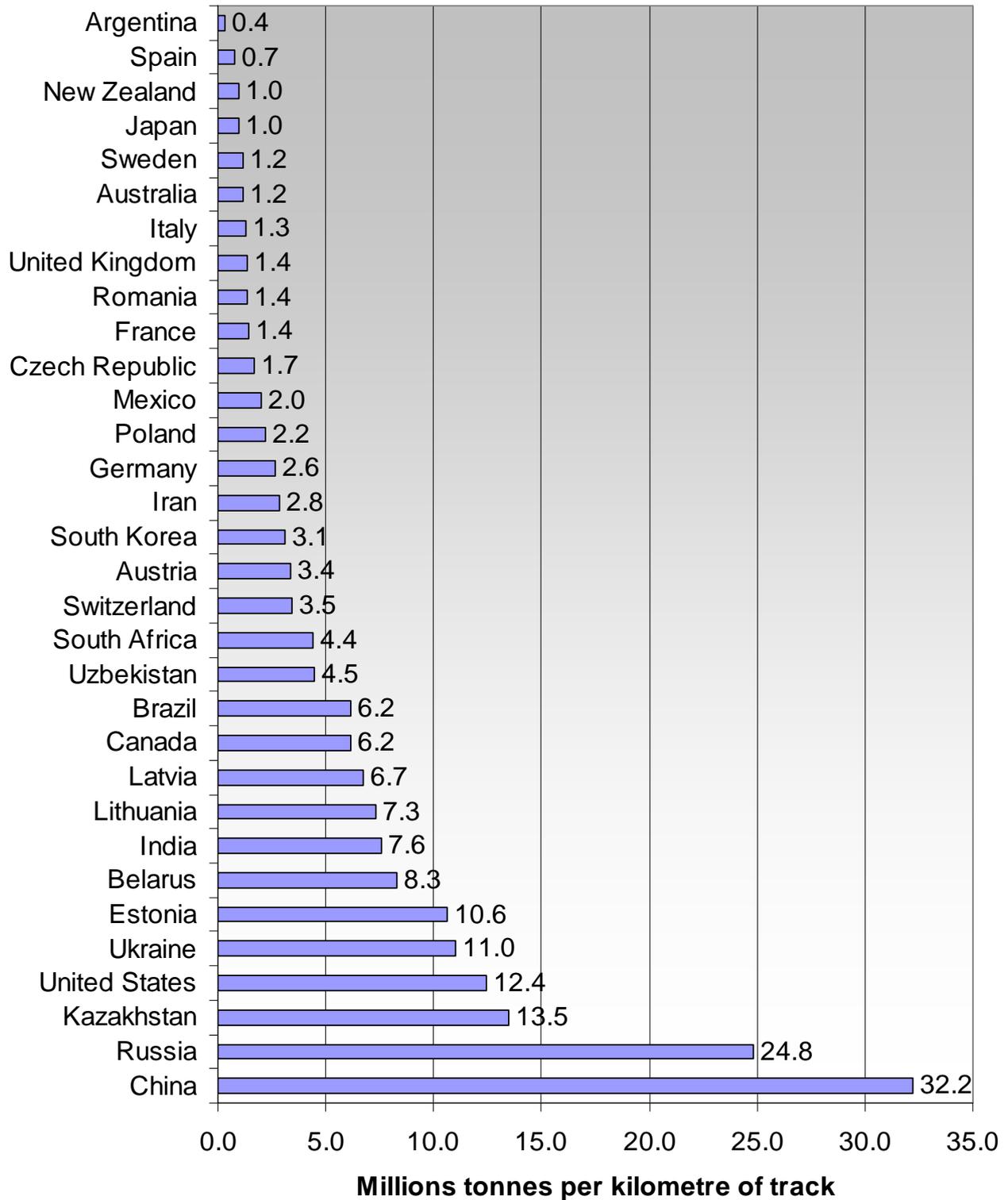


Figure 8. Rail freight density: international comparison.¹⁰
 (Sources: Central Intelligence Agency, 2009; “Rail usage statistics by country,” 2009; Richard Paling Consulting, 2008)

¹⁰ Data from years in the range 2003 to 2008 was used in the compilation of this graph, which may lead to some inaccuracies.

Scale effects become relevant when considering changing the size of an existing network. In the simplified network depicted in Figure 9, 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 make it complex (but not impossible) to assess the profitability of individual lines.

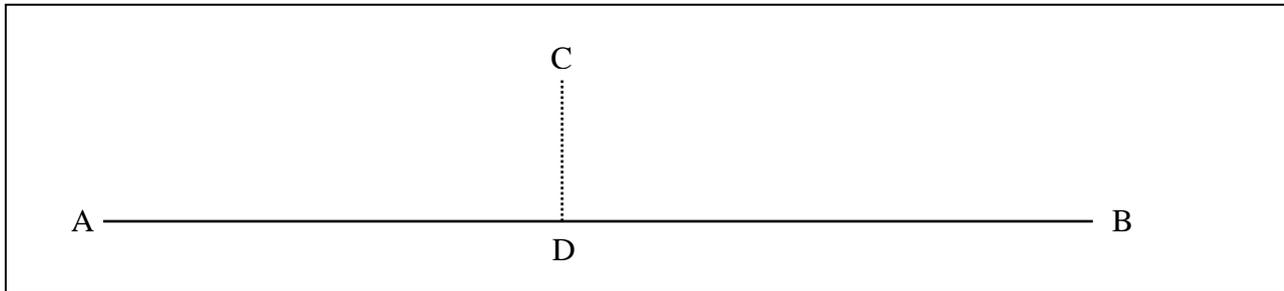


Figure 9. A simplified rail network.
AB is the main line and CD is a branch line.

3.1.2 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 (Mills & Wills-Johnson, 2008).

3.1.3 Is rail a natural monopoly?

Markets with significant economies of scale are often characterised by dominant leaders that capture most of the market. A single firm in such a market is called a natural monopoly. However economies of scale are a sufficient but not a necessary condition for natural monopoly (Carlton & Perloff, 2005). 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 (ISCR, 1999a; Mackie, Baas, & Manz, 2006; Rail Development Group, 2008b), and buses are close substitutes for rail passenger services.

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, 2008b) or in the past (ISCR, 1999b). It is reasonable to conclude that New Zealand railways are not a natural monopoly.

3.1.4 Is rail a network industry?

Transportation networks in general and railways in particular have been classified as network industries by economists (Shy, 2001; Wills-Johnson, 2006b). Network industries have many distinctive economic properties with significant competitive and regulatory implications.

Shy (2001) identifies the characteristics of network industries as:

1. Complementarity, compatibility and standards;
2. Consumption externalities;
3. Switching costs and lock-in (making it expensive for customers to switch between competing suppliers); and
4. Significant economies of scale in production.

In the context of a rail network with a single operator, characteristics (1) and (4) are internalised by the operator.

Consumption externalities are positive and negative effects on the value to one user of membership of the network when another user joins (or leaves) the network. For example, in general a telephone connection becomes more valuable to its owner as the number of other people with telephone connections increase. In the case of transport networks in highly developed economies, there are typically strong negative congestion externalities when another user joins the network (Banister & Y. Berechman, 2001). However, in a lightly used transport network, the addition of new customers can lead over time to more frequent services, which may benefit existing customers. This is known as the Mohring Effect (Waters, 2007). In a New Zealand context, where parts of the railway network are congested and others underutilised, both positive and negative consumption externalities can be expected. The positive externalities are only likely to arise for time-sensitive customers using uncongested parts of the network. There are probably relatively few customers who fit this description, suggesting that net consumption externalities are more likely to be negative.

Bulk freight customers are likely to face significant switching costs should they move away from rail as they typically have dedicated equipment for loading and unloading rail wagons. However, this customer 'lock-in' comes at a cost for the operator, who typically needs to invest in specialised rail wagons for that customer (KiwiRail Group, 2008). The majority of rail customers ship using containers or smaller loads and can therefore switch to road or sea freight at low cost. The low switching costs of these customers and high levels of flexibility offered by road transport create a strategic weakness for rail.

In the context of New Zealand Rail with a single vertically integrated operator network effects can be expected to be absent or muted. Consequently rail does not require specific analysis as network industry.

3.1.5 Diminishing returns on investment

Rail networks are subject to supply bottlenecks. Such bottlenecks include tunnel sizes limiting payload sizes, steep inclines limiting train weight, tight corners limiting train speeds, passing loop lengths limiting train lengths and single-tracking causing scheduling delays. Low levels of infrastructure and maintenance spending can exacerbate these bottlenecks and create new ones.

For any given pattern of demand, there are many such bottlenecks which act as constraints to improved reliability, speed and/or efficiency. The removal of one bottleneck however will inevitably lead to a different bottleneck becoming the constraining factor, a phenomenon known as "bottleneck shiftiness".

It is generally possible to identify some bottlenecks that can be removed at relatively low cost that can lead to significant capacity improvements before the next bottleneck becomes the constraining factor. These "low-hanging fruit" will have a high return on investment, and it makes sense to prioritise such investments. However the return on infrastructure investment projects can be expected to quickly decline as the low-hanging fruit are cleared. For example, consider a line with six steep inclines and one very steep incline. Infrastructure spending on the very steep incline can expand the capacity of the whole line by increasing the maximum train weight. However to achieve further improvement requires expenditure on all of the other six inclines.

The implications of the "bottleneck shiftiness" phenomenon in the context of New Zealand rail is that capital investment can be expected to offer diminishing returns over quantum of investment.

3.1.6 Inherent limitations of rail

Rail has inherent limitations relative to competing modes of transport. Realistically it is never going to be as fast as air, have the connectivity of road or the fuel economy of sea. Decisions taken in the past

about technical standards and alignments will continue to impact operations for the foreseeable future. These inherent limitations must be accounted for in economically-rational decision making.

3.2 Where is rail competitive?

3.2.1 The natural home of rail: bulk freight

“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. For almost all other freight services, rail faces strong competition from the road mode. In countries which are substantial producers of bulk commodities such as Russia, China and the US, the rail mode tends to have a substantially higher share of the overall freight transport market” (OECD, 2005, p. 26)

Overseas experience is that rail is most competitive for carrying non-urgent, bulk goods of low value (Gorman, 2008), over long distances and where both source and destination are directly serviced by rail. In general, rail will not be able to compete with sea transport between ports as coastal shipping is cheaper than rail.

This situation is no different in New Zealand. The current use of rail (by weight) is 30% coal, 11% dairy products, 9% logs and chips, 5% liquid milk, 5% meat and 3% metals (Richard Paling Consulting, 2008).

Coal is the only commodity where rail has a higher modal share than road (64% to 36%). Rail also carries a significant share of processed meat (43%) and dairy products (41%).

Road has an overwhelming advantage where minimal handling is important (e.g. livestock 100%), timing is critical (concrete 100%) or endpoints are dispersed (aggregate 99%, liquid milk 94%, logs and chips 94%).

New Zealand rail is well placed to take advantage of predicted future increases in bulk commodity transport. Richard Paling Consulting (2008) predicts a 70% increase (by weight) in rail transport of bulk commodities through to 2031, with growth being concentrated in the Auckland, Waikato, Bay of Plenty and Canterbury regions. These forecasts were based on expected growth in the production or transportation requirements of specific commodities, and then assuming a constant modal share for rail unless specific industry knowledge indicated otherwise. While the forecast increase may turn out to be overestimated (see Section 7.1.4), it is reasonable to conclude that the natural home of rail will continue to what it does best: bulk goods transport.

3.2.2 Containerised freight

The transport of containers represents approximately 26% of the New Zealand rail freight task (KiwiRail Group, 2008). Typically containers are used to transport international trade goods to or from ports. Rail has a current advantage in this market segment, especially for heavier commodities, as road transport is currently limited to carrying a single container. Moves to introduce larger and heavier trucks, for example the current trial of 50-tonne trucks which can carry two containers, are a direct threat to rail in this market segment (Rail Development Group, 2008a).

A cost advantage for rail over road in container transport is suggested in Table 3. Coastal shipping has a further cost advantage over rail. As the three modes compete on this sector, it is apparent that customers choose different tradeoffs 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. Little direct competition between road and coastal shipping can be expected where rail is a viable mode choice.

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

Table 3. Modal comparison: freighting a container from Auckland to Christchurch.
(Source: Hyder Consulting, 2008, p. 33)

3.2.3 General freight and intermodal transport

For general freight, the rail network competes directly with 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. 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, but the relationship is not reciprocal.

'Intermodal' is the term used to describe a door-to-door freight service that spans more than one mode of transport.

Intermodal freight suffers from several competitive problems, including:

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

Gaballa & Cranley (2008) examined the greenhouse gas emissions from transporting items in a standard basket of food from its source to Melbourne in Australia, by road and by intermodal transport. My reanalysis of their data showed that the weighted average distance for intermodal transport was longer than the road-only distance. The intermodal substitute for a 1000km direct road trip would require, on average, 1070km of rail and 220km of road transport.

The situation is likely to be similar or more pronounced in New Zealand where railways follow alignments created 100 or more years ago through difficult terrain. In contrast, there have been substantial ongoing realignments of roads in the interim.

Janic (2008) reports that the road portion of intermodal transport accounts for 30-40% of total costs. If this ratio applied in New Zealand, then the rail needs a substantial cost advantage per tonne-km to be evenly priced with road. If only 65% of total costs are available to fund the rail portion, and rail has to cover 107% of the road-only distance, then the rail portion needs to cost 60% or less of the equivalent road transport on a tonne-km basis.

Overseas studies consistently find that intermodal rail is only competitive with road alone only over relatively long distances. Kreutzberger (2008) finds intermodal competitive in Europe for distances over 600km. Gorman (2008) finds intermodal competitive in the US for shipment distances above 500 miles (805km), assuming a dray¹¹ distance of 50 miles (80km). Janic (2008) reports that in Europe for corridors up to 900km, intermodal transport has only a 2% market share¹². As this segment accounts for 90% of freight by volume, this relegates intermodal transport to a minor player.

The problem for New Zealand is that transport distances are generally below these thresholds. The average rail freight distance has been a little less than 300km for the last 30 years. Meanwhile the distance threshold at which rail becomes more advantageous than road has shrunk, as road transport improves its ability to provide cost competitive and timely services (Rail Development Group, 2008a, p. 6).

¹¹ The 'dray' distance is the length of the road portion of an intermodal trip.

¹² In terms of total tonne-km.

The door-to-door speed of intermodal transport averages 18 km/h in Europe (Janic, 2008). Trucking typically achieves faster deliveries except where there are compulsory driver sleeping requirements which slow down average speeds on very long distance deliveries.

Customer requirements mean that only a relatively small proportion of intermodal freight is contestable. Societal trends towards increased product variety, just-in-time supply chains, the use of couriers and internet ordering are favouring road transport at the expense of other modes.

3.2.4 Urban commuter rail

In New Zealand, Wellington and Auckland have urban commuter rail systems. The services in other cities were progressively closed due to lack of patronage. Christchurch’s final service closed in 1976 and Dunedin’s in 1982.

While commuting by train has increased substantially in Auckland in recent years, it began from a very low base. Achieving increased levels of patronage on public transport is proving difficult throughout the Western world (O’Toole, 2008; Poudenx, 2008). Many cities have increased service quality in an attempt to increase patronage; however this can result in increased costs, including overall energy consumption if:

- it captures users who previously used non-motorised transport;
- more comfortable infrastructure lowers capacity (e.g. increased inter-seat spacing) or increases running costs (e.g. air conditioning), or
- more frequent services lower average passenger numbers per vehicle.

Attempts to increase public transport are at odds with societal trends towards increased accessibility and comfort as living standards rise (Poudenx, 2008). Other societal changes have significant effects as well, such as the doubling of the proportion of students being driven to school between 1989-90 and 2003-2006 (Ministry of Transport, 2007).

Urban rail systems usually rely on feeder bus systems or private transport (park-and-ride systems) to deliver enough passengers to make them viable. The economic desirability of switching from road to rail must take these dependencies into account.

Rail currently carries only 0.27% of total person trip legs in New Zealand (see Table 4). The proportion rises to 0.31% if walking is excluded. In contrast, over 99% of vehicle-based trip legs are road-dependent. Even if rail expanded patronage by an order of magnitude it would still be largely irrelevant at a national level.

Travel mode	% trip legs	Vehicle-based travel modes	% trip legs
Driver (any vehicle type)	54.10%	Road-dependent	99.11%
Passenger (in private vehicle)	25.48%	Train	0.31%
Walk	15.54%	Other modes (plane, boat, etc)	0.57%
Bus passenger	2.39%	Total	100.00%
Bicycle	1.39%		
Taxi passenger	0.39%		
Train	0.27%		
Other modes (plane, boat, etc)	0.48%		
Total	100.00%		

Table 4. Proportion of trip legs¹³ by travel mode 2003-2006.

¹³ A trip leg is defined as “a single leg of a journey, with no stops or changes in travel mode. For example, driving from home to work with a stop at a shop is two trip legs; one ending at the shop and one ending at work”. Journeys include “all on-road travel by any mode; any walk which involves crossing a road or walking for 100 metres or more along a public

(Source: Ministry of Transport, 2008c)

Rail requires a \$7-\$8 subsidy per passenger-trip in Auckland (Auckland Regional Transport Authority, 2006). Wellington passengers are also subsidised, but at a lower level. Such subsidies may be justified if the benefits of decreased congestion exceed the subsidy costs. Congestion externalities are examined further in Section 6.3.

The viability of urban commuter rail for a city depends on the interaction of a number of factors, including:

- a minimum population size;
- population density along rail corridors;
- workplace density and accessibility by rail;
- regular patterns of working hours; and
- the availability and desirability of substitutes.

New Zealand's cities are small and have low population density by world standards. Urban rail is typically unviable for similar cities in Western countries. Wellington is somewhat of an exception as its topography has constrained much of the population to relatively densely-settled radial corridors, and one-third of employment is in the CBD (Auckland City Council, 2005). These factors improve the viability of urban commuter rail in Wellington relative to Auckland and Christchurch. In these cities only 13% of employment is in the CBD. Dispersed employment strongly favours road transport over rail.

Urban commuter rail requires extensive specialised infrastructure: stations, trains and where applicable electrical power systems. These services have limited synergies with freight rail operations. Tracks are typically fully utilised for commuter services at peak times requiring the rescheduling of freight train services to off-peak times or additional track infrastructure. The electrification system in Wellington is incompatible with that used for freight on the North Island Main Trunk and with that planned for Auckland. For these reasons New Zealand's two urban rail systems are best considered separately, and independently of the national rail freight network.

3.2.5 Long-distance passenger rail

In New Zealand, long-distance passenger travel has moved almost entirely away from rail. For example, consider the Overlander that travels south from Auckland each day over summer, with less frequent services in winter. This train carries up to 160 people, about as many people as a Boeing 737¹⁴. By the time the Overlander reaches Wellington 12 hours later, a 737 could have easily done the return trip three times. One hundred and forty-seven domestic flights leave Auckland daily¹⁵, carrying on average 7871 passengers a day (Auckland International Airport Limited, 2009). Air has clearly won the long-distance passenger market.

Long-distance passenger rail is no longer relevant in New Zealand from a passenger transport perspective. It survives only as a tourist experience, and the economics of this application is doubtful. Toll NZ attempted to close the Overlander service in 2006 because it was losing \$2m a year due to poor patronage, only retaining it in response to public and government pressure (Newstalk ZB, 2006). Toll's 2008 "Plan B" required closing both the Overlander and the Tranz Coastal (Cullen, 2008a). Only the Tranz Alpine service would have been retained.

footpath or road; cycling on a public road or footpath; some air and sea travel" and exclude "off-road activities such as tramping, mountain biking, walking around the mall or around the farm."

¹⁴ Air New Zealand flies the 737-300 in a configuration with 135 seats. Pacific Blue flies the 737-800 with 180 seats. Qantas flies the 737-400 (176 seats) and 737-300 (132 seats).

¹⁵ Based on outgoing flights for 13 and 14 February 2009 retrieved from: <http://www.auckland-airport.co.nz/FlightInformation/Domestic-arrivals-and-departures.aspx>.

It is not possible for a maximum of two trains per day on a long route to generate enough revenue to make a significant contribution to the upkeep of the fixed infrastructure. Long-distance tourist trains in New Zealand will only survive as opportunistic users of tracks that are funded from other revenues.

This conclusion may appear anomalous to those with experience of well-patronised, high-quality long-distance passenger services in other parts of the world. To be competitive with air travel, rail needs to offer similar end-to-end travel times. This includes: waiting for the next available service, travel to the point of departure, check-in and boarding, travel time, unloading, travel to the desired destination and allowances for delays. While the central location of inter-city railway stations can offer time savings relative to the city-periphery location of airports, even the fastest trains have significantly longer travel times than aeroplanes. As all the other time components are fixed, trains will only be able to offer competitive travel-times with frequent services on relatively short routes.

Fast trains require an enormous investment in infrastructure, which can only be recouped by spreading it across large numbers of passengers. Therefore long-distance passenger services will only be economically viable on sectors where there is a high demand for travel. A high demand for travel requires, amongst other things, a large population.

These conditions are met in many parts of the world including Europe, India and parts of North America. However a comparison of New Zealand with continental or sub-continental networks is unlikely to be informative. A better comparison is against island countries of a roughly similar size and shape to New Zealand. For example, the United Kingdom and Japan are first-world countries that have well-developed long-distance passenger rail which competes effectively with air travel on at least some sectors. The crucial difference is population density: New Zealand less than 16 persons per square kilometre, approximately one-twentieth of the density of the UK (252 persons/km²) and Japan (341 persons/km²)¹⁶.

In New Zealand, domestic air travel offers better interconnectivity with international travel than rail. It would appear that New Zealand has made the economically rational choice of investing in air rather than rail for intra-country long-distance passenger travel.

¹⁶ Population density information sourced from: <http://www.wolframalpha.com/input/?i=population+density>. Accessed on May 26, 2009. Globally, New Zealand is ranked 198th of 238 countries in terms of population density.

4 Economic performance

ISCR (1999b) found that while rail started to return an operating profit after privatisation in 1993, the profits earned were insufficient to cover the opportunity cost on capital. Their data are reproduced in Figure 10. Even in the best year reported (1995), the economic surplus of rail was negative \$60m (1997 dollars).

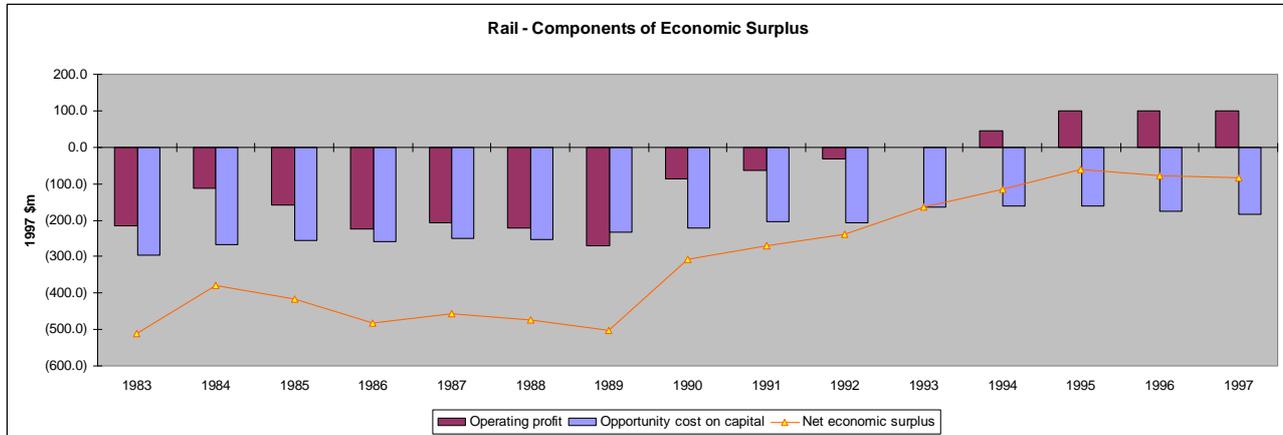


Figure 10. Components of economic surplus 1983-1997.
(Source: ISCR (1999b))

ISCR (1999b) had access to an internal cost model which was used to calculate the composition of capital stocks. The research for this paper did not have access to the disaggregated data sufficient to replicate such a model. The task of extending the series in ISCR (1999b) beyond 1997 is further complicated by the changes in organisational structure, business scope, accounting treatments and financial reporting that have occurred over the past 25 years. At various times the reporting entity has, for example, included and excluded ferry operations, a road freight business, passenger buses, rail corridor land, scenic rail operations, Auckland commuter rail, and below rail infrastructure.

One way to look at the aggregation question is to view the railways operator¹⁷ as three businesses each operating different transport modes:

- Cook Strait ferries (Interislander);
- trucking & logistics (Tranz Link); and
- rail (Tranz Rail, Tranz Metro, Tranz Scenic etc).

The accounts for these three businesses were aggregated in annual reports for 1993-2007. Some disaggregated figures for 2008 can be deduced from NZPA (2009) and Toll Holdings Limited (2008b).

By examining the environment in which each of these businesses operates, the implications of the performance of the aggregated entity for the performance of the rail business can be understood.

Firstly, it is unlikely that the ferry business is inherently unprofitable. The market was sufficiently attractive for commercial competitor BlueBridge to enter in 2003 and expand with the purchase of a second ship in 2006. The economic profit¹⁸ of the ferry business could therefore be presumed to be non-negative in the long term.

¹⁷ Over the past 25 years the 'railways operator' has been NZRC, NZ Rail, Tranz Rail, Toll NZ, Toll Holdings and KiwiRail.

¹⁸ An *economic profit* is the difference between revenues received and the opportunity cost of the inputs. The *opportunity cost* is the alternative returns foregone by using the chosen inputs. A firm that maintains the value of its assets and earns just enough profit to pay its investors the same return they would receive had they invested in their next-best choice of investment (at the same level of risk) is earning an economic profit of zero. Logically, no-one should invest in a firm that

There are synergies between the ferry and rail businesses as 30-40% of the freight by weight¹⁹ carried on the Interislander ferries is sourced from rail (Richard Paling Consulting, 2008). Although there are some additional capital costs involved with providing rail transport on the two rail ferries (NZPA, 2009), these costs should be defrayed by the approximately \$60m of annual ferry rail-freight revenue. The economic profit due to these synergies should be greater than zero as they are not available to competitors.

Secondly, the trucking and logistics business may be assumed to be earning a non-negative economic profit. There are a small number of competitors and demand has expanded rapidly (see Figure 5 on page 14). The competitor Mainfreight has been very profitable over this period (see Figure 12 on page 32).

There are further synergies between trucking and ferries, and between rail and trucking. These synergies could reasonably be presumed in a competitive environment to offer a non-negative economic profit.

This leaves the only the rail portion of the business. So if performance of the aggregated entity is poor, then by inference it must be rail that is dragging it down.

Analysis of economic performance is further complicated by the fact that rail assets are both very expensive and very long-lived, creating a significant degree of management discretion as to the timing of maintenance and renewal activity.

There are also divergent views as to the value of rail assets (see Appendix 1) and what should be an appropriate rate of return for those assets.

Using publicly available data economic performance can be examined from various perspectives. If the conclusion from each of those perspectives is consistent then that conclusion can be considered reasonably certain. This approach has been adopted here.

The perspectives examined are:

- Financial performance for shareholders
- Return on equity as a state-owned enterprise
- Ability to maintain assets
- Ability to cover the opportunity cost of capital
- Ability to pay for infrastructure from current cash income
- A return on government expenditure
- Salvage value

4.1 Perspective 1: financial performance for shareholders

Fay, Richwhite, Wisconsin Central and Berkshire Fund purchased NZ Rail from the Crown with a payment of \$328m in 1993. The purchasers' actual equity contribution was \$105m, \$100m of which was returned in 1995. Twenty-five percent of the company (by then renamed Tranz Rail) was floated on the NZX in 1996 with the stock code TRH. In 1997 the four main original investors realised profits of \$370m from sale of shares (Gaynor, 2008). These transactions were subject to an insider-trading inquiry, resulting in a \$27m settlement in 2008 ("Key's \$30,000 refund," 2008). It can be seen that the original purchasers did very well on their investment.

offers a negative economic profit. One exception to this rule would be if the firm was an effective market hedge; however that does not appear to be the case for transport businesses (see Footnote 20).

¹⁹ The figure is similar (35%) as a proportion of revenue. (Source: NZPA, 2009)

Figure 11 shows the raw share price of Tranz Rail (later Toll NZ) during the period it was a public company. Though widely publicised, the 1999 study by ISCR that reported that rail was not covering its cost of capital (ISCR, 1999b) does not appear to have made a significant impact on the share price.

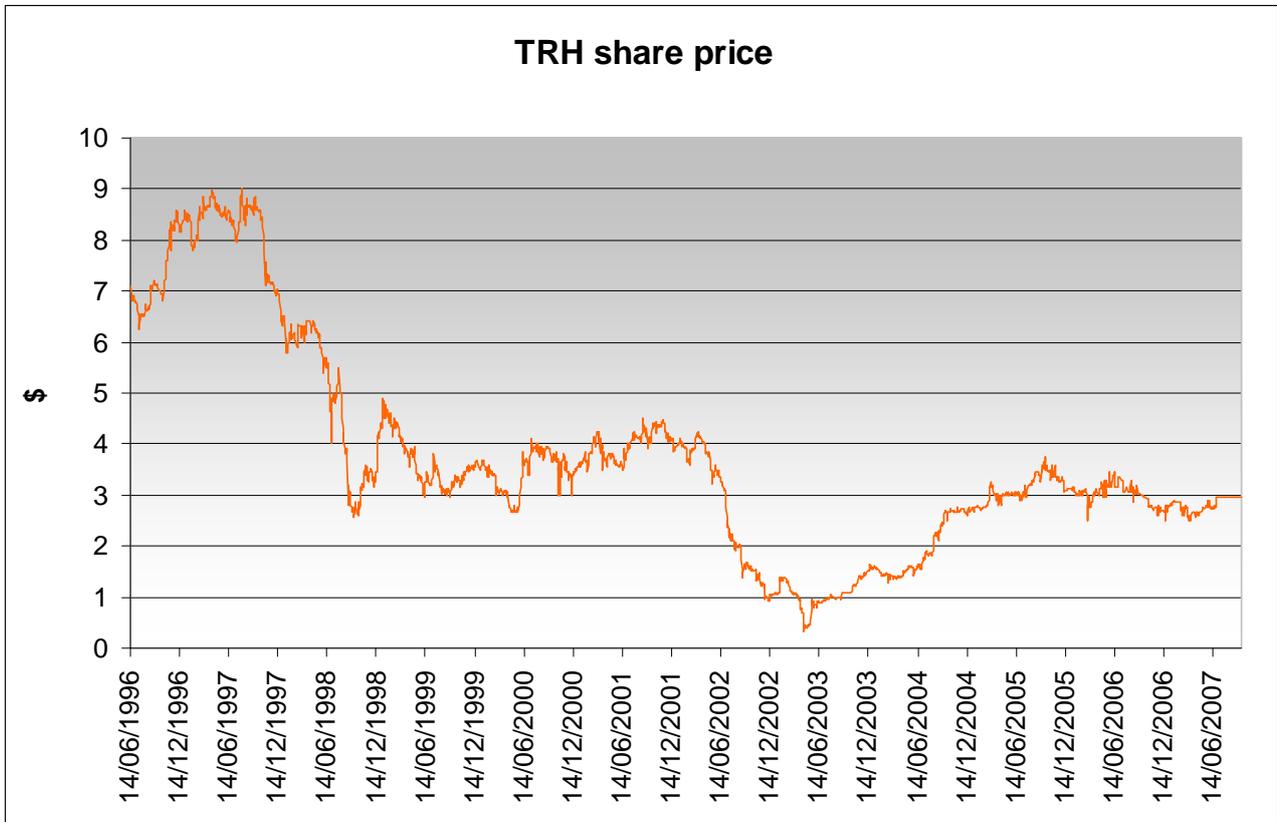


Figure 11. Tranz Rail / Toll NZ raw share price.
(Source: NZX Deep Archive)

Shareholders who bought in 1996 and subsequently followed directors’ recommendations through to 2003 received only 28% of their original investment back (Gaynor, 2008).

Figure 12 shows the indexed share price (adjusted for stock splits and dividends) for TranzRail, the New Zealand market index and for Tranz Rail competitor Mainfreight²⁰. A \$100 investment in Mainfreight returned 11 times more than if invested in Tranz Rail over the period 1996-2007. An investment in an NZX index fund would have returned five times as much.

Tranz Rail performed very poorly for shareholders as a publicly-listed company.

²⁰ Mainfreight was chosen as a comparison as it was the only other publicly-listed transport-sector company catering to domestic markets in New Zealand over the same time period. Mainfreight has outperformed the index and Tranz Rail has underperformed, so it is therefore reasonable to ask whether this could be explained by a positive equity beta for Mainfreight and a negative one for Tranz Rail. The published data over the 15 quarters to September 2007 show values for both companies confined to the range 0.93 to 1.43 and with roughly similar mean values (PriceWaterhouseCoopers, 2007; and prior versions). It is reasonable to reject this explanation for the difference in performance.

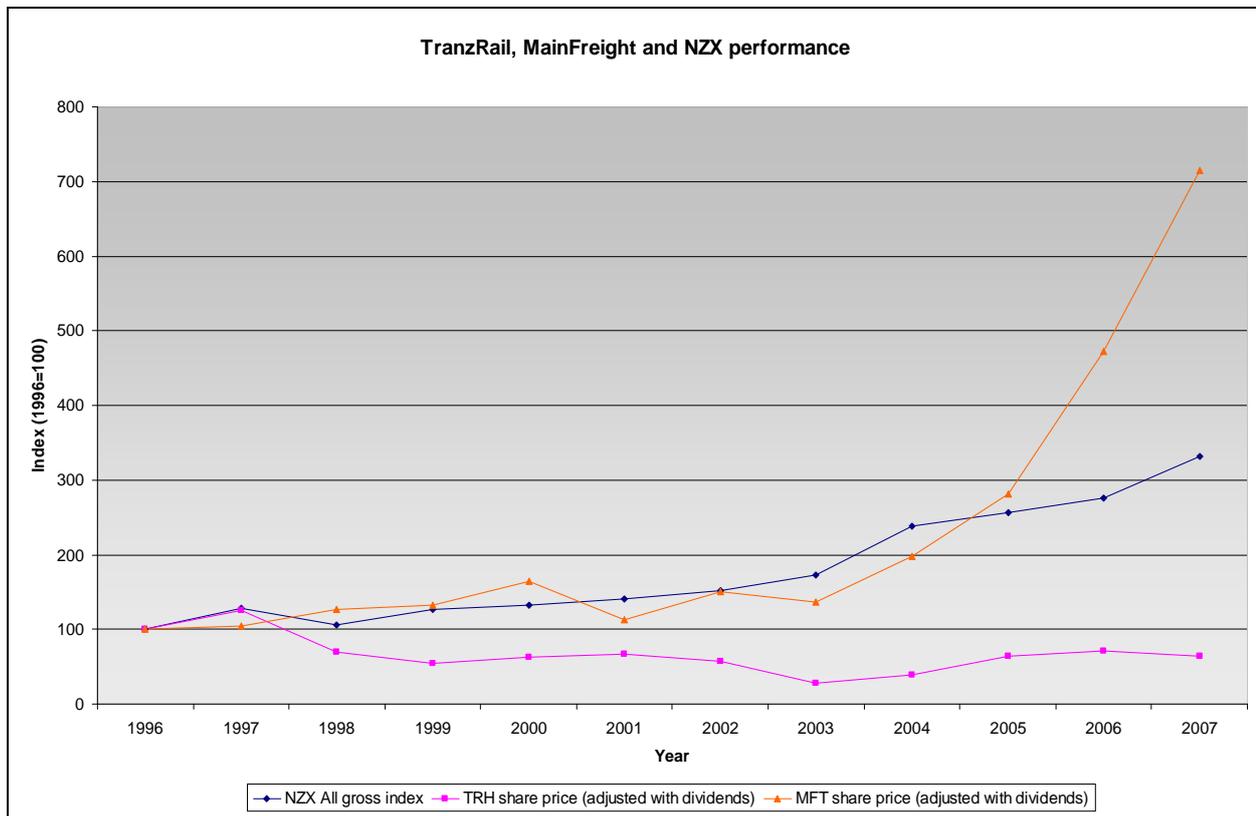


Figure 12. Performance of Tranz Rail and Mainfreight shares vs. NZX All Gross Index.
(Source: NZX Deep Archive)

4.2 Perspective 2: return on equity as a state-owned enterprise

Rail is now a state-owned enterprise (SOE). The New Zealand Railways Corporation (NZRC) owns and operates KiwiRail and ONTRACK under the trading name KiwiRail Group (KRG).

The performance of New Zealand SOEs lags far behind the private sector (Russell, 2009). Nevertheless, as the government has made an explicit choice to use the SOE model for NZRC, the performance of other SOEs is a useful comparison point.

The equity in NZRC is valued by the government at \$12.1bn²¹. This is very close to the total book equity value of all other New Zealand SOEs. Stated another way, if the valuation is credible then rail is as valuable to New Zealand as Meridian, Genesis, NZ Post, Mighty River Power, Transpower, Solid Energy and the nine other SOEs combined. The net profit after tax (NPAT) of those 15 SOEs was \$637m on revenues of \$9.4bn in 2007/08. Their return on equity (ROE) was 5.3%.

The State-Owned Enterprises Act 1986 does not make special allowances for NZRC, so similar performance should be expected. However NZRC's comparable²² figures are \$9m NPAT²³ on operating revenues of \$614m²⁴, a ROE of 0.1%.

²¹ This consists of \$11.628bn for ONTRACK (equity value as at 30 June 2008) and \$448m for KiwiRail. The KiwiRail figure is the government valuation as at 30 September 2008, which is \$242m less than the purchase price of \$690m. The \$242m figure represents a sunk purchase premium on which arguably no return was expected, so it has been excluded from the total equity.

²² What is actually being compared is the 2007/08 performance of other SOEs against the performance of ONTRACK aggregated with those parts of Toll NZ subsequently sold to the government (and renamed KiwiRail). This comparison is valid to the extent that the performance of KiwiRail in private ownership is likely to be replicated in public ownership. The evidence to date is that KiwiRail is performing less well in public ownership, although other factors may be responsible (see Section 2.3).

²³ This aggregation cancels out the track access fee paid by Toll to ONTRACK and so is not sensitive to variations in that figure.

The assumption that the figure of 5.3% for the other SOEs provides a reasonable estimate of the after-tax ROE that should also apply to NZRC identifies a significant discrepancy. It would appear that NZRC is nowhere close to earning an acceptable return compared to other SOEs. NZRC would need to at least triple its rail revenues without any increase in costs to earn a similar ROE.

Particular factors that might explain this performance include that:

- 2007/08 was an unusual year, and that normally rail does much better;
- the aggregate figures are hiding a hugely unprofitable ferry business;
- ONTRACK is now dealing with its huge backlog of deferred maintenance; or
- the equity valuation for rail is way out of line.

Each of those possible explanations will be dealt with in turn.

It is not apparent from Figure 13 that 2007/08 was unusual relative to the immediately preceding years. Revenue has increased but presumably costs also increased hence EBIT remained flat.

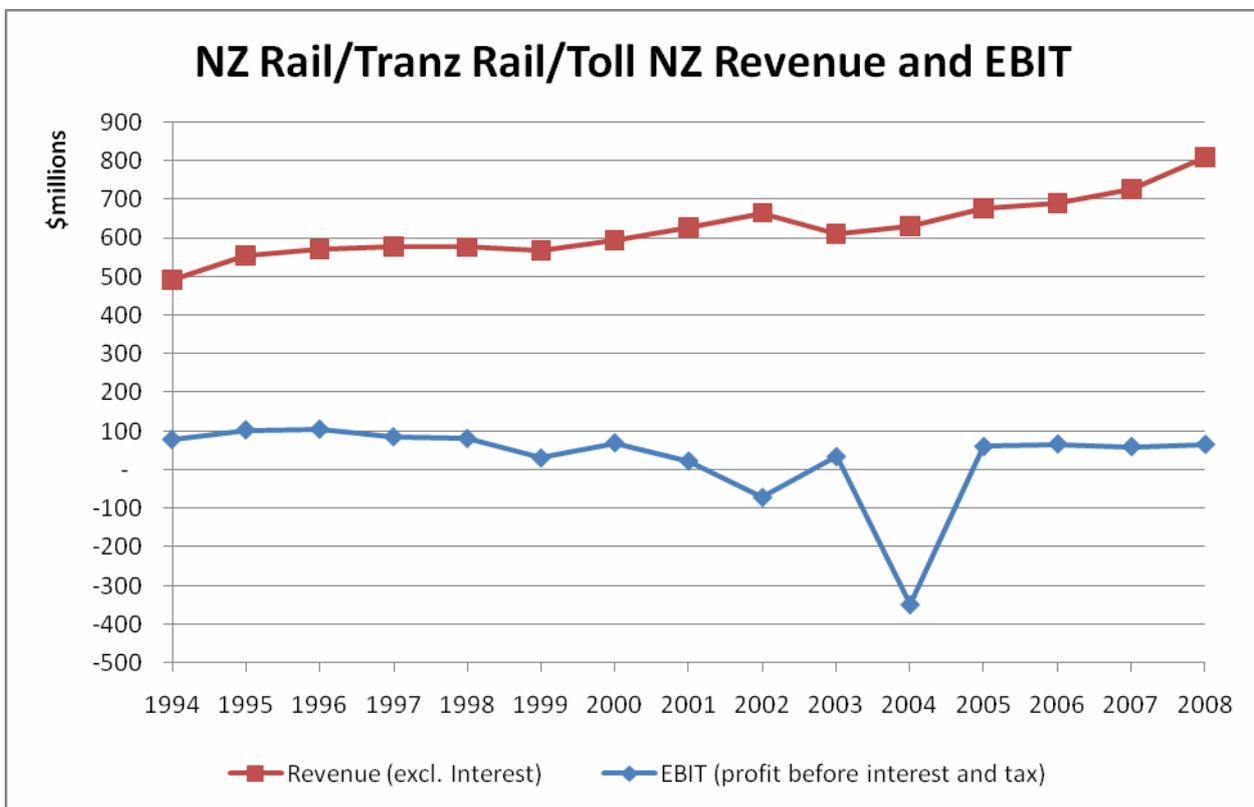


Figure 13. Revenue and EBIT for NZ Rail/Tranz Rail/Toll NZ 1994-2008
(Source: NZX Deep Archive; Toll Holdings Limited, 2008b)

The discussion of the ferry business above deals with the second possible explanation. The ferry business is likely to be profitable and synergies between ferries and rail should further improve aggregate performance.

Maintenance and renewal levels have risen in recent years (see Section 4.3), but 2007/08 was by no means the historic high point. Further, ONTRACK received government grants of \$139m which contribute towards maintenance and renewal costs. These have been treated as income in their accounts, meaning that the estimated 0.1% ROI is an overstatement of the social return on equity.

²⁴ \$614m is the revenues for 2007/08 excluding ONTRACK grants (KiwiRail Group, 2008). This total can be split into Interislander revenue of approximately \$155m and rail income of \$459m.

This leaves the equity valuation as the potential explanation. Almost all of the equity in question relates to ONTRACK's assets. The examination of ONTRACK's asset valuations in Appendix 1 concludes that they are excessive.

4.3 Perspective 3: ability to maintain assets

In 2004 an infrastructure audit by PriceWaterhouseCoopers brought attention to low and declining level of asset replacement over the preceding eight years (PriceWaterhouseCoopers, 2004). Like ISCR (1999b) they noted that the financial performance of Tranz Rail and its predecessor organisation had resulted in the rail business failing to cover the replacement cost of its capital.

PWC considered data for sleeper replacement and track renewal for 1996-2003 to draw their conclusion. Figure 14 presents their data²⁵ for sleeper replacement together with the required replacement level suggested by PWC. In only two years (1997-98) has the replacement rate approached the long-term replacement level.

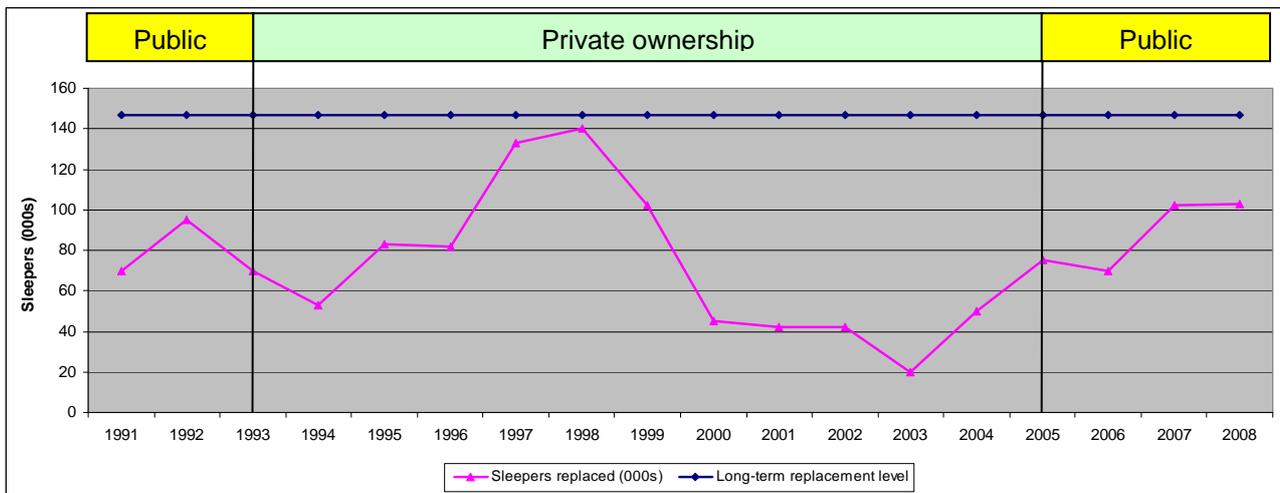


Figure 14. Sleeper replacement 1991-2008.
(Source: PriceWaterhouseCoopers, 2004; Annual Reports)

Figure 15 shows the same analysis for track renewal. The required replacement level was calculated as the network length (4000km) divided by the upper bound of the depreciable life of tracks (25-40 years according to ONTRACK, 2008a). This data follows a pattern similar to that for sleeper replacement (see Figure 14).

²⁵ Extended both forwards and backwards in time with additional data from Annual Reports.

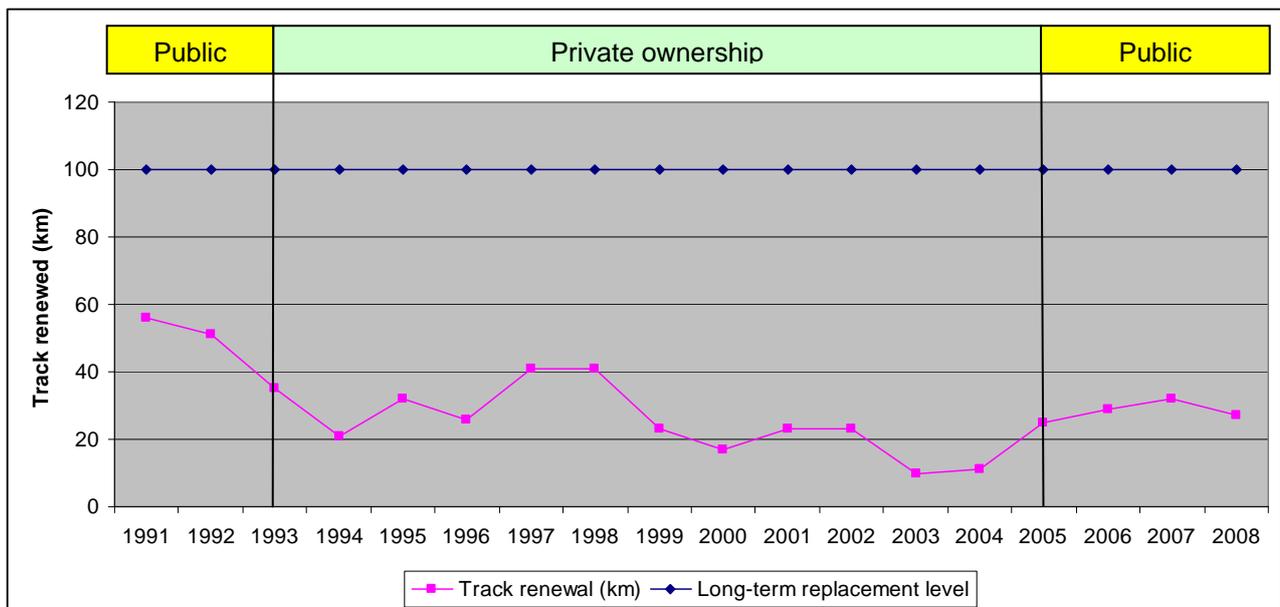


Figure 15. Track renewal 1991-2008.
 (Source: PriceWaterhouseCoopers, 2004; Annual Reports)

Correlation is evident between the sleeper and track renewal data and the Tranz Rail/Toll NZ share price over the period 1996-2007 (Figure 11, page 31). Enthusiasm for asset replacement in the years shortly following privatisation is reflected in the high share price. Both subsequently fell to low levels.

Over the period 1991-2008 sleeper replacement was 16% higher and track renewal was 50% higher during periods of public ownership than that during the period of private ownership. These higher levels have only been achieved with large government subsidies.

Other rail assets have also declined in quality. The average locomotive age is now 30 years; the youngest having been built in 1988 (KiwiRail Group, 2008). One-third of the fleet was built in 1965 and is considered underpowered and obsolete by today's standards. Rolling stock is on average 25 years old.

A third of bridges (more than 550) are 80 or more years old and 23% are more than 90 years old (KiwiRail Group, 2008). This should be contrasted with their depreciable life of 60-100 years (ONTRACK, 2008a). Substantial bridge renewals will be required in the very near future.

It is clear that neither private nor public owners have maintained the economic position of rail.

4.4 Perspective 4: ability to cover the opportunity cost of capital

Booz Allen Hamilton (2005) evaluated the economics of rail freight as at 2000/01. They found that current revenues (\$328m) were sufficient to cover operating costs and track renewal²⁶ (\$235m) and rolling stock replacement (\$42m). Revenues were insufficient to cover an economic return of 7% on non-sunk assets excluding land (\$113m). They were clearly insufficient to cover the economic costs of land²⁷ and other infrastructure assets (\$362m). BAH calculated that the annual economic deficit of rail freight was \$424m in 2000/01.

BAH made similar conclusions for urban rail passenger transport.

²⁶ BAH appear to have assumed that Toll's expenditure on track renewal was adequate in 2000/01. The analysis in Section 4.3 suggests that it was well below the long-term replacement level.

²⁷ BAH valued rail land at \$462m. This is a small fraction of the 2007/08 ONTRACK valuation of \$6bn.

Long-distance passenger services came close to covering its operating and rolling stock replacement costs in their analysis; however it was unable to make a contribution to joint infrastructure and land assets.

The BAH analysis uses a lower required return (7%) than the 12% used in ISCR (1999b), but their conclusion is identical: rail is unable to pay the opportunity cost of capital employed.

4.5 Perspective 5: ability to pay for infrastructure from current cash income

As noted in Section 4.8, the differing accounting treatments for road and rail obscure comparisons between the perceived levels of government subsidy for the two modes. This Section considers the question: would railways be viable when assessed using the accounting treatment used for roads?

The construction, maintenance and operation of road infrastructure in New Zealand are funded by a pay-as-you-go (“PAYGO”) system (Booz Allen Hamilton, 2005). Such systems are widely used internationally, including in Australia, Germany, USA and UK (Road User Charges Review Group, 2009). The main feature of PAYGO is that charges are set so that all operational and maintenance expenses and capital works for the current year are funded from revenue collected in that year. PAYGO is an alternative to conventional accounting systems where users are charged an amount each year that covers asset depreciation and a return on capital (Productivity Commission, 2006). As capital works are fully funded by current users there is no need for debt.

While the amount that needs to be spent on maintenance and operation of the current network is relatively easy to determine, it is harder to determine the appropriate amount to be spent of capital works intended to improve the network. Network users in any particular year are getting a free ride off the capital works paid for by users in previous years. In exchange, they are investing in capital works which allows future users to free ride off investments made in prior years.

PAYGO systems do not in themselves provide any good signals as to the appropriate level of infrastructure investment. Under- or over-investment in infrastructure can create problems of intergenerational equity. The judgement as to whether under- or over-investment is occurring has to be made outside of the accounting system. In general, if the utility²⁸ of the roading system is increasing over time then it is possible that over-investment by the current generation is being made to the benefit of future generations. Conversely a decline in utility could indicate under-investment by the current generation. Because of these intergenerational equity issues and the requirement on the ability to levy taxes, a PAYGO system is only an option for governments.

If it is accepted that the utility of New Zealand roads is improving over time, then as user charges (predominately fuel excise duty and road user charges) and local government rates provided 94% of the 2008/09 expenditure under the PAYGO model²⁹, it is difficult to argue that road users are not paying their way under this system, at least in the aggregate³⁰.

If rail was assessed under a PAYGO system and also met similar criteria, that would suggest equivalent levels of subsidy for the road and rail systems.

²⁸ Utility is used here to mean the ability of the network to deliver transportation benefits to users. For example, utility would increase if better quality roads improved safety levels, or decline if increased congestion slowed average travel times.

²⁹ Calculated from data in Figure 1 of NZ Transport Agency (2008, p. 30). Revenue carried forward was ignored in the calculation. Some of the revenue collected was used for non-road purposes, including subsidies for rail users.

³⁰ This does not rule out the possibility that there are cross-subsidies between different groups of road users. The analysis of Booz Allen Hamilton (2005) suggested a cross subsidy from cars to trucks, and another from local roads to State Highways. It is unclear from their analysis whether heavy trucks on State Highways (the direct competitors of rail transport) are the beneficiaries (or otherwise) of these cross subsidies.

A PAYGO system for rail would treat all existing assets as sunk and forgive all debt. The rail system would no longer be the recipient of any grant monies (except perhaps, for positive externalities such as subsidies for the reduction of road congestion). Such a system can be simulated by looking at the EBITDA (earnings before interest, tax, depreciation and amortisation) for Toll NZ and ONTRACK. The results of such a simulation are inexact due to limitations of the data sources, but indicate that under a PAYGO system an additional \$103m p.a. (on average) would have been available to cover maintenance and capital expenditure for the years 2005-2007 (see Table 5). This amount is of the right order to increase maintenance to long-term replacement levels, but insufficient to maintain the utility of the railway network³¹.

(\$m)	2005	2006	2007
Toll NZ EBITDA	87	104	100
ONTRACK EBITDA (no grants)	5	-10	22
Total EBITDA	92	94	122

Table 5. Estimated EBITDA for Toll NZ and ONTRACK 2005-2007.
(Source: Annual Reports)

Rail received an extra \$201m of grant funding above previous levels in 2008/09, and the government has announced plans to inject \$879m over the following four years (see Table 6). At that level of subsidy it might be expected that the utility of the rail network would be maintained. The levels of grant funding proposed by Rail Development Group (2008c) and KiwiRail Group (2008) would increase the utility of the network at a still higher level of grant funding.

When assessed on this simulated PAYGO basis:

- Rail users were paying costs but with declining utility (2005-2007).
- Under the announced funding proposal, rail users would pay around 80% of costs (i.e. receive a 25% subsidy) with roughly constant network utility (2008-2013).
- Under the KiwiRail Group proposal, rail would pay around 60% of costs (i.e. receive a 66% subsidy) with increasing network utility (2009-2013).

This result is not favourable for rail when compared against the roading system.

The RDG also modelled a PAYGO system for rail and concluded “it is clear that the PAYGO commercial shortfall for operating a full network would have to be met by a subsidy or an alternative business model pursued” (Rail Development Group, 2008b, p. 5).

The rail system is not viable, nor likely to become viable, simply as a result of a change to a PAYGO funding model.

4.6 Perspective 6: a return on government expenditure

Buying back the railways has been an expensive exercise. As Table 6 illustrates, the government has spent \$2.9bn on railways since 2002, and by the end of 2008 had announced plans to spend another \$0.9bn (Cullen, 2008c; Swann, 2008).

³¹ If the utility of the network was being maintained, then rail would be expected to be maintaining market share in the face of increasingly competitive road transport. This clearly requires continual upgrading of the key operational parameters of the network, rather than just maintenance at a constant level.

Date	Amount (\$m)	Paid to	For
2002	81	TRH	Purchased Auckland track network and some train stations
1-Jul-04	50	TRH	Purchased property assets including Wellington railway station
1-Jul-04	0	TRH	Purchased below rail network
2004	200	TRH/ONTRACK	Line maintenance and renewal
2004/05	19	ONTRACK	Equity injection
2005/06	102	ONTRACK	Equity injection to fund rail land transfer from Crown balance sheet (\$99m)
	500		Committed to upgrading and re-equipping the Wellington urban network
	1,000		Committed to upgrading and electrifying the Auckland suburban network
2007/08	34	ONTRACK	Capital injection
1-Jul-08	690 ³²	Toll	Purchase rail and ferries operating company (KiwiRail)
2008/09	80	KiwiRail	Tranz Scenic to tidy up its operations
2008/09	121	NZRC	"Rail industry improvements"
Actual expenditure	2,877		
Planned for 2009-13	879	NZRC	Required expenditure for: a new series of high power, double headed locomotives, rehabilitation of the railway network, the construction of freight hubs and IT upgrades
Actual & planned expenditure	3,756		

Table 6. Actual and planned government expenditure³³ on rail 2002-2013.
(Source: Cullen, 2008c; Annual Reports)

If it is desired to place rail on a commercial footing, then expenditure to date might be used as the measure of equity in rail. Assuming rail can continue to function without the additional \$879m capital grant, it would need to be making a before tax profit of \$218m to perform the same as other SOEs, or \$345m to earn a more commercial before-tax WACC of 12%. If the \$879m capital injection is required (as suggested by the poor state of network assets), then these numbers increase to \$281m and \$481m respectively.

This is a vastly higher profit for an enterprise to earn that is earning near zero profits today.

4.7 Perspective 7: salvage value

The salvage value of an enterprise is the amount that could be realised by closing it down, selling its assets and paying off all liabilities. The salvage value is important because it allows the estimation of the social cost of capital, i.e. what else society could do with the resources currently committed to that enterprise.

If the land under rail really is worth \$6bn (the current ONTRACK valuation), and society is not earning a profit from railways, then it must be that the land could be put to a more productive use within the economy.

In a shutdown scenario, assets like tracks, signalling systems and rolling stock would have no likely purchasers within New Zealand and hence have little market value. Many other assets such as bridges

³² According to Swann (2009), the \$690m purchase included \$200m of debt and other costs which would put the actual purchase cost at \$890m.

³³ This table includes actual expenditure and announced planned expenditure as at the end of 2008. The proposals by the Rail Development Group (2008c) would increase the 2009-2013 planned expenditure from \$879m to \$1237m, consisting of a \$473m operating subsidy and capital investment of \$764m. The capital expenditure program proposed by the KiwiRail Group (2008) would raise expenditure by an further \$273m over the RDG proposal.

and tunnels are sunk, and extra costs will be incurred making them safe for other purposes. The ferries could be sold as a going business. There will be additional costs from breaking contractual obligations including staff redundancies.

As discussed in Appendix 1, the full value of land (when valued on the basis of adjacent land use) is unlikely to be realised by sale³⁴.

Assuming that land can be sold for a net two-thirds of its valuation, and that all other assets net out at zero results in an estimated opportunity cost of rail of \$4bn. Four billion dollars could finance several major hospitals or road projects, retire debt, improve the national electricity transmission system or meet other national priorities.

Understanding the salvage value also informs rational partial shutdown decisions. Partial shutdown scenarios may achieve higher net returns, as some infrastructure assets are redeployed in the retained parts of the network. Line closures can also be timed to coincide with the expiry of contractual obligations. If a notional half the network was closed then over time this could make more than \$2bn available for renewing the remaining rail network or other social priorities³⁵.

4.8 Is road subsidised to the detriment of rail?

Advocates of railways frequently claim that road transport is the recipient of a higher level of public subsidy than rail³⁶. For example:

“Historically, rail has been required to meet the capital costs of running its business as well as ongoing maintenance and running costs. In this respect it is at a disadvantage vis-à-vis the road transport industry. Road User Charges paid by road transport operators do not recover the costs imposed on the roading network by trucks by some margin.” (KiwiRail Group, 2008, p. 5)

Despite ample evidence that the rail has not been meeting capital costs (Section 4.4) nor properly providing for ongoing maintenance (Section 4.3), this statement typifies the widespread belief of a cross subsidy from rail to road transport. It is also widely held that if this cross subsidy was removed then in the resulting state of *competitive neutrality* there would be substantial modal shift from road to rail transport. Evaluation of the veracity of these claims is complex for many reasons including:

- the different accounting treatments used for the rail and road;
- the difficulty of estimating externalities associated with the different transport modes; and
- the difficulty of allocating costs and externalities amongst different users of the road and rail networks.

Equivalent claims made for the Australian transport system were examined in depth by the Australian Productivity Commission who found the facts “quite difficult to discern” (Banks, 2009). Their conclusions were not, however, supportive of the claims of the railways advocates:

- “Competitive distortions between road and rail have been limited and not a significant source of market inefficiency.

³⁴ In specific cases the value of the rail corridor land may be higher than the pure sale value when diverted to alternative use, for example for roading or cycle trails. Such diversions would increase the salvage value of rail.

³⁵ This assumes that land values are distributed evenly between the retained and closed parts of the network. As land prices are generally higher in the major cities, and those cities are likely to retain the majority of their lines in more realistic partial closure scenarios, this may not be the case.

³⁶ These claims are disputed by advocates for other transport modes. For example, Allan (2009) claims that both rail and road are subsidised to the detriment of coastal shipping in New Zealand. In a similar vein, the Road User Charges Review Group (2009) noted that road users in New Zealand were taxed to fund subsidies for rail and sea freight. They considered this to be an inappropriate use of road user charges.

- The case that road is subsidised relative to rail is not compelling, even accounting for externalities.
- And even if network road charges were greatly increased, rail would not derive much benefit given limited substitutability and much complementarity between the two transport modes” (Productivity Commission, 2006, p. XXVI)

While the Australian conclusions are not necessarily applicable in New Zealand, they do cast some doubt on the claims of the existence of such a subsidy in New Zealand, and the likely consequences of its removal.

As this report considers externalities in Section 6, and modal shifts in response to price changes in Section 7.2, those issues will not be considered in this Section.

It is clear from the analysis in Sections 4.2 to 4.6 that rail is the recipient of subsidies in New Zealand. This Section then addresses the question: is there evidence that road transport receives a higher level of economic subsidy than does rail transport?

4.8.1 Does rail freight receive higher subsidies than competing road freight?

The analysis of PAYGO systems (Section 4.5) showed that the use of two different accounting treatments for road and rail in New Zealand is not of itself obscuring a hidden subsidy to the road system. That analysis found the rail system was receiving a significantly higher level of public subsidy than the road system³⁷.

However this finding was based on the road system as a whole. In reality it is only the heavy freight trucks driven on a subset of State Highways that compete directly with rail transport (the “rail-competing segment”). If there are no cross-subsidies within the road system, i.e. revenue collected from the rail-competing segment was paying for their share of costs, then it would be reasonable to conclude that rail freight was being subsidised to a greater extent than road freight. For the contrary conclusion to be supportable there would need to be cross-subsidies from other road users to the rail-competing segment of sufficient size to reverse the overall direction of subsidy. The following analysis examines the evidence for such a cross-subsidy within the current road user charging system.

In New Zealand, heavy vehicles (over 3.5 tonnes) and all diesel vehicles are charged road user charges (RUC) calculated to internalise the increased costs of road maintenance they incur (Starkie, 1998). Costs are recovered from light-weight petrol-powered vehicles via petrol taxes.

The RUC was introduced as a means of ensuring that the operators of heavy vehicles:

- "Paid for the infrastructure costs of their operation in the same way that railways pay for the cost of providing and maintaining the permanent way; and
- Paid for these infrastructure costs on a realistic and rational basis according to the costs incurred on their behalf in providing and maintaining the road way network and according to a reorganised measure of the amount of damage each vehicle causes to the road;
- Ultimately reflected in their pricing the real long-term economic costs of their operation;
- Were able to compete with rail on a realistic basis” (Working Party, 1979; quoted in Starkie, 1998, p. 241)

It is notable that competitive neutrality with rail and the non-subsidisation of road are central to these design goals.

³⁷ As the analysis included congestion payments collected from road users and paid to rail operators, this finding can be assumed to internalise road congestion externalities (to the extent that they can be ameliorated by rail).

The RUC system determines costs based on a series of equations that relate measurable attributes of vehicles to the costs incurred in providing roads for those vehicles. As axle load is the main determinant of road wear and deformation (Johnsson, 2005), damage to roads is modelled using a function of axle load known as the *damage law equation*. This equation has an assumed exponent of four for the purposes of RUC calculation (Arnold, Steven, Alabaster, & Fussell, 2005; Starkie, 1998). An exponent value greater than one means that RUC increase non-linearly in response to increased axles loads, i.e. the heavier vehicles will pay a far higher proportion of the total RUC than lighter vehicles on a per-kilometre travelled basis³⁸.

The damage law exponent value of four is based on studies conducted fifty years ago in the USA. Recent pavement testing conducted by Arnold et al. (2005) on typical New Zealand road types calculated exponents ranging from 1.1 to 3.4, depending on road construction. The highest quality roads have the lowest damage law exponent – and these will typically be the major State Highways. It would therefore appear that the present RUC equations substantially overstate the contribution of increasing axle weight on well-constructed roads. The current practice of applying a constant damage law exponent of four creates a cross-subsidy from the rail-competing segment to the other vehicles on which RUC is levied.

At this point two effects have been established:

- The rail system is more highly subsidised than the road system; and
- There is a cross-subsidy within the road system from the rail-competing segment to other RUC-paying road users.

To disprove the original claim it is necessary to now show that there is not a cross-subsidy from non-RUC paying road users (petrol-fuelled light road vehicles) to RUC-paying road users, of sufficient magnitude to reverse both of the effects established above.

If there was such a cross-subsidy, it could be expected to significantly distort the incentives faced by road users. Firstly, such a subsidy would make it very attractive to opt-in to the RUC system by buying diesel-powered vehicles when petrol-powered vehicles were a closer match to users' requirements. There is no evidence of this happening on a significant scale. Secondly, it would create substantial political problems as there are far more petrol-powered vehicle owners than diesel-powered vehicle owners. Lastly it would be expected that operating costs for heavy trucks in New Zealand would be lower than in comparable countries. In fact road transport costs are significantly higher than those in Australia, and RUC is a significant contributor to these higher costs (Friedlander, 2009).

In conclusion, there is no evidence that road transport is subsidised to the detriment of rail transport in New Zealand. The evidence points to a subsidy in the reverse direction.

4.8.2 Strategic implications of changes to the road user charging system

The ideal road user charging system would charge all road users based on costs actually incurred by each user. Such a charging mechanism would send the right price signals to users encouraging them reduce these costs to an economically efficient level.

In practice these costs depend on variables not captured in the current RUC system. Pavement damage costs depend critically on the type and quality of the roads traversed, and the actual axle loading on each journey. The costs of externalities such as congestion and air pollution are highly variable depending on location and time of day. Under the present system of incentives, it should be expected

³⁸ This is, of course, dependent on the axle configuration of the vehicles compared. Freight vehicle owners will choose an axle configuration that lowers their total costs. This is, of course, a desired outcome of the RUC system.

that there is more road congestion and pollution, and fewer larger trucks on high-quality roads than is economically efficient.

Global positioning systems, cellular data networks and geographic information systems have substantially reduced the cost of collection and analysis to the point where direct road charging based on time and location is technologically feasible. Electronic location and fee collection systems for heavy vehicles have been implemented in Switzerland, Austria, Germany and the Czech Republic, and are planned for several other European countries. Direct road charging for heavy vehicles is perhaps less than five years away in New Zealand (Road User Charges Review Group, 2009).

A reduction in the damage law exponent from its present assumed value of four to a value appropriate to the road on which the truck was been driven could lead to a substantial cost saving for rail-competing road transport. It would also improve the operating economics of heavier trucks, which offer further fuel, salary and administration cost reductions for operators.

As RUC makes up approximately 10% of the total costs for road transport operators³⁹, lower RUC charges for trucks on competing freight routes will increase the competitive position of road transport relative to rail. Direct road charging is probably inevitable in New Zealand, and can be expected to further undermine the economics of rail. It should be acknowledged as a significant strategic threat to the future of rail freight operations.

4.9 How has rail performed?

The performance of rail in the first decade of the 21st century is consistent with the conclusions of ISCR (1999b): rail is covering operating costs but failing to cover the cost of its capital. With full access to KiwiRail's internal accounts, the Rail Development Group came to a similar conclusion:

“None of the [freight and passenger rail] businesses have been commercially sustainable in their own right with current policy settings if network-wide operations are to continue and assets maintained.” (Rail Development Group, 2008b, p. 3)

ISCR's conclusion that “the history of rail in New Zealand has been one of enormous taxpayer and social cost entailed in retaining rail as a state-owned enterprise” (ISCR, 1999b, p. 2) can now be updated to 2009 as:

The history of rail in New Zealand has been one of enormous taxpayer and social cost entailed in retaining rail, regardless of its ownership.

4.9.1 The counterfactual

The fact that rail has not been economically viable for a long time means that it has operated at a net cost to the whole New Zealand economy.

Rail is not a monopoly. Most freight that currently travels on rail is contestable by road (Mackie et al., 2006). Buses and private vehicles offer a substitute for passenger trains⁴⁰. It might be desirable for New Zealand to have rail, but it can hardly be considered essential.

Without rail, there would have been more resources to invest in other areas, including in health, education and other transport infrastructure. An interesting counterfactual to explore is what if rail had been abandoned rather than privatised in the 1990s, and the net resources put into other parts of the

³⁹ The RUC proportion of total operator costs has varied within the range 9-11% over the period 2002-2009. (Source: RTFNZ/Deloitte Index.)

⁴⁰ For example, buses replaced trains on the Johnsonville line for six weeks starting December 2008 in order to allow for construction and maintenance (ONTRACK, 2008c).

transport system. What would New Zealand have now instead of a run-down rail network, under-funded road infrastructure and a coastal shipping sector overly focused on Cook Strait? Would this have created a more efficient transport sector than the one that operates now?

This report is not going to attempt to answer those questions. The point of asking them is to draw attention to the fact that the inefficient use of society's resources has costs and longer term consequences.

4.9.2 Summary

Rail has performed poorly since at least the 1920s, and since at least the mid-1980s its social cost has substantially outweighed its social benefit⁴¹. The rational response is a gradual rundown of long-lived infrastructure. This has been happening to 2008 under private and public ownership.

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.

The whole network should be closed unless:

- These economic problems can be improved by changing governance or ownership;
- It has significant positive externalities that exceed the costs involved and these cannot be achieved at lower cost by other means; and/or
- A viable subset of the network can be found.

The next Section considers governance and ownership issues.

⁴¹ Prior to the removal of price controls and road transport restrictions in 1983-86 it was not possible to accurately assess the economic performance of rail. However the very existence of these restrictions indicates that it was not competitive with other forms of transport.

5 Can performance be improved by changing governance or ownership?

The institution of ownership is a common and effective way for providing people with incentives to create, maintain and improve assets (Milgrom & Roberts, 1992). Ownership matters a great deal in determining economic performance. In large organisations however, ownership incentives are blunted by complex governance arrangements. This Section looks at the performance of rail in New Zealand under different ownership and governance arrangements and whether further changes might offer improvements in performance.

5.1 Experience in New Zealand

This Section briefly describes the range of ownership and governance models for rail that have been tried to date in New Zealand.

5.1.1 Local ownership

New Zealand's railways were primarily owned by provincial governments between 1860 and 1876 (see Section 2.1). This arrangement had problems with technical standardisation (e.g. track gauges) and financing.

5.1.2 Corporatisation

Orr (1981) describes the governance structure of New Zealand railways between the 1870s and the 1950s as a cycle which repeated on four occasions. A perception of poor financial performance led to a review, a finding of political interference as the primary cause and a recommendation of corporatisation as a remedy. Corporatisation was duly implemented with the goal of making rail a viable business, and generally succeeded in improving the short-run financial position. These periods of corporatisation are listed in Table 7 and labelled A-D in Figure 16. Within five years each of these corporatisations had been reversed, inevitably due to demand for increased political control. The financial performance gains of each corporatisation period were typically short-lived, with performance returned to the long-run trend.

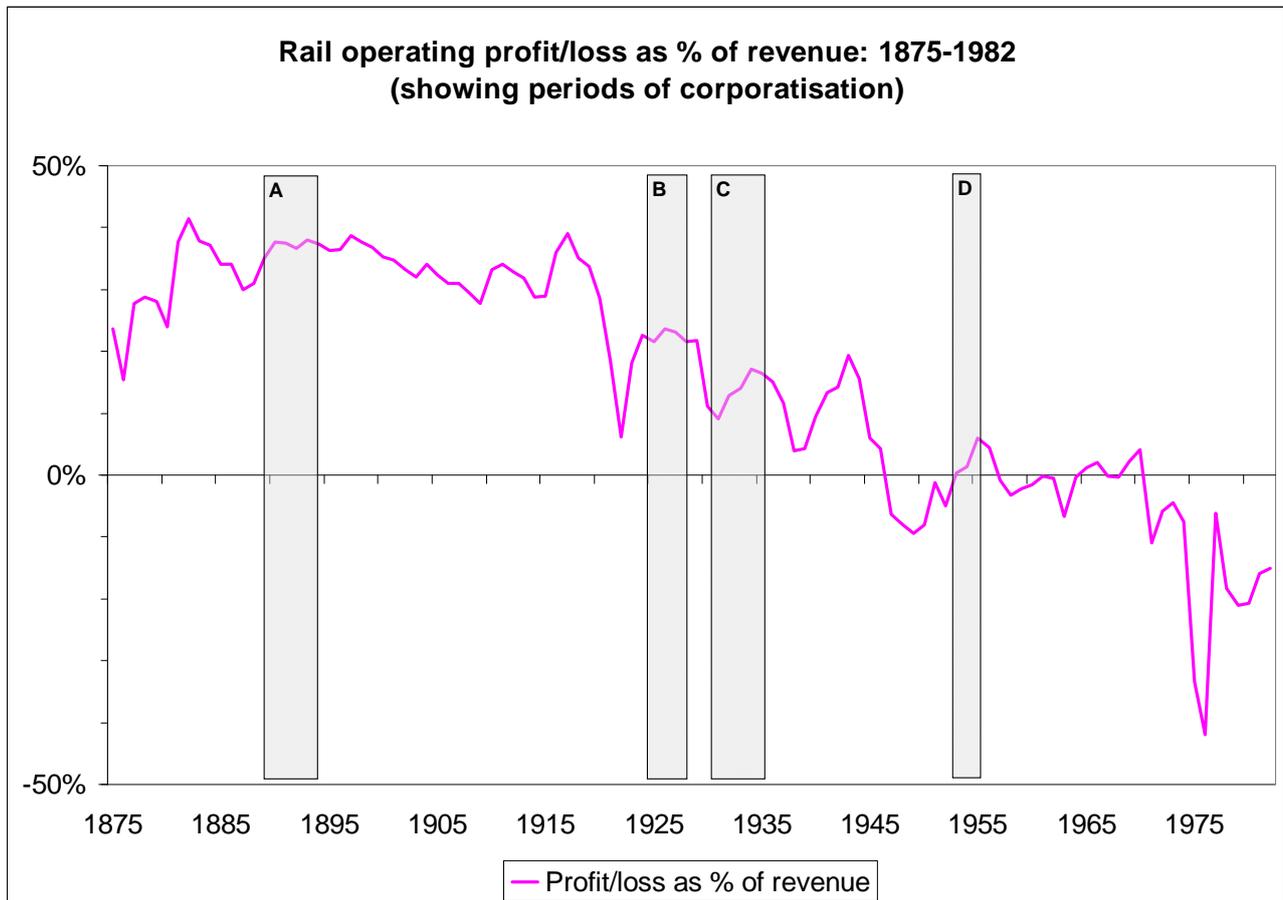


Figure 16. Financial performance of New Zealand railways 1875-1982.
See Table 7 for period legend. (Source: Orr, 1981 and Annual Reports).

Periods of corporatisation			
Label	From	To	
A	1889	1894	Railways Commission
B	1925	1928	Board of Management
C	1931	1936	Government Railways Board
D	1953	1956	NZ Railways Commission

Table 7. Periods of corporatisation.
Labels refer to Figure 16.

5.1.3 Private ownership

Various private railways were built during the early days of rail in New Zealand either under special legislation or under the Railways Construction and Land Act 1881 (Neale, 1938b). The latter provided for the private construction and operation of railways as being conducive “to the more speedy settlement of the Colony”. There was power under the Act for the companies to receive rating powers over the areas benefited and to receive grants of Crown land. Under the Act the Crown could purchase the railway at any time after ten years from opening at a price to be determined by arbitration.

Most railways built under this model were unsuccessful financially, and many were never completed under private ownership (Neale, 1938b). In 1884 the government started to repurchase railways it had authorised under the 1881 Act.

The Wellington and Manawatu Railway was successful - in part because it was able to profit from land development on the Kapiti Coast (Blake, 1927). This railway was repurchased by the government in 1908, marking the end of independent private railways in New Zealand.

The railway network was sold in 1993 and operated under private ownership until 2008 (see Section 2.2).

A notable aspect of the privatisation was that the land under the rail corridor was not sold; the new owners purchased a “Core Lease” – a 40-year right (with a right of renewal for a further 40 years) to use the land for the purposes of running a railway. A (perhaps unintended) consequence of this separation of ownership and operation is that it undermined incentives to maximise the economic welfare from each railway line. Economic efficiency is maximised when land is used for its most productive use. If a railway operator can make a greater return from closing a line and selling to land for a more productive use then it is in the economic interests of both the operator and society for them to take that action. However the terms of the Core Lease meant that the railway operator would not gain the benefit of the sale value. Their incentive was therefore to keep a lines open even where it was not economically efficient to do so. These incentives provide a partial explanation of the fact that the reduction in length of the rail network has stalled since privatisation (see Figure 2 on page 11).

Even with these modified incentives, the private operator was rationalising and restructuring rail services. For example, the Bay Express and Southerner passenger services were closed in 2001 and 2002 respectively. A goal of privatisation was to achieve economic efficiency, but for that goal to be achieved the government had to resist the temptation to intervene to prevent rationalisation.

A 2002 Tranz Rail internal review of uneconomic lines recommended closing 41% of lines (Rail Development Group, 2008c). When faced with these plans, the government took a series of actions aimed at preventing network rationalisation, cumulating in the repurchase of the rail network and operations.

A future re-privatisation of rail is unlikely because New Zealand governments cannot credibly commit to non-interference in the operation of privatised railways. Knowing that such interference could constrain or eliminate profits, potential owners have a strong disincentive to invest.

5.1.4 Horizontal integration

Rail has been integrated with the Cook Strait Ferries since 1962. Rail was integrated with long-distance bus passenger services until 1990. Rail freight operations were integrated with trucking operations in the 1980s and this arrangement continued until 2008.

5.1.5 Structural separation

Structural separation⁴² of railways started in Auckland in 2002 and was extended to the remainder of the country in 2004. This arrangement continued until 1 October 2008, when the KiwiRail Group became a vertically integrated operator. Auckland commuter services and some heritage rail operations are still independently owned but operate on tracks owned by the KiwiRail Group.

The primary motivation for structural separation in other jurisdictions has been to enhance competition (OECD, 2005). However there are costs – largely to do with coordination – as well as benefits, and the difficulty of determining whether benefits will outweigh costs for particular countries make it hard to provide general recommendations (Competition Committee, 2006). Structural separation has been found to reduce the efficiency of railways in the US, though not in Australia (Wills-Johnson, 2007c). Experience with structural separation in the EU has been mixed. Positive benefits were observed in Sweden, but the levels of competition have remained low in many other countries (Competition Committee, 2006).

⁴² Also known as *vertical separation*. In the context of rail, structural separation involves a separation into a single below-rail entity and one or more above-rail entities.

The motivations for the structural separation of rail appear to be different in New Zealand. Structural separation was an alternative to the direct subsidisation, nationalisation or (possible) bankruptcy of a private rail operator seeking subsidies to maintain a national rail network. Vertical separation offers governments the opportunity to make “safer” investments below rail, where costs are sunk and the value of assets created cannot be destroyed through inefficiency or extracted through profits (Wills-Johnson, 2007a). This factor may have made structural separation more attractive than direct subsidies or an outright purchase in 2004.

While the 2004 agreement with Toll NZ did assign exclusive access rights to Toll, it also included a use-it-or-lose-it provision: if Toll’s traffic fell below 70% of the average 2002-2004 freight levels for any line segment it would lose its exclusive access (“National Rail Access Agreement,” 2004). It must be considered very unlikely that this provision would have led to the appearance of a serious above-rail competitor to Toll, as the competitor’s operations would have been restricted to those isolated line segments where there was declining demand for rail freight.

Structural separation in New Zealand created a holdup situation with its own problems of coordination and negotiation, which led to its dissolution in 2008. The new institutional arrangements have reduced but not solved the holdup problem. Figure 17 compares the institutional arrangements over time as they apply to the general freight market. The holdup problem between ONTRACK and Tranz Rail that applied over 2004-2008 has now become a potential holdup between KiwiRail and the major freight-forwarding companies, in particular Tranz Link who remains KiwiRail’s largest customer.

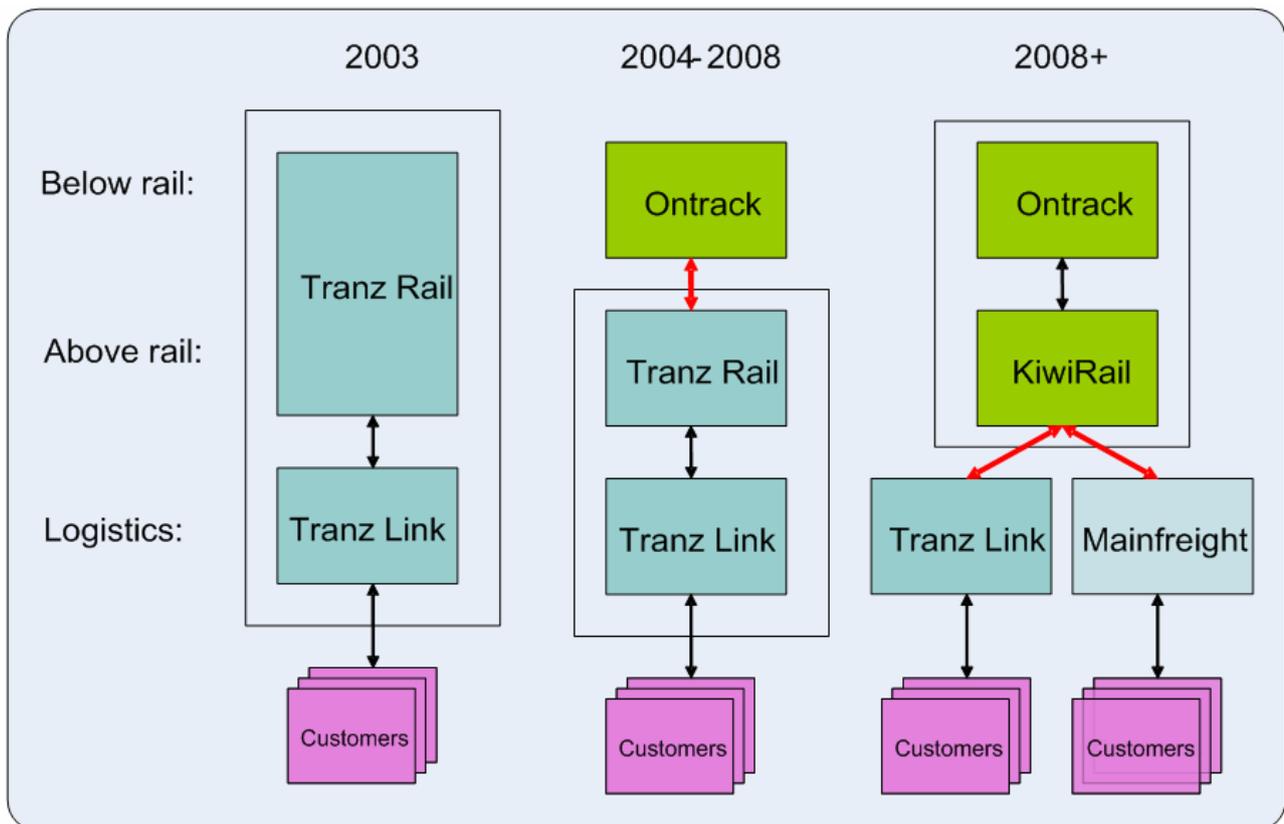


Figure 17. Changing organisational form. Holdups indicated in red.

A particular problem with structural separation is information asymmetries, where parties hold information that other parties need in order to improve the efficiency of their own operations, and there are disincentives or barriers to sharing this information. For example, to plan its capital works program ONTRACK needed access to high-quality forecasts of future freight volumes. The information on which such forecasts relied was held by Toll (and its customers), but it may not have

been in Toll's interests to pass on that information if there was a risk that it might be used by ONTRACK to justify higher track access charges.

The natural organisational form would appear to be vertical integration in the form that applied prior to 2004.

5.1.6 State-owned enterprise

Rail operated as a state-owned enterprise from 1986-1990, and has again from 2008. As the economic performance of state-owned enterprises has been generally poor relative to their privately-owned equivalents (Russell, 2009), it would be unwise to assume that the performance of rail will improve purely as a result of the move from private to public ownership.

5.2 Other models

5.2.1 Experience overseas

“Over the past 25 years the rail sector in virtually all OECD countries has undergone significant reform. These reforms were usually driven by inefficiency and poor performance within the rail sector and long-term loss of market share to other transport modes” (OECD, 2005)

No single governance or ownership model has emerged overseas which effectively counters these problems. Structural separation has been mandated in the EU with mixed results. A promising model from an economic-performance perspective is that of the US freight market, where there is competition between vertically-integrated carriers with contracted access to each others' tracks. Such a model is unlikely to be applicable in New Zealand as the market is too small to support multiple, competing rail companies.

5.2.2 Devolved ownership

Where there is a single major user of a rail line, it may make sense for the user to own that line. As an example, Solid Energy made a bid to Tranz Rail to purchase the Midland Line in 2002. Solid Energy's coal exports have been constrained by the condition of the Midland Line. In 2005 their CEO estimated that Tranz Rail's rundown of the rail track cost it \$200m (Steeman, 2005).

It may also be sensible for Fonterra to purchase and operate the lines that are important to its supply chain. Similarly, where the primary role of a rail line is to service a port, then it may be sensible for the port to own that line. New Zealand has a history of local port ownership, though there are concerns that this model has led to over-investment in ports.

Lastly, if a region places a high value on a line as an availability option, then it may be sensible for the region to purchase that line. This is discussed in Section 6.1.

Devolved ownership creates new issues of coordination. Still, it may have some part to play in the future of rail in New Zealand.

5.3 Summary

A wide variety of governance and ownership models have been tried in New Zealand. Typically the economics of rail has improved around the time of changes but reverted to the long-term trend within a few years. The underlying economic problems have persisted despite these changes. It appears unlikely that the adoption of any alternative model will, by itself, make an improvement sufficient to overcome the uneconomic position of the national rail network.

ISCR (1999b) postulated that appropriate decision-making would be more likely with rail in private ownership. If rail could not cover the costs of maintaining its infrastructure then the logical response of the owner is to progressively run down and close infrastructure as it reaches the end of its economic life. The approach allowed the restructuring of rail to retain any economically viable pieces.

The fact that the government retained the land ownership when privatising rail meant that the private owner could not access that element of salvage value from closing lines. This factor made appropriate decision-making less likely.

The government had its own vision for rail and worked hard to impose that vision on the rail operator. Rather than letting a private operation scale back or cease trading an uneconomic activity, they took upon themselves the responsibility for rail. In the end, this 15-year experiment was not all that different from the cycle described by Orr (1981) and discussed in Sections 2.1 and 5.1.2. Whereas the corporatisations she described were reversed within five years, privatisation was harder to undo and lasted 15 years. But like the others, it was the desire for political control that drove its undoing.

The ISCR (1999b) postulate can now be rewritten as:

Appropriate decision-making is no more or less likely with rail in private ownership, as the political considerations which motivate governments to intervene are not diminished.

A future re-privatisation of rail is unlikely as a government could not now credibly commit to non-interference in the operation of a privatised railway.

6 Do externalities justify having rail anyway?

Externalities are the components of total social benefits and costs that are not accounted for by private markets without some intervention. ISCR (1999b) made an assessment of externalities of rail. The net externalities identified were health benefits due to reductions in pollutants (\$7.69m in 1997) and reductions in vehicle crashes on roads (\$6.11m), totalling \$13.80m. This level of externalities was insufficient to overcome the negative economic surplus of rail (-\$84.8m in 1997).

ISCR (1999b) chose not to account for greenhouse gas externalities. As greenhouse gas emission reduction has become a driving force in transport policy in New Zealand, it is appropriate to consider those externalities in this report.

A study of the negative externalities associated with transport in Canada produced a ranking of the five externalities considered: accidents, air pollution, congestion, greenhouse gas emissions and finally noise (Economic Analysis Directorate of Transport Canada, 2008). While the ranking may be different in New Zealand, this list is indicative of the externalities that deserve consideration.

The Surface Transport Costs and Charges (STCC) study (Booz Allen Hamilton, 2005) estimated the total costs and charges associated with road and rail transport in New Zealand for the 2001/02 year. Their analysis contains estimates of the cost of negative externalities. They chose to ignore positive externalities. Differences in the treatment of road and rail in the STCC have led to criticism of the study and alleged misuse of the data (Hyder Consulting, 2008).

The Ministry of Transport has initiated the Understanding Transport Costs and Charges (UTCC) project to update, improve and extend the STCC study. Phase 1 of the UTCC study concentrates on methodological issues and project planning. It was completed in September 2008 (Hyder Consulting, 2008). Phase 2 will include the actual analysis and completion is planned for December 2010.

This report does not attempt to reproduce the work planned for the UTCC study. This Section considers the potential sources of externalities associated with rail in order to assess the likely sign and order of magnitude of externalities, and the degree to which a modal shift towards rail might be an effective policy to reduce those externalities.

It should be noted that the optimal level of externalities is not zero (Productivity Commission, 2006). At some point it becomes more socially costly to lower them than the welfare created by their further abatement. The rational aim is to lower externalities towards this point at the least cost. As rail investments are very expensive, they need to be evaluated according to this least cost principle.

6.1 Rail as a source of economic development

Rail infrastructure spending is often believed to be as a source of economic development. It is true that infrastructure spending will of itself create economic activity, but for that development to be an externality it has to create indirect benefits, i.e. those that go beyond the direct provision of transport.

In the US, railways had a significant impact on urban growth and regional economic development in the second half of the 1800s (Atack, Haines, & Margo, 2008; Glaeser & Gottlieb, 2008). This association was also found for highways between 1960 and 1990, and airports in the 1990s (Glaeser & Gottlieb, 2008). Access to rail today may no longer be a positive factor. Cities built around the car grew faster and replaced those built around walking and public transportation during the 20th century (Glaeser & Shapiro, 2003).

In New Zealand, there is a perception that rail is essential for regional economic development (e.g. Clark, 2008; “Toll planned to close Gisborne line,” 2008). This argument has been used to justify the retention of lightly-used, currently uneconomic lines.

A lightly-used line has *option value*: potential value for future (direct or indirect) use. However retaining the option also has a cost: track maintenance and renewal and accumulated operational losses. The option is most valuable regionally whereas the costs are borne centrally. The only costs borne by the regions in keeping the option open are lobbying costs.

An important distinction is between the *distributive* and *generative* effects of transport infrastructure (Rietveld, 1994). Rail infrastructure may be valued regionally for its distributive effects: inducing the relocation of economic activity and/or population even if at the expense of other regions. However at the national level policy-makers should be expected to be more concerned with generative effects: overall changes in the level of economic activity.

Transport is a necessary, but not sufficient, condition for economic growth (Peters, Paaswell, & J. Berechman, 2008). While transportation has the potential through changing the accessibility of a region to create the opportunity for economic activity, regional conditions must also be favourable for firms to locate into the region.

The types of economic developments that would be enabled by a rail option are limited. For a proposed development to gain an advantage, rail has to be cost competitive from the perspective of the developer. Unless a substantial subsidy is on offer, this means transporting large volumes of bulk commodities in a situation where coastal shipping is infeasible. In a New Zealand context the candidates are mining, agriculture or forestry. Outputs from agriculture and forestry are reasonably predictable over the medium term, so economic developments requiring an unexpected and substantial increase in transport demand are unlikely.

In the case of mining, if a mineral deposit is large and valuable enough, then financing the construction of transport infrastructure to service it may be feasible. For example, new railway lines have been built in recent years to connect iron ore mines in the Pilbara region of Western Australia to ports. For a large-scale mining operation the existing New Zealand railway infrastructure and track alignments are probably unsuitable and complete reconstruction on a new alignment may be required.

As the freight requirements of small mining operations can probably be easily handled with existing road infrastructure, there is only a limited class of intermediate-sized mines with intermediate projected profitability whose viability might be affected by the presence or absence of a railway option. It is very costly to keep railway options open around the country just in case one of these opportunities comes along.

New mineral deposits are most likely to be found in areas already known to be mineralised and with existing mining activities. These areas tend to be the ones that already have viable rail lines.

A rational position for a region is to negotiate compensation in return for quietly accepting the closure of sub-economic regional lines⁴³. The compensation could be used to improve other transport infrastructure (thus benefiting existing and future economic activity in the region) or to create a fund available to subsidise future developments that might have been rail-dependant.

Alternatively, if a region places a high valuation on an option to retain rail, then they should be given the opportunity to provide an ongoing subsidy or to purchase that part of the rail network. Given the

⁴³ This proposal can be seen as an application of the Coase Theorem, whereby an efficient allocation of resources in the presence of externalities can be achieved by the grant of property rights (e.g. a right to be connected to the rail network) and the ability to trade those rights (e.g. for compensation) (Milgrom & Roberts, 1992).

role of rail in serving ports, this might be an optimal ownership scenario for ports that are currently regionally owned.

In summary, it is unlikely that rail as a national network is providing positive net economic development externalities.

6.2 Greenhouse gas emissions

6.2.1 Climate change policies

Carbon emissions are a negative externality of burning fossil fuels. To internalise this externality a sensible solution is to impose a carbon charge. Because it is difficult to directly measure carbon emissions, it is more efficient to impose a charge covering the externality costs on fuel, which can be reliably metered.

A carbon tax, or an economically-equivalent emission-trading system (ETS)⁴⁴, 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. Implementing and setting the level of such a tax will require unprecedented levels of international cooperation; however significant moves in that direction have been made by the EU and in some parts of North America. New Zealand has passed legislation for an ETS⁴⁵, but its implementation is currently under review.

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.

The value of carbon chosen for modelling by the Ministry of Environment is NZ\$25/tonne⁴⁶, equivalent to 5.5c/litre of transport fuel (Ministry for the Environment, 2008). As they note, this is a small amount when compared to the recent volatility in fuel prices. However, over the medium term it should create the appropriate incentives for investment in order to reduce carbon emissions.

If rail is more fuel efficient than road as the government has consistently maintained, then anything that increases fuel costs should increase the price of road transport relative to rail and hence motivate private owners to invest more in rail. Having committed to an emissions trading system, there was no need for the government to purchase the rail system in order to achieve its climate change plans. The risk now is that the government may invest in rail as an emissions-reduction strategy, rather than making the economic settings for least-cost abatement and allowing those instruments to work.

6.2.2 “Rail is 4x more efficient than trucking”

This result is based on European Union (e.g. Mellios & Giannouli, 2005) and New Zealand studies and regularly quoted in New Zealand government material (e.g. Ministry of Transport, 2008c). On the same basis, sea freight is around twice as efficient as rail freight.

⁴⁴ Carbon taxes and emissions trading schemes are both mechanisms that allow markets to find least-cost ways of reducing emissions. Freebairn (2009) discusses the (ideal) conditions under which the two mechanisms are economically equivalent, and some real-world considerations that might make a carbon tax mechanism preferable. Other authors (e.g. Garnaut, 2008) favour emissions trading schemes.

⁴⁵ With the assent of the Climate Change Response (Emissions Trading) Amendment Act 2008 on 25 September 2008, New Zealand has an emission trading system in place that will apply to the transport sector from 1 January 2011. However the scheme is under review by the government at the time of writing (April 2009).

⁴⁶ NZ\$25/tonne is approximately A\$20/tonne — the estimated starting price required to reduce emissions so as to stabilise atmospheric CO₂-equivalent levels at 550 parts-per-million. Higher emission prices are required to achieve lower stabilisation levels, and lower risks of dangerous climate change. The starting price is 40% higher to achieve 510ppm, and 110% higher to achieve 450ppm (Australian Government. The Treasury, 2008).

The “rail is 4x more efficient” statement is potentially misleading in that it compares average not marginal benefits (Van Wee, Janse, & Brink, 2005). The averages for rail are dominated by things it does well, e.g. bulk freight. The averages for road are dominated by things it does well, e.g. fast point-to-point delivery. The two modes do not generally compete for such tasks.

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.

Affleck Consulting (2002) studied actual emissions for seven specific Australian long-distance corridors and found intermodal produced on average 55% of the road-only emissions. Intermodal distances were generally similar to road-only distances for the cases studied.

In a reanalysis of the data in Gaballa and Cranley's (2008) study of shipping consumer food products to Melbourne, the weighted average intermodal distance was 30% longer and intermodal produced 61% of the road-only emissions.

The comparative figures from these two studies (55% and 61%) are much higher than the 25% implied by the “4x more efficient” claim. As freight distances are shorter in New Zealand than those used in the Australian case studies⁴⁷, and rail freight’s relative efficiency reduces with decreasing distance, it might be expected that efficiency gains from a switch from road-only to intermodal in New Zealand would be less than these case studies indicate.

Averages are misleading in the case of truck efficiency. New Zealand’s vehicle fleet is older than comparable nations such as Australia and Canada (Ministry of Transport, 2008e). Almost half of all vehicles on the road are used imports, but this does not extend to the heavy trucks that compete with rail freight. Over 95% of large (more than 25t) trucks were purchased new in New Zealand. It is the recently manufactured trucks that are travelling the longest distances (Ministry of Transport, 2008e). These vehicles will likely have much better fuel efficiencies than the “average” truck.

Another major problem with the “4x more efficient” statement is that it is based on operating efficiency, not full life-cycle efficiency. In particular, the construction costs of the rail network are not considered. The main inputs into rail infrastructure are steel, concrete and diesel. All are energy-intensive and are significant sources of CO₂ emissions. For the Netherlands, Bos (1998) estimated that 45% of total rail energy use is in providing the rail infrastructure. This proportion is likely to be much higher on lightly-used tracks in NZ. Bos found that once all indirect energy use was taken into account, the total energy use of rail was similar to that of large trucks on major road routes.

O'Toole (2008) found urban rail energy payback periods could be longer than the realistic project lifetime. He cites some examples with very poor energy paybacks: 172 years for a light rail project in Portland, Oregon and 70 years for a light rail project in Seattle, Washington. O'Toole also noted that urban rail projects tend to cannibalise the most efficient bus routes thus lowering their average energy efficiency.

Clearly modal comparisons are misleading without full lifecycle and cross-modal accounting of environmental costs (Van Wee et al., 2005).

A further issue for many comparisons is the assumption of constant technology. For example, Auckland Regional Transport Authority (2006) presents the data in Table 8 as part of its justification for new electric trains in Auckland. This looks like a good case, until one reads the accompanying

⁴⁷ The weighted average rail trip length for the Gaballa and Cranley study was 805km. The average intermodal rail trip length for the Affleck Consulting study was 1832km. The average freight haul in New Zealand is 283km, though for the domestic freight segment (which includes intermodal) it ranges from 300-1200km (KiwiRail Group, 2008).

material and realises that the planned lifetime of the new electric trains is 40 years. Hybrid buses are already available with 70% of the emissions of diesel buses, and will no doubt improve significantly over time. The next version of the Toyota Prius hybrid is expected to halve the Prius's fuel consumption ("Toyota 1/X Hybrid Concept Doubles Prius' Mileage," 2008). It will achieve better fuel economy than the Auckland's planned new electric trains, in all probability before the electrification project is completed. The fuel consumption of the "average car" will plummet if the government achieves its National Transport Strategy target of early and wide deployment of electric cars (Ministry of Transport, 2008a).

	CO₂ 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

Table 8. Comparison between different transport options.
(Source: ARTA, 2006)

The benefits of modal shift to electric trains are largely limited to commuter trips in peak hours. In contrast, a consumer switch to a hybrid or electric car reduces the impact of all trips in which the car is used.

Rail is a very long-term investment, but long-term commitments may well not be desirable when technology is rapidly evolving.

Taken together these arguments do not say that road is more efficient than rail, or vice-versa. What they do say is that broad statements that "rail is better than road" are not supportable, especially in the context of proposed modal shift. The specific context needs to be examined and full-lifecycle environmental accounting considered before being able to make a conclusion in specific situations. It may be that rail does have a significant potential environmental contribution, but on present information it appears that contribution will be limited to particular circumstances.

6.2.3 Summary: greenhouse gas emissions

Greenhouse gas interventions should be based on full-lifecycle accounting. In the case of rail, without such accounting there is a risk that operational emission benefits will be negated by infrastructure emissions. Rail infrastructure will need to be well-chosen and heavily used to make a positive net contribution to greenhouse gas abatement.

Forced modal shift risks moving tasks onto rail for which it is not naturally efficient, potentially increasing overall emissions.

Greenhouse externalities are best dealt with via a carbon tax or equivalent emission-trading system which should drive an optimal modal allocation at least overall cost. Such a system should create incentives for the right infrastructure investments. The government purchase of the rail network was not necessary for this outcome.

6.3 Congestion

The total cost of congestion on roads in NZ is in the order of \$1bn per year (Booz Allen Hamilton, 2005). This is an estimate of the value of time lost due to delays caused by other road users. Over 90% of this congestion cost is incurred in the three main centres: Auckland, Wellington and Christchurch.

Over 70% of it is in Auckland. The majority of these congestion costs are incurred at peak travel times.

This information suggests that a national rail freight system contributes little to the reduction of congestion. Rail does most of its haulage in rural areas, where little congestion is incurred. 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.

There are also congestion issues within the rail network, for example between commuter and freight trains. Some of the current rail infrastructure spending in Wellington and Auckland is designed to address these congestion issues.

Shifting freight from road to rail will not automatically reduce congestion costs unless the specific rail lines are currently uncongested and below capacity. When capacity limits are reached the congestion costs on rail may equal or exceed those on the road. 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.

While road congestion is undoubtedly an issue, it does not necessarily follow that simply providing more commuter rail is the answer. The success of urban rail systems is dependent on population size and density, spatial layout and working patterns (see Section 3.2.4).

Wellington has very high commuter rail patronage relative to other cities in this part of the world. Christchurch is the same size but has no commuter rail. However both cities suffer road congestion.

Access to roads at peak times is under priced, leading to overuse. Better answers to road congestion are likely to come from new approaches to road pricing. Rail may have a role to play within such an approach.

ISCR (1999b) made the reasonable approximation of valuing the road congestion avoided by commuter rail at the value of subsidies paid by local authorities to reduce it. This assumption has the effect of reducing congestion externalities to zero, as the subsidies are internalised in the income of the rail operator. The analysis in this report continues this practice by treating subsidies from local governments as railways operating revenue.

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.

6.4 Accidents

There is certainly a perception in New Zealand that rail is safer than roads (e.g. Preston, 2008). Certainly there are more truck-related than rail-related deaths. This would be expected: the higher volume and multiple-use of roads has economic-efficiency benefits but raises the probability of accidents.

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 NTK over 1998-2007⁴⁸ 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 comparable⁴⁹. While there are a number of potential criticisms of this analysis⁵⁰, the perception that rail is safer may not be justified. 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. Booz Allen Hamilton (2005) calculated total road system accident costs of \$2.87bn for 2001/02, of which \$2.2bn 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).

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.

6.5 Air pollution

The costs of air pollution from the combustion of transport fuels are primarily incurred in cities, predominately health costs.

The amount and type of pollution is determined by the type of fuel, the amount of fuel used and the technology used for combustion. Electrification of transport is an effective way to reduce air pollution in cities, although if the marginal generation source of electricity is fossil fuels then it may simply be a case of shifting the pollution elsewhere.

Auckland's commuter rail service currently relies on old diesel locomotives that are older than most cars on the road. These locomotives are scarcely more fuel efficient than the average car (see Table 8) and they are unlikely to use any emissions-reduction technology. It is therefore unlikely that there is any significant reduction in air pollution due to the current passenger trains in Auckland.

The situation is likely to be better in Wellington which has electric passenger trains on the majority of routes.

Booz Allen Hamilton (2005) estimated the local environmental externalities associated with the road system for 2001/02 (see Table 9). The air pollution externality associated with heavy commercial vehicles (those that compete with rail) is \$101m. The corresponding figure for rail is \$6.3m. Normalising these figures by the freight task for that year suggests that the air pollution externality associated with road freight is roughly five times higher than that associated with rail.

⁴⁸ Derived from data in Ministry of Transport (2005b, 2008a, 2008f) and Richard Paling Consulting (2008).

⁴⁹ The definitions of 'injury' for the two datasets are different.

⁵⁰ Potential criticisms include: (1) a collision between a truck and a train would be double-counted regardless of fault; (2) the analysis includes all trucks, rather than just the heavy trucks on State Highways that compete with rail (and which may have different safety characteristics); (3) the rail figures include accidents solely due to passenger rail, but rail passenger activity is not accounted for in the denominator.

(\$m)	Grand total	Car	Bus	Truck ⁵¹				Total
				LCV	MCV	HCVI	HCVII	
Air pollution	442.0	149.0	7.0	96.0	89.0	32.0	69.0	286.0
Water quality	28.0	22.5	0.1	4.3	0.6	0.2	0.3	5.4
Water quantity ⁵²	98.0	78.9	0.2	15.0	2.3	0.7	0.9	18.9
Noise	289.0	200.0	2.0	38.0	29.0	9.0	11.0	87.0
Total	857.0	450.4	9.3	153.3	120.9	41.9	81.2	397.3

Table 9. Local environmental quality externalities of road system by vehicle type 2001/02.

(Source: Booz Allen Hamilton, 2005, p. 46)

All other things being equal, the potential externality savings if rail could double its freight task at the expense of road, the reduction in air pollution externality would be of the order of \$17m (2001/02 figures). If rail was abandoned and all its freight shifted to road then the additional externality incurred would be the same figure. This is a very small cost relative to the economic cost of the present rail network.

The heavy truck fleet is relatively young and thus benefits from technical changes to pollution standards are quickly realised. A regulatory approach is thus likely to be the most effective way of reducing this externality.

As can be seen in Table 9, the contribution of heavy commercial vehicles to water quality, water quantity and noise externalities are minor compared to air pollution. Those particular externalities are not considered further in this report.

6.6 Policy responses to externalities

Having identified an externality, there remains the question of what is the right way to deal with it.

An ideal approach is one that meets the following criteria: it addresses the externality directly, promotes an optimal level of the externality and encourages opportunities for lower cost abatement alternatives (Productivity Commission, 2006).

In the context of freight externalities, providing subsidies for one mode of freight over another does not meet these criteria. Subsidised products are likely to be over-consumed, which may actually increase the level of the externality. 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.

Similarly government ownership of a freight mode will not, of itself, meet the criteria. If the ownership is simply a means of subsidy, then the above considerations apply. Conversely if ownership is expected to achieve a commercial return, then commercial imperatives may lead to actions that would have the effect of increasing the externality. An example would be competing for business that could be handled by a different mode at a lower level of externality.

Having one mode in government ownership compromises the government's ability to act as a fair broker forcing each mode to internalise the cost of the externality.

6.7 Externalities summary

The situation for rail has not changed materially since the 1999 assessment of ISCR. Greenhouse gases have emerged as a significant issue, but that issue is best handled though the emission trading

⁵¹ LCV = light commercial vehicle; MCV = medium commercial vehicle, HCVI = heavy commercial vehicle with three or four axles; HCVII = heavy commercial vehicle with more than four axles.

⁵² "Water quantity" refers to the costs of dealing with water run-off from roads.

scheme or tax rather than rail-specific policy. The network is now ten years older and evidence suggests that it is more run down, as was expected in 1999.

Externality	Effect of rail	Best addressed via
Economic development	Likely to be zero	Not addressed in this report
Greenhouse gas emissions	May be positive	Carbon tax or emissions trading scheme
Congestion	Mixed. Positive effects already internalised to some extent.	Commuter rail subsidies (as at present) and road congestion charging
Accidents	Unclear. May be positive.	Regulation and increased user charges
Air pollution	Positive but economically small	Regulation

Table 10. Summary of transport externalities.

The externalities considered in this Section are summarised in Table 10. They either relatively small or best dealt with via other mechanisms. Taken together, they do not offer a significant offset to the negative contribution to New Zealand’s economic performance by the existing rail network.

The difficulties in the measurement of externalities led Glaeser and Gottlieb (2008) to conclude that transport infrastructure should be decided on the basis of its primary benefits and not externalities. That advice seems appropriate in this context.

7 Is the future for rail a break with the past?

In previous sections it has been established that the current rail system is uneconomic, performance is unlikely to be improved by changes in governance and ownership and that the externalities from rail do not provide a compelling case for its retention. It may, however, be the case that rail should be retained if future conditions are likely to be significantly different from those in the past, and those likely future conditions create an environment which favours rail.

This section examines two viewpoints advocating the retention and expansion of rail. The views examined are the Government's justification for the repurchase in July 2008 and the National Transport Strategy from 2008.

7.1 Government justification for the repurchase of rail

Sir John Templeton warned that the four most expensive words in the English language are "it's this time it's different" (Parkman, 2006). That seems to be underlying message in the justifications for the government's re-nationalisation of rail.

At the launch of KiwiRail in July 2008, Prime Minister Helen Clark gave the following reasons for the repurchase:

- "The rail system needs major investment so that it can play a growing role in our transport system"
- Increasing fuel prices ("the price of a barrel of oil reaching an historic US\$142")
- Reducing fuel consumption ("rail is 4x more efficient than trucks")
- Climate change
- Reducing congestion on roads
- Total freight movements are expected to double by 2040
- "Building a more sustainable New Zealand" (Clark, 2008)

Climate change and congestion are covered as externalities in Section 6. "Sustainability" is assumed to be covered by the other points. The remaining points are considered in this sub-section.

7.1.1 Need for major investment ... to play a growing role

The analysis in this paper draws attention to the fact that rail needs major investment in order to survive. Priority capital expenditure projects totalling \$2.63bn have been identified for the next five years (KiwiRail Group, 2008). The focus of these projects is the rehabilitation and replacement of "life-expired" assets. The investment levels required to achieve a "growing role" have not been quantified, but can only be assumed to be significantly greater.

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 significant regulatory interventions (e.g. the government regulation that restricted road freight in the 1930s to 1980s), or extreme (and persistent) price shocks, very high levels of investment may be required to achieve minor growth in modal share.

7.1.2 Increasing fuel prices

Taken in the context of Clark's other statements, "increasing fuel prices" is actually a reason why the government's purchase was *not* required. If rail is as fuel-efficient as Clark claims, then it should gain a significant cost advantage over road as fuel prices rise. Private-sector rail owners will therefore receive the desired price signals and respond by making major investments in rail.

With the benefit of hindsight, the 1 July 2008 price of US\$142 a barrel was very close to the all-time peak of US\$147 reached later that month. The price subsequently dropped to below US\$34 in January 2009 (“Oil Prices Hit US\$34 a Barrel,” 2008) and is now around US\$50 (April 2009). Oil prices can be expected to remain volatile but it appears unlikely that they will return to the US\$142 level in the short-to-medium term.

If New Zealand rail is indeed more efficient than competitive road transport, then that efficiency should translate into a significant cost advantage for the rail operator. And that energy-efficiency cost advantage should increase as fuel prices rise. Real fuel prices have risen significantly since 1998 (as shown in Figure 18), so the cost advantage should have increased over the same period. Such an effect is not apparent in the comparison of road and rail transport in Figure 19, in fact the cost-advantage gap between rail and road appears to have narrowed as fuel prices have increased.

Figure 19 suggests that the energy-efficiency cost advantage of rail is at most 2-3% of operating costs.

A cost advantage should also translate into a profit advantage. The change in wholesale diesel prices between 2007 and 2008 was 18% – a substantial cost increase for transport operators. As an integrated operator, Toll NZ was in a position to be able to shift freight towards the most fuel efficient mode (subject to capacity constraints) and translate this into a profit advantage. It would therefore be reasonable to expect that Toll NZ’s rail operations would be more profitable, their truck operations to be less profitable and their overall profitability to increase. However this expected pattern is not apparent in the data (see Table 11). As the increments are small and the data is limited⁵³ this analysis is not conclusive, but it provides no support for a strong cost advantage effect.

EBIT (A\$m)	2007	2008	% change
Rail and ferry operations	52.0	56.0	8%
Trucking and logistics operations	7.3	9.4	29%
Total	59.3	65.4	10%

Table 11. Toll NZ EBIT for 2007 and 2008.

(Source: Toll Holdings Limited, 2008b)

The evidence for a significant cost advantage for rail in New Zealand based on fuel efficiency is thin. A possible reason is that current rail operations are a lot less fuel efficient than their potential, because, for example, the locomotive fleet is old and inefficient (KiwiRail Group, 2008).

If fuel prices did increase substantially in the future and that increase translated into an extra cost burden on road transport, then that burden may not be an unambiguous benefit for rail. Australian modelling suggests that the dependencies of rail transport on road means that an extra charge on road transport would lead to a general lowering of the level of all transport, which would affect rail adversely as well (Productivity Commission, 2006).

⁵³ This analysis was limited to two financial years as they are the only years for which disaggregated EBIT data for Toll NZ is publicly available.

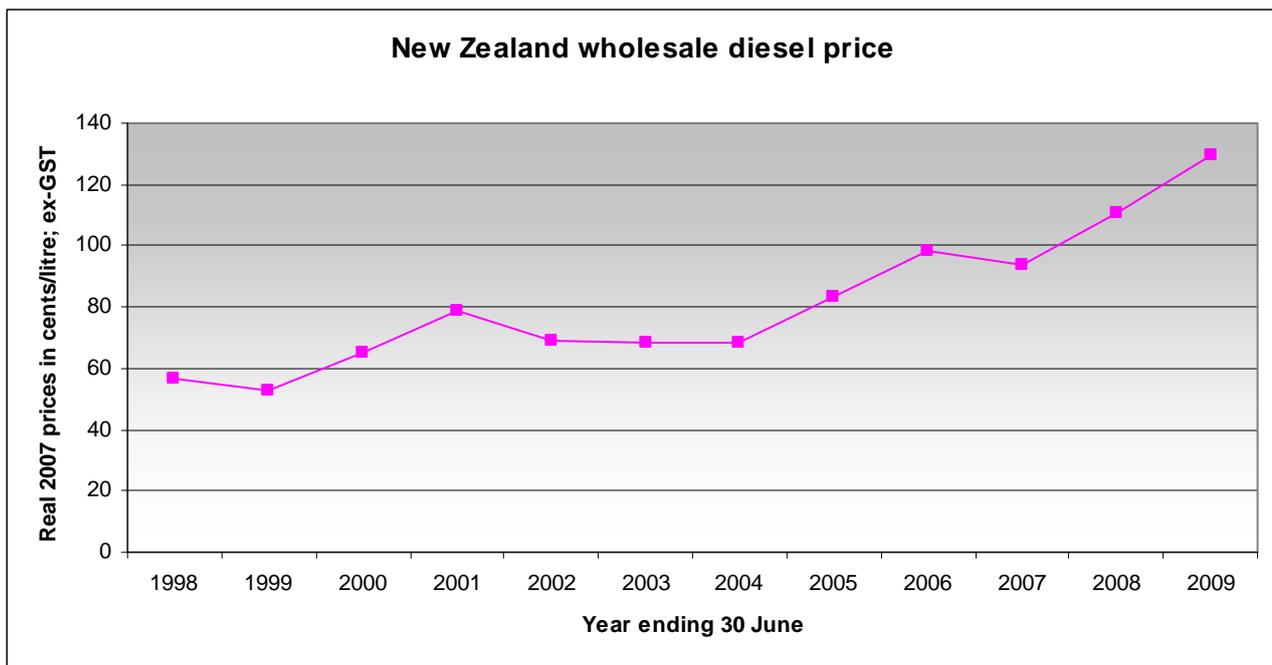


Figure 18. Wholesale diesel prices (real 2007 prices)⁵⁴.
(Source: Ministry of Economic Development, n.d.)

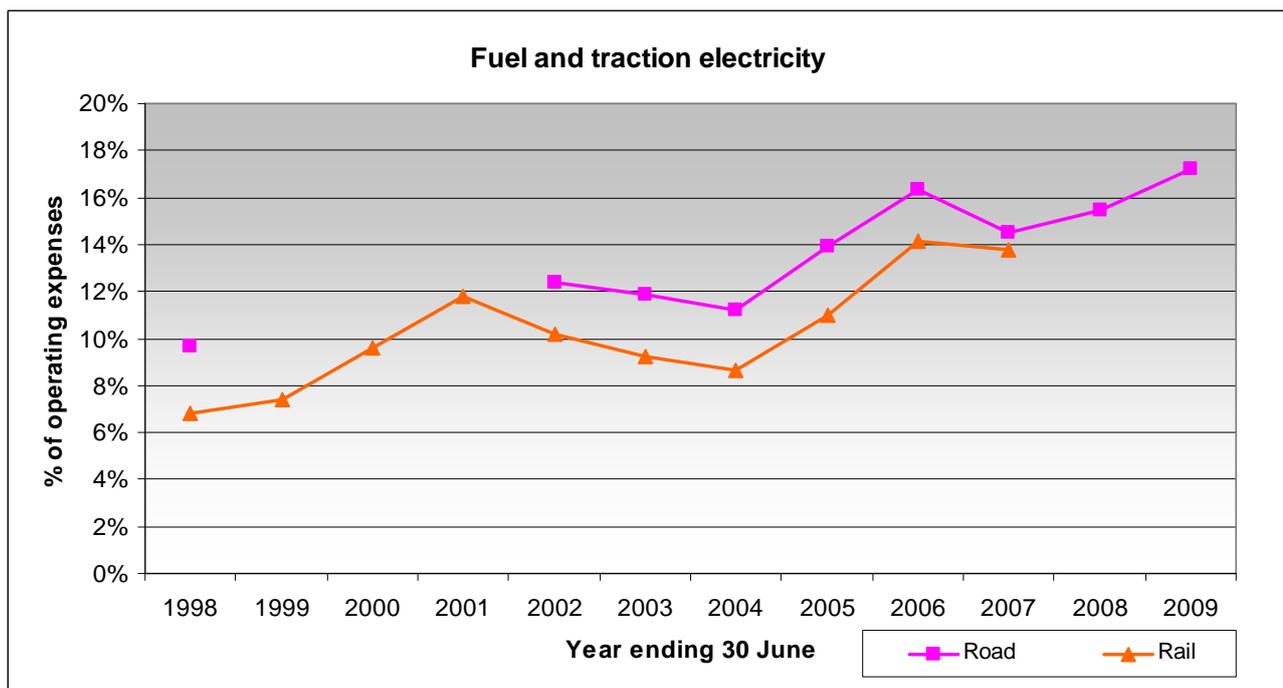


Figure 19. Proportion of operating expenses spent on fuel and traction electricity.
(Source: Tranz Rail and Toll NZ annual reports and RTFNZ/Deloitte Index)⁵⁵

⁵⁴ Note that the 2009 figure is based on the MED September quarter figures supplemented with October and November 2008 price data from RTFNZ.

⁵⁵ The 'road' figures are based on the trucking operations of road transport operators. Other activities such as warehousing are excluded. Road figures for 1998, 2002 and 2009 are for partial years. The 'rail' figures relate to the whole operations of Toll NZ (and its predecessors) which aggregate rail, trucking and ferry operations. The aggregation of trucking operations should have nil effect on the comparison, as Toll's trucking operations can be assumed to have the same characteristics as other road transport operators. The aggregation of ferry operations could be expected to lower the proportion reported for 'rail' as coastal shipping operations are understood to be more fuel efficient than rail. The actual difference between road and rail is therefore likely to be less than the 2-3% indicated.

7.1.3 Reducing fuel consumption

As transportation fuel use is roughly proportional to greenhouse gas emissions it makes sense to group these two issues. It should be understood is that the limiting factor for fossil fuel usage is not the scarcity of supply. The scarce resource is the ability of the biosphere to absorb the by-products of burning fossil fuels⁵⁶. Broad strategies that reduce greenhouse gas emissions will have the side-effect of reducing transportation fuel usage. The reduction of greenhouse gas emissions is considered in Section 6.2.

7.1.4 Total freight movements are expected to double by 2040

Richard Paling Consulting (2008) predicts a 70% increase (by weight) in rail transport from 2007 to 2031, with growth being concentrated in the Auckland, Waikato, Bay of Plenty and Canterbury regions. The increase is dominated by bulk commodities. It predicted that the modal share of rail would fall slightly over this period. Richard Paling Consulting factored in the effects of an emission trading system and rising fuel prices. It is important not to account for those effects twice.

Their freight growth forecasts may turn out to optimistic: for example they forecast a 35% increase in coal transport over a period where the world is expecting to cut back on coal usage due to greenhouse concerns.

If such an increase did occur, then it would create significant additional traffic on parts of the rail network. This would help those parts become more economic, and might improve the viability of some currently economically unviable lines. But given the regional concentration of the forecast growth is in the regions where rail already has its highest freight volumes; it is reasonable to expect minimal effects on marginal lines outside those regions.

The forecast increase in freight movements bolsters the case for the retention of some rail, but does nothing for the case for retention of the extant rail network. Given that existing lines will require significant upgrading to cope with increased freight volumes, it becomes more important that infrastructure spending is focused rather than dispersed.

Richard Paling Consulting (2008) did not examine the cost of providing infrastructure to service the forecast increased demand. It is not necessarily the case that investment in rail would be more desirable than investment in other modes of transport. This is most appropriately judged on a case-by-case basis.

7.2 National Transport Strategy

The National Rail Strategy to 2015 (Ministry of Transport, 2005a) and domestic sea freight strategy (Ministry of Transport, 2008d) are parts of the government's National Transport Strategy (Ministry of Transport, 2008a). A focus of these strategies is achieving modal shift in order to achieve national energy efficiency and environmental goals. The two key freight targets are to:

- increase coastal shipping's share of inter-regional freight to 30% of tonne-kilometres by 2040; and
- increase the rail share of freight to 25% of tonne-kilometres by 2040.

The National Transport Strategy contains no targets to improve the efficiency of any mode. By implication, gains in energy efficiency are only available (or best achieved) by substitution between

⁵⁶ The Earth has fossil fuel reserves containing about 5000 Gt of carbon (Raghuvanshi, Chandra, & Raghav, 2006). This should be compared with about 765 Gt currently in the atmosphere, and the current rate of fossil fuel burning of 5 Gt/annum. Burning all fossil fuel reserves would increase atmospheric carbon levels by a factor of four to eight (Kasting, 1998). The adverse effects of such an increase substantially exceed the effects attributed to today's commonly discussed climate change scenarios. It is not the supply of fossil fuels that is scarce; it is the ability of the biosphere to absorb the extra carbon.

modes. The strategies contain no arguments to support this contention. It is reasonable to ask whether modal shift on this scale is a desirable and feasible policy mechanism to achieve the Strategy's goal.

7.2.1 Is modal shift desirable?

A strategy to improve overall energy efficiency by moving a freight task T from mode A to a mode B, where mode B is on average more energy efficient than A, relies on three key assumptions:

1. That T is technically contestable, i.e. both modes A and B are inherently suited to the task;
2. That T is commercially contestable, i.e. both modes meet customer requirements and are cost-competitive for the contested task; and
3. That the actual energy use of mode B for carrying T is less than the actual energy use of mode A for the same task.

These assumptions are only likely to hold for a small proportion of the freight task. The transport of many commodities is not technically contestable. There are good reasons why coastal shipping and rail are unsuitable for the transport of aggregate, wet concrete, livestock, courier movements, logs from the forest and liquid milk from the farm gate⁵⁷.

Modal shift also relies on commercial contestability. While direct subsidies can be used to encourage modal shift⁵⁸, they are unlikely to be cost-effective unless the target mode is already close to meeting customer requirements and being cost-competitive.

Even if the criteria of technical and commercial contestability are met, the third assumption is still critical. The first danger here is to assume that the modal averages apply at the margins. A second danger is to assume that the marginal values for small modal shifts will also apply to large modal shifts.

These dangers can be understood using the abstract model presented in Figure 20. For freight haul distances less than D_1 , road has the lowest energy use, and is therefore the most efficient mode. Similarly for distances greater than D_2 , coastal shipping is the most efficient. Rail is most efficient for distances between D_1 and D_2 .

If energy cost was the dominant cost factor and all freight was technically and commercially contestable, then it would be expected that road would capture all freight tasks for which it was most efficient (i.e. all distances less than D_1) with an average energy use of $Road_{av}$. Similarly rail and coastal shipping would capture the tasks for which they are most efficient, with corresponding average energy uses.

In this model a small modal shift has little impact on overall energy use. The tasks near distances D_1 and D_2 have similar energy use for the two competing modes. If rail takes over a single task from road then it is not the case that the energy use of the shifted task will suddenly jump from $Road_{av}$ to $Rail_{av}$. Instead, $Road_{av}$ will increase very slightly as road has lost a task with a lower energy use than $Road_{av}$. $Rail_{av}$ will also increase very slightly as rail has gained a task with a higher energy use than $Rail_{av}$.

For large modal shifts the situation is more problematic. If rail appropriated a large portion of tasks currently serviced by road, then it would be servicing those tasks at a higher energy use than could road. Both $Road_{av}$ and $Rail_{av}$ will increase significantly, and overall energy use will climb.

⁵⁷ These commodities alone account for approximately one-third of the New Zealand freight task (Richard Paling Consulting, 2008, Table 3.70).

⁵⁸ E.g. a \$1m subsidy granted in 2009 to shift road-freighted logs to trains funded from the National Land Transport Programme (Churchouse, 2009).

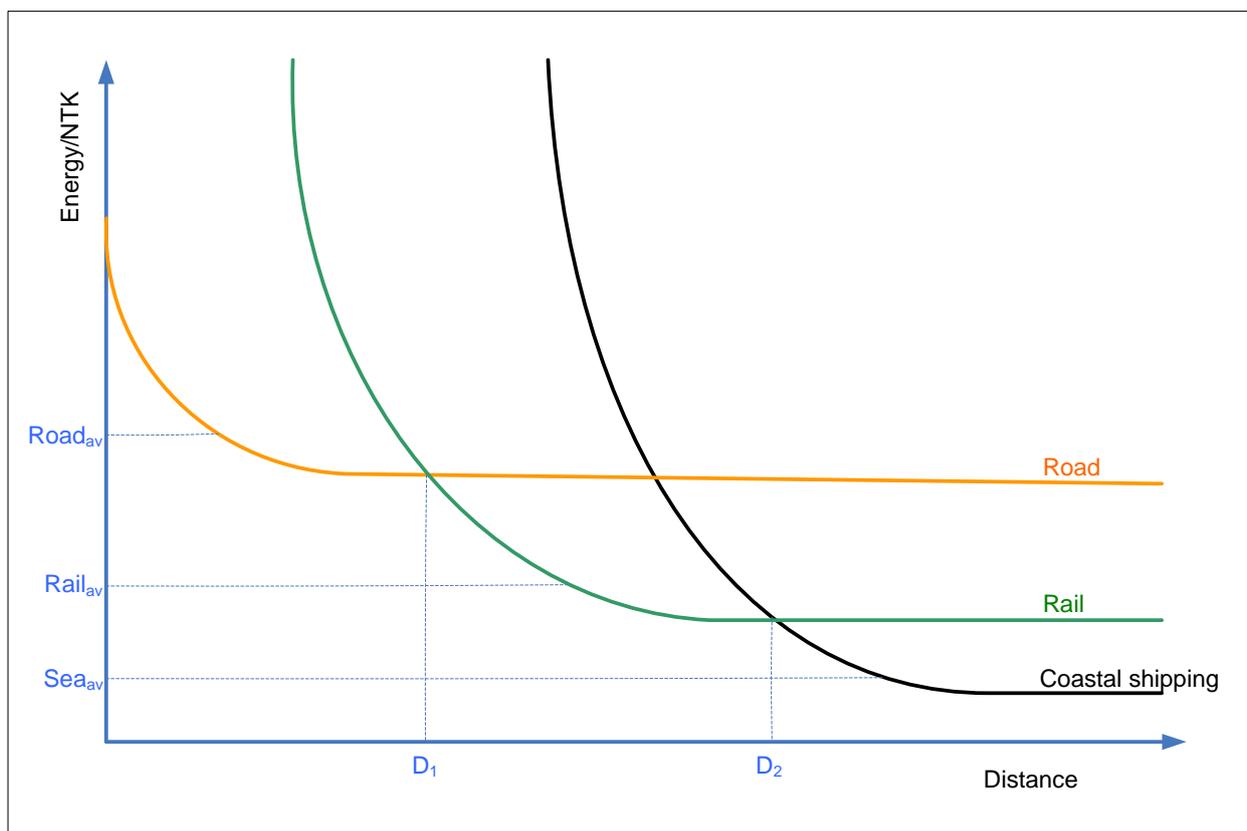


Figure 20. Theoretical energy use with increasing freight distance.

It is apparent that modal shift strategies to reduce energy usage will only be successful if:

- the tasks actually shifted between modes are not already being transported by their most efficient mode; and
- a significant proportion of the task is technically and commercially contestable.

There is strong evidence for modal sorting of freight based on haul distance and energy use in New Zealand, as can be seen in Table 12. This provides support for the application of the abstract model, and the inference that, to a significant degree, tasks are already being transported by their most efficient mode.

Mode	Average haul (km)	Average energy use (MJ/NTK)
Road	90	2.92
Rail	285	0.72
Coastal shipping	952	0.36

Table 12. Average modal freight haul lengths 2006/07 and average modal energy use 2003. (Source: Richard Paling Consulting, 2008; Ministry of Transport, 2005a)

The next section looks at whether the modal shift targets in the National Transport Strategy are actually feasible.

7.2.2 Are the modal shift targets feasible?

Road's current share of the freight task is 70% of tonne-kilometres. Even if the National Freight Strategy modal shift targets are achieved road will still be transporting 45%.

The modal shift required to achieve these targets is significant. The targets are also contradictory as the nature of coastal shipping means that it largely competes with rail rather than road (see Table 3).

For coastal shipping to increase from its present 15% of the freight task to 30%⁵⁹, it will need to appropriate the entire current freight task serviced by rail. This would leave rail in a difficult situation. It would need to appropriate a 15% share from road to maintain its present position and then attract an additional 10% to meet its target. This requirement is depicted graphically in Figure 21.

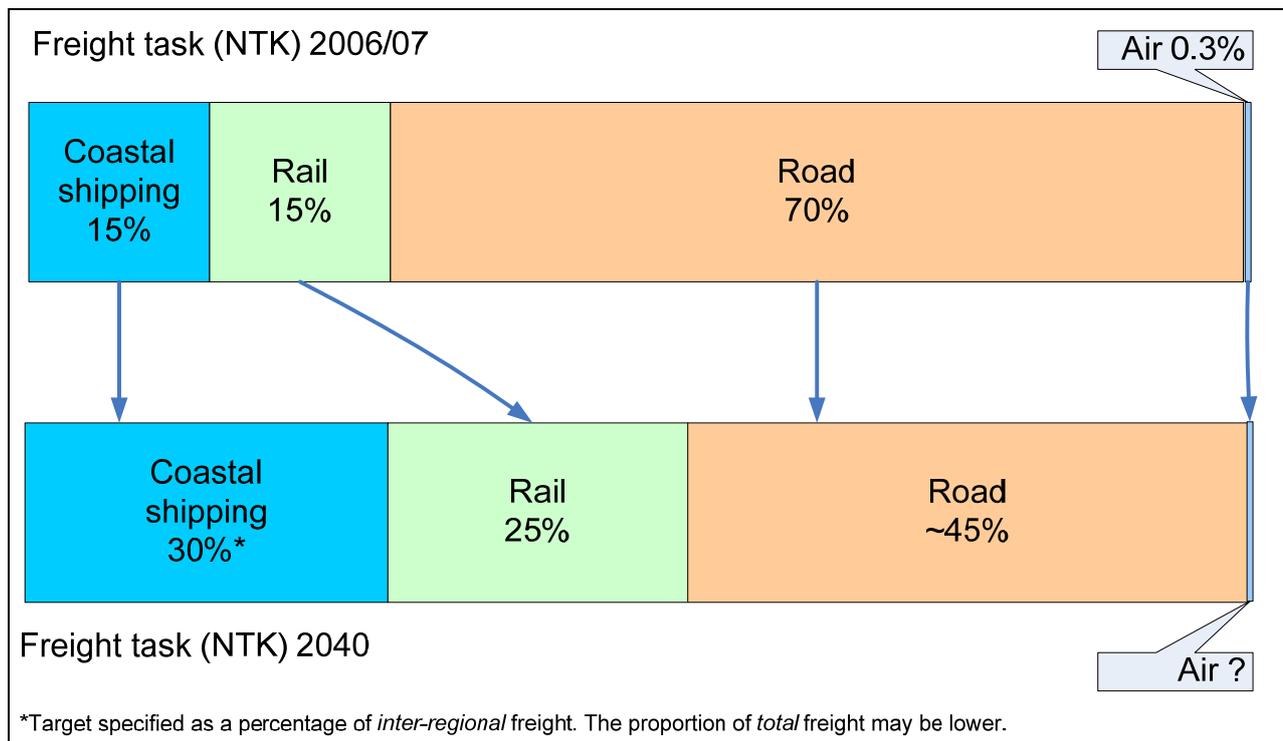


Figure 21. Modal shift required by the National Transport Strategy.
(Source: Ministry of Transport, 2008a; Richard Paling Consulting, 2008)

The two targets are logically incompatible, and are likely to be a consequence of rail and shipping strategies being created separately and combined into a single “integrated” national strategy without consideration of compatibility.

Even assuming that coastal shipping fails to increase its modal share, rail would be unlikely to reach its own target. The problem is that relatively little freight is contestable between rail and road. Mackie et al. (2006) estimate that only 3-7% of the current road freight task is currently contestable by rail. They thought it unlikely that the modal share of rail could increase above 20% without revolutionary changes in the way that freight is transported. Richard Paling Consulting (2008) forecast the modal share of rail to fall slightly between now and 2031, even with an emissions trading system in place which may favour rail transport over road.

The targets are not viewed as realistic within the transport industry. KiwiRail Group describes the National Transport Strategy rail targets as “ambitious” and “unlikely to be attained” (KiwiRail Group, 2008, p. 4). They note the coastal shipping targets are “in conflict with those set for rail” (p.26). Richard Allen of Pacifica Shipping describes the coastal shipping target as “extremely challenging” (Allan, 2009). Tony Friedlander of the Road Transport Forum notes that the modal share of rail actually fell between 2000 and 2007 and that a reality check is needed on the modal targets (Friedlander, 2009).

⁵⁹ There are some slightly different units being used here. Coastal shipping currently has 15% of the *total* freight task (Richard Paling Consulting, 2008) but the National Transport Strategy target is specified as 30% of the *inter-regional* freight task. Given that inter-regional freight is the great majority of the total freight task (as inter-regional distances are longer than intra-regional ones) the simplifying assumption has been made that the inter-regional freight task and the total freight task are the same. The argument presented does not rely on this assumption.

7.2.3 The failure of integrated transport planning

The National Transport Strategy's modal shift targets appear to be both infeasible and undesirable. It does not appear to be an effective strategy to address the climate change challenge "to halve per capita domestic greenhouse gas emissions from transport by 2040" (Ministry of Transport, 2008a, p. 2). Rather than set modal targets without understanding the likelihood of their achievement, nor the consequences of actually doing so, government would preferably focus on instruments such as carbon taxes to internalise the costs of negative externalities and encourage the modal allocation that achieves greenhouse gas emission reductions at least cost.

Schöller-Schwedes (2009) describes the long history of integrated transport policy formulation in Germany and notes its repeated failure to influence transport development. "Against the background of historic experience it is certainly questionable whether an integrated transport policy is feasible" (p.11). This is worthwhile question for debate in a New Zealand context.

7.3 Summary

The physical characteristics of rail transport offer energy efficiency and environmental advantages over road transport. Within a future scenario of increasing demand for freight, increasing fuel prices, increasing road congestion and greenhouse emission constraints, modal shift from road to rail appears to be an attractive proposition. Large-scale modal shift has been elevated to a key target of the government's National Transport Strategy; however the Strategy is strangely silent on how a shift of this magnitude is to be achieved.

Against the reality that modal shift is moving in the opposite direction – from rail to road – the government's diagnosis would appear to have been that the underlying problem was underinvestment in rail, a problem best solved by public ownership.

An analysis of the modal shift targets in the National Transport Strategy suggests that they are infeasible. They could only be achieved at the cost of decreased efficiency, and quite likely an increase (rather than the desired decrease) in total fuel use and greenhouse emissions.

The problems that government ownership was meant to fix are better dealt with via other policy means. Increased fuel price will naturally lead to increased private investment in energy efficiency without any requirement for government intervention. Road congestion may be better addressed via congestion-based pricing or specific road infrastructure investment. An emissions-trading system will encourage least-cost greenhouse gas abatement – an outcome that could be undermined by over-investment in rail.

Private sector under-investment in rail is best seen as a rational outcome of the economic and physical characteristics of rail and the competition it faces in New Zealand, rather than an ownership issue.

The assumption that the future will be a break with the past allows decision-makers to ignore history. In this case such an assumption appears unwarranted. History suggests that the role of rail in New Zealand is contracting to the small number of tasks at which it excels. The following Section examines some alternative futures.

8 Options for the national rail network

Commuter passenger services in Auckland and Wellington are logically independent of freight services (see Section 3.2.4). They have few operational and infrastructure synergies with freight and their viability and future should be assessed separately.

For freight and long-distance passenger operations, the available options for the national network are to:

- Expand;
- Maintain current extent;
- Prune (close further branch and spur lines);
- Segment (retain isolated, viable sub-networks); and
- Abandon.

At the present time there are no serious proposals in the public domain for significant expansion of the network. The National Rail Strategy (Ministry of Transport, 2005a) is to maintain network and allow for limited expansion; however the Strategy does not provide enough resources for this to occur.

Extensive network pruning in the 1950s to 1980s was insufficient to achieve economic viability for the remaining network. Some further pruning is possible, but at some point pruning will lead to segmentation.

The three options considered below are to maintain the network at its present size, reduce it to a (segmented) economically-viable core, and to abandon rail.

8.1 Maintain the network at its present size

The Rail Development Group (RDG) presented its reports containing recommendations for the operation of rail under public ownership in August 2008 (Rail Development Group, 2008a, 2008b, 2008d, 2008c).

At the core of their reports is the choice between two different futures for rail:

- A pure commercial model operating on a 1500km network; and
- A non-commercial model with continuing government subsidies operating on the entire current 4000km network.

The recommended approach is the non-commercial model where the government purchases non-commercial services from KiwiRail. The services purchased are commonly called a “community service obligation” (CSO). CSOs in railways are an old concept: railways in Victoria were receiving payments for non-commercial services as long go as 1896 (Wills-Johnson, 2006a). The State-Owned Enterprises Act provides for CSOs, and ONTRACK has been the recipient of CSO payments of around \$4m p.a. for non-commercial activities over the past few years. The proposed subsidy levels for the KiwiRail Group are reproduced in Table 13. These proposals are in addition to operational subsidies and planned capital works programme for urban commuter services.

Item	2009	2010	2011	2012	2013
Crown operating subsidy revenue	90	92	95	97	99
Upgrades (growth + catchup)	93	153	206	161	151
Total subsidy	134	201	266	243	235

Table 13. Proposed (non-commuter) subsidies 2009-2013.

(Source: Rail Development Group, 2008c, p. 4)

These subsidies are to allow the KiwiRail Group to deliver the outcomes listed in Figure 22.

- a) Freight:
- i) Baseline
 - (1) **A national network: all lines open** with regular rail ferry services, most of the time;
 - (2) **Services on all lines, at least weekly;**
 - (3) **Achieve modal shift to rail from road (as opposed to rail to and from coastal ship**, other than at the margin), prioritised according to the value of taking incremental traffic off roads in various corridors (for example shifting NTKs to rail in Auckland-Tauranga are likely to be more valuable than NTKs in Southland in terms of **avoided roading costs**).
- b) Passenger Metro:
- i) Substantial increase in Auckland as per the Rail Development Plan from the ARC and ARTA, resulting in a reducing per head contribution from taxpayers;
 - ii) Moderate increase in Wellington as per the GWRC rail upgrade plan;
 - iii) Other commuter services as commercially justified or as supported by NZTA;
- c) Long distance passenger:
- i) Domestic and international tourist services on Christchurch – Greymouth, Christchurch – Picton and Wellington – Auckland;
 - ii) Other services as commercially justified;
 - iii) Non-scheduled heritage train services at a similar level to today at minimum cost;
- d) Passenger, car and commercial vehicle movement across Cook Strait to continue to be purely commercial; and
- e) State sector level of compliance – assets, processes and systems in proper state.

Figure 22. Desired non-commercial outcomes.
 (Source: Rail Development Group, 2008c, p. 3) [emphasis added]

The RDG used three main arguments in favour of the non-commercial model:

- The government’s policy outcomes will not be achieved without subsidies;
- Avoided roading costs (due to modal shift); and
- Network economics dictates that closing lines will shed revenue faster than it sheds cost.

This subsidised non-commercial model and the arguments used to support it have significant flaws.

Firstly, there is nothing special about the current extant network. It is nothing more than the result at one point in time of the historical interplay of political and economic forces. The assumption that the public is best served by paying to freeze the network at its 2008 size is not backed up by any hard analysis. A subsidised line carrying one train per week cannot be providing much in the way of a community service. It is highly unlikely to avoid any roading costs. Nor is it likely to contribute meaningfully to any modal shift. The environmental costs of maintaining and renewing the line are likely to significantly outweigh any environmental benefits due to its operation. And persisting with operating the line has an opportunity cost, e.g. the railway corridor land is unavailable for other productive purposes.

Secondly, their analysis of network economics is self-contradictory. If, as claimed, closing lines will shed revenue faster than it sheds costs (Rail Development Group, 2008b), then it logically follows that every network size smaller than the extant network will be less profitable than the current size. This is not consistent with the assertion elsewhere in the reports that a smaller network (of around 1500km) is commercially viable. The authors may have confused economies of size with economies of density. As discussed in Section 3.1.1, while rail exhibits strong economies of density, there is a lack of empirical evidence for economies of network size. Subsidies with the aim of protecting network size will act to reduce network density and therefore reduce potential returns due to economies of density.

Thirdly, the RDG are cherry-picking with regard to government policy. They state “rail can operate in a commercial model, though in doing so it will not meet the needs of the New Zealand Transport Strategy” (Rail Development Group, 2008d, p. 4). But the recommended non-commercial model for rail is also at odds with the NZTS. Modal shift towards coastal shipping, also a part of the NZTS, is seen as a competitive threat to be neutralised. Increased energy efficiency and removing trucks from the roads is presented as a positive, but only in so far as it benefits their arguments in favour of retaining rail. The RDG and KiwiRail Group (2008) view the current trials of 50-tonne trucks as a competitive threat and suggest those trials be curtailed. However, 50-tonne trucks would improve energy efficiency and reduce the number of trucks on the road – outcomes consistent with the NZTS.

The proposals by the RDG are an echo of the situation that applied from the 1930s to the 1980s, where rail was protected from competition in order to meet goals that did not necessarily align with the national interest in social and economic performance.

The RDG’s recommendations elevate the running of one train service a week on all lines in the extant network to a national goal, to be achieved regardless of the nation’s productivity, economic costs or environmental goals. These recommendations are not in New Zealand society’s interests.

8.2 A commercially-viable subset

Further pruning is almost inevitable, but at some point closing parts of the main trunk lines needs to be considered. The main trunk lines are not necessarily essential to the network, as indicated by the fact that rail operated for the best part of a century before the trunk lines were completed.

In 2006/07, 30% of the network (Auckland, Waikato, Bay of Plenty, Canterbury and West Coast) carried 70% of freight⁶⁰. These are also the areas with the majority of future predicted increases in demand (Richard Paling Consulting, 2008). This should form the ‘viable core’ of the future rail network. The South Island Main Trunk from Canterbury to Otago (and possibly Southland) could also be viable.

Tranz Rail’s 2002 review of its uneconomic lines recommended closing 41% of lines. The basis for this analysis was that every line segment should cover its long-run costs (Rail Development Group, 2008c).

Toll’s “Plan B” was to segment into three sub-networks (Cullen, 2008a). The North Island Main Trunk would have been cut between Palmerston North and Hamilton, and the South Island Main Trunk shortened by eliminating the segment between Picton and Christchurch. The rail ferries would have lost their role in transporting trains. Plan B would have shortened the network to about 2000km, half its present length.

The Rail Development Group concluded that only 1500km of the network was commercially viable (Rail Development Group, 2008b).

There appears to be a consensus that a commercially viable rail operation is possible at a network length between 1200 and 2000km. The viable core is unlikely to include the Picton to Christchurch line. Closing this line will improve the viability of coastal shipping on routes other than Wellington–Picton. Coastal shipping from Auckland and Wellington direct to Christchurch is very likely to be more environmentally friendly than the present rail/ferry and intermodal options. The Interislander business will no longer be integrated with rail and should be separated out and sold.

⁶⁰ The freight density of this subset of the network is approximately 2.3 million tonnes per track kilometre, significantly better than the density of the remaining parts of the network: 0.4 million tonnes per track kilometre. See Figure 8 for an international comparison.

The costs of keeping the network larger than the viable core include:

- Ongoing operating subsidies paid by taxpayers and an efficiency cost to society.
- Ongoing capital expenditure on uneconomic lines (a capital subsidy with analogous implications to operating subsidies).
- As capital for rail upgrades will be limited, spending on uneconomic lines will entail less than optimal capital expenditure on viable lines. This will reduce the future economic and environmental potential of the core network.
- Subsidised services on uneconomic lines will operate with smaller loads and older, inefficient locomotives. They are likely to operate at a net environmental cost compared with substitutes.
- Missed opportunities to utilise the salvage value for social benefit, e.g. parts of the rail corridor for roading.

It would appear that a commercial viable subset of the existing network exists. Moving to such a subset is an economically sensible goal.

8.3 Abandoning rail

Completely exiting rail would be more economically desirable than the present situation. However there may well be tasks and sections of track that are economically viable.

8.4 Recommendations

Future policy needs to concentrate on the strengths of rail. Its primary role is and will remain the point-to-point transport of large quantities of bulk goods and processed products. Rail should integrate with, rather than duplicate, coastal shipping routes and state highways.

A viable subset of the network would seem to be available. It will probably be around 1500-2000km. Line closures and land sales in other areas could fund upgrading of the core network to 21st century standards.

The potential environmental and economic advantages of rail will only be realised on heavily-used lines.

The aim should be to move to a smaller network in an economically efficient manner.

Rigorous economic and environmental accounting should be applied to planned changes to the Wellington and Auckland commuter rail networks. Rail has a role to play, particularly to reducing congestion in Auckland, but its potential benefits should not be overstated.

9 Conclusion

The economic performance of rail has been poor for almost a century. To echo ISCR (1999b), the history of rail in New Zealand has been one of enormous taxpayer and social cost entailed in retaining rail. This situation is the same in 2009. Rail has been costing the taxpayer hundreds of millions of dollars a year and under current plans, will continue to do so for the foreseeable future.

The issue is not just the current state of the rail system. Rail has had a net social cost for at least 50 years, soaking up resources that could have been diverted to other, more productive uses. Without that drain on social welfare, New Zealand might today have vastly improved roads, hospitals and other infrastructure.

Given the poor productivity and economic performance of rail in public ownership, private ownership should have been in the public interest. The proper response by a private owner to the economic situation of rail was to increase productivity where possible, and where this was insufficient, to rationalise services and reduce the scale of the network.

The retention of land ownership by the Crown muted private incentives to rationalise the network. However the main obstacle was government intervention. It is apparent that the political considerations which motivate governments to intervene were not diminished by privatisation.

The prediction of ISCR (1999b) that appropriate decision-making was more likely with rail in private ownership did not eventuate, although the productivity of rail improved for the period. Surprisingly, the public owners of rail were much more successful at network rationalisation between 1952 and 1992 than the private owners between 1993 and 2008.

A future re-privatisation of rail is unlikely as a government could not now credibly commit to non-interference in the operation of a privatised railway. Remaining options for changes to governance or ownership are unlikely to offer any substantial improvement in performance. Rail is over-valued and can be expected to under-perform in government ownership.

There are some positive externalities associated with rail. Greenhouse externalities are best dealt with via a carbon tax or equivalent emission-trading system which should drive an optimal modal allocation at least overall cost. Such a system should create incentives for the right infrastructure investments. In contrast, modal shift such as that envisaged by the New Zealand Transport Strategy risks moving tasks onto transport modes at which they are not naturally efficient, potentially increasing both overall emissions and social costs.

The externalities of rail examined were relatively small in magnitude and/or best dealt with using other economic instruments. These externalities do not justify having the current rail network. The re-nationalisation of the rail network was not a necessary, nor an ideal, strategy for their abatement.

Other arguments for the retention of the network in its present form are unconvincing. As the evidence for a significant cost advantage for rail in New Zealand based on fuel efficiency is thin, railways cannot be expected to improve their competitiveness in response to increased fuel prices. The retention of lightly used lines has some option value, but that option value may well be exceeded by the costs of their retention. A source of concern is that the retention of such lines will divert resources from the parts of the network where demand might increase in response to infrastructure investments.

Arguments based on “network effects” are misleading – economies of density apply to rail systems and these improve in response to the closure of uneconomic lines. The national rail network was fragmented between 1863 until 1962. There is no logical reason why a fragmented network is not the

best configuration for the 21st century. The network has evolved in response to competition and demand in the past and should continue to do so in future.

Some changes in the future transport environment can be reasonably predicted. These are unlikely to favour rail overall. Achieving a viable future for rail will involve concentrating on the strengths of rail and downsizing the network to an economically viable size. The potential environmental and economic advantages of rail can only be realised on a smaller, denser network.

While completely exiting rail would be more economically desirable than the present situation, such a move would not capitalise on the tasks and rail lines that may be economically viable. A viable subset of the network would seem to be available. It will probably be around 1500-2000 kilometres in length – less than half the present size. Line closures and land sales in other areas could fund upgrading of the core network to 21st century standards. The potential economic and environmental benefits of rail are most likely to be realised in this scenario.

Appendix 1 ONTRACK asset valuation

ONTRACK is a trading name of the New Zealand Railways Corporation, a State-Owned Enterprise (Crown Company Monitoring Advisory Unit, 2008). The principal objective of every SOE is to operate as a successful business (Crown Company Monitoring Advisory Unit, 2007).

In 2006-07 ONTRACK re-valued the rail network assets held, resulting in an increase of valuation from \$322m to \$10,647m (ONTRACK, 2007). Assets were previously valued at cost. They are now valued at “fair value” by an independent assessor. Though ONTRACK (2007) provides no explanation of “fair value”, Controller and Auditor-General (2008) explains that depreciated replacement cost (DRC) was used for rail network assets and fair value of adjacent land was used for the land under the network.

Further upward adjustments were made to asset valuations in 2007-08, resulting in a total asset valuation of almost \$12bn (see Table 14). The total is roughly equally split between land (\$6bn) and infrastructure (\$5.8bn).

Year ending	Asset book value				Income		Cash flow from operations
	Land	Infrastructure ⁶¹	Other	Total	Track access income	Grants	
2005	0	50	42	92	43	62	-9
2006	137	119	66	323	60	66	6
2007	4,963	5,658	175	10,647	66	125	11
2008	6,016	5,738	127	11,798	71	139	16

Table 14. ONTRACK asset valuations, income and cashflow, 2005-2008.
(Source: Annual Reports)

ONTRACK’s costs are the maintenance, renewal and upgrades to the rail network, and the operation of that network.

A1.1 Conflicting assumptions

From an economic perspective these two types of valuation should not be added as they rest on conflicting underlying assumptions.

DRC valuation assumes that the business is a going concern (RICS Valuation Faculty, 2007). Concomitantly, if trains are using the track network, then the land under that network is not available for the alternative uses that determined the value of adjacent land. If the policy intention is to keep the network at its present size and continue its operation for a long time into the future, then the value of the land is zero.

Conversely, valuing the land on the basis of alternative uses implies that the network will be shut down. In this instance the track network must be valued at its salvage value. Salvage value is likely to be small as most of the significant costs are sunk (e.g. on bridges, tunnels and embankments). Net salvage value may be negative once contractual obligations, severance costs and liquidation costs are accounted for.

This suggests that the maximum economic value of rail is \$6bn rather than \$12bn. If there is some probability of a shutdown then both valuations should be affected by this.

⁶¹ “Infrastructure” refers to the buildings and railway infrastructure categories in ONTRACK’s Annual Reports.

A1.2 Land valuation

In 2007 when the land was re-valued, Toll NZ held an 80-year right (with 63 years to run) for the operation of railways on the rail corridor land. This right was part of the Core Lease between the rail operator and the Crown created in 1990.

This encumbrance made the land effectively un-saleable to adjoining landowners — the only likely buyers — unless Toll voluntarily relinquished or the government landowner bought back these rights. Given rail land would not have been available for non-rail use until up to 63 years into the future, the value should have been based on the discounted value of that future use, rather than the current value of unencumbered adjacent land. Assuming a real interest rate of 3%, the discounted value would be approximately 15% of its current value⁶².

Recording the undiscounted value of land in ONTRACK's accounts ignored the existence of the Core Lease and created a misleading picture of the value of ONTRACK's assets.

The right to operate a railway on this land was repurchased by the government in 2008 along with Toll's rail and ferry operations, so railway land sales are now possible, and the 2007 valuation gains a (belated) measure of credibility. If rail network declines in size in the future, those rights may be the most valuable part of the government's \$690m purchase, as they have unlocked the value in the real estate.

However, it is doubtful whether the valuation as recorded can be achieved at sale time. Rail corridors are narrow, sometimes contaminated (e.g. Department of Environmental Protection, n.d.; Smith, Smith, & Naidu, 2006) and require substantial reinstatement costs. They will need to be broken into small parcels for sale. There are limited buyers for such parcels and in cases where rail crosses a single property there will be only one potential buyer who possesses substantial bargaining power. Net recoveries may be substantially below the total valuation.

On the other hand some rail corridors may have substantial value for other purposes, including communication corridors, cycle trails or roads. For example, the segment of the North Island Main Trunk crossing the volcanic plateau between Waiouru and Raurimu would make a very attractive cycle trail. Similarly, conversion of the rail corridor paralleling the Centennial Highway (part of State Highway 1 north of Wellington) into a second carriageway for the highway might contribute to a cheaper alternative to the proposed \$1bn Transmission Gully inland route.

A1.3 Infrastructure valuation

Another question is whether DRC is an appropriate valuation method for the network infrastructure. The International Valuation Standards Committee guidelines for applying DRC suggest its use only when the market value cannot be otherwise reasonably determined (IVSC, 2005). A market value for the network now owned by ONTRACK was established when it was purchased 3-5 years before the revaluation for a price of \$81m⁶³. While it could be argued that this was not the "market value" due to bargaining power on the part of the State, no explanation is forthcoming in ONTRACK (2007) as to this discrepancy.

A1.4 Adequate profitability test

A further question is whether DRC has been correctly applied. According to the International Valuation Standards Committee guidance note:

⁶² Looking at the past 63 years, reasonable values for a real interest rate fall in the range of 2-4%. The discounted value would be 29% of the current value using a real interest rate of 2%, or 8% with a real interest rate of 4%.

⁶³ \$81m paid for the Auckland track network in 2002 and \$1 paid for the remaining network in 2004.

“When an asset has been valued by reference to depreciated replacement cost, adequate profitability is the test that the entity should apply to ensure that it is able to support the depreciated replacement cost conclusion.” (IVSC, 2005, p. 1).

ONTRACK do not appear to have applied an adequate profitability test to their valuation. Track access and property revenue (the only form of operational income earned on ONTRACK’s assets) in 2007/08 was \$88m — only 0.75% of the value of its fixed assets. Comparing this with the maintenance and renewal costs that are being funded out of this income (see Table 15 for the most recently available figures) reveals that “adequate profitability” on its fixed assets valuations is not being achieved (unless one defines “adequate” to be near zero or negative).

Since it took over the rail network in 2004, ONTRACK has claimed that the track access fees are too low. However there is little scope to increase them. The great bulk of track access fees were paid by Toll. KiwiRail made an EBIT of \$56m in the last year it was owned by Toll (Toll Holdings Limited, 2008a), and a surplus of \$4m in the first seven months of government ownership (The Treasury, 2009). Even KiwiRail’s entire revenue — \$555m in 2007/08 (Toll Holdings Limited, 2008b) — with zero expenditure would be insufficient to offer a commercial rate of return on \$12bn of assets.

Year ending 30 June	Maintenance	Renewals	Minor upgrade work (excludes major projects)	Total
	(\$millions)			
2005	35.0	36.8	11.8	83.6
2006	42.7	70.3	5.5	118.4
2007	41.9	65.4	28.0	135.2

Table 15. Rail network spending by ONTRACK excluding major projects.
(Source: Controller and Auditor-General, 2008b, fig. 5)

A1.5 Is ONTRACK a public benefit entity?

ONTRACK claims to be a *public benefit entity* for the purposes of financial reporting (e.g. ONTRACK, 2008b). Public benefit entities are defined as:

“reporting entities whose primary objective is to provide goods or services for community or social benefit and where any equity has been provided with a view to supporting that primary objective rather than for a financial return to equity holders” (Financial Reporting Standards Board, 2005, p. 10).

The accounting guidelines for public benefit entities allow them to avoid the application of the adequate profitability test to their valuations. Treasury guidelines suggest replacing it with a *service potential* concept.

“In the public sector, the concept of service potential usually takes the place of free market cashflows and the test of adequate profitability applied in the private sector. Service potential is measured as the level of productive capacity that would have to be replaced if the entity was deprived of the asset. In the public sector, continued service potential is expressed in quantifiable physical terms such as remaining useful life and remaining productive capacity.” (Wareham Cameron & Co Ltd, Rider Levett Bucknall, & The Treasury, 2007, p. 27)

Correct application of the service potential concept as defined above would logically involve consideration of the public sector as a whole. For example, if a lightly used rail line was paralleled by a road with spare capacity, then no productive capacity may need to be replaced if the line was closed. The service potential concept would imply an infrastructure valuation of zero for such a line. It is not known whether the DRC valuation applied to ONTRACK’s infrastructure considered a context larger than its own assets.

ONTRACK have provided no justification of their claim to be a public benefit entity. The New Zealand Institute of Chartered Accountants' Application Guideline for determining whether an entity is a public benefit entity clearly precludes the classification of a SOE as a public benefit entity (New Zealand Institute of Chartered Accountants, 2007). ONTRACK's claim would appear to be in breach of the relevant accounting guidelines.

A1.6 Should ONTRACK continue to be a SOE?

This raises the question: should ONTRACK (and therefore its parent NZRC) be some different form of public sector entity, one that had a principal objective compatible with the definition of public benefit entity? While such a reclassification would not escape the identified problems of conflicting assumptions (Section A1.2) and land valuation (Section A1.3), it might resolve the infrastructure valuation problem (Section A1.4).

There are several arguments why ONTRACK should be a SOE. Together they make a strong case for the retention of ONTRACK's SOE status.

Firstly, ONTRACK is now bundled with KiwiRail as part of NZRC. KiwiRail competes with the private sector in all its activities. NZRC's competitors expect to face transparent competition with government-owned entities.

Secondly, rail has a long history of poor financial performance. The SOE model arguably represents the best attempt to have efficient public businesses (Boles de Boer & Evans, 2000). The consequences of adopting a less commercial organisational model are almost certainly to be reduced productivity and net welfare.

Thirdly, if the government believes that an entity is producing public benefits for which it is not being directly rewarded (positive externalities) and they want to increase the levels of those externalities, then directly subsidising that entity is one appropriate response. This is exactly what is going on at present. Commuter rail is subsidised by regional councils and central government to reduce congestion on roads and provide transportation for those without access to private transport. The government believes that the provision of rail has positive externalities that are not rewarded by operating income, so it subsidises ONTRACK with grants for railway maintenance and construction. Such grants are ONTRACK's primary source of income.

So if NZRC should be an SOE, and externalities are met by the payment of subsidies, what does this mean for ONTRACK's asset valuation? Plainly the assets should be valued on a purely commercial basis. A government choice to subsidise an activity is not enough in itself to make assets more valuable to their direct owner. The owners also run the risk that subsequent governments may change their priorities.

NZRC has market characteristics that imply it is best organised as a SOE and as such its assets should be valued on a fully commercial basis.

If the government believes that the rail assets have a wider social value and wishes to recognise that value in the whole-of-government accounts, then such a revaluation best occurs in the government's accounts, not in those of NZRC.

A1.7 Other approaches to valuation

There are many possible approaches to the valuation of rail assets. Booz Allen Hamilton (2005) list five approaches to the valuation of transport assets. They also chose DRC for valuing rail assets, but took the more nuanced approach of separately identifying sunk assets.

According to CCMAU (2007), the Ministers holding shares in SOEs prefer that the commercial value of SOEs to be determined using discounted cash flow (DCF) methodology. But even with ONTRACK's principle of treating grants as revenue and their related expenditure as capital — which has the effect of inflating profit figures (ONTRACK, 2008b) — it would still be impossible to justify the 30 June 2008 commercial valuation of the Crown's investment of \$11.6bn. CCMAU acknowledges this reality in a footnote: "it is accepted that in the foreseeable future it is unrealistic to expect that it will earn a commercial rate of return on its approximately \$12 billion of land and rail assets" (2008, p. 5).

A1.8 How much are ONTRACK's assets worth?

Given that \$12bn is an economic overvaluation of the assets, what is an appropriate valuation? There are two ways to look at this:

- What asset base could income support?
- What is the salvage value of the network?

Under the present structure ONTRACK's operational and property income is approximately \$100m, and it is spending more than that on maintenance, renewals and minor upgrades (see Table 15). ONTRACK is unable to pay a capital charge on any assets on this level of income.

The 2007 revaluation of ONTRACK's assets is unsupportable on economic and accounting grounds. The going concern value of ONTRACK's land and infrastructure assets is near zero, and their public accounts should reflect this reality.

Section 4.7 suggests that the salvage value of the network is likely to be approximately the realisable value of land sales: possibly of the order of \$4bn. If so, this is the opportunity cost of those assets: that is, the value of the most valuable alternative use.

A1.9 Summary

ONTRACK's 2006/07 asset revaluation and 2007/08 revaluation were indefensible on economic and accounting criteria.

If the rail system remains in public ownership, then there are solid arguments why ONTRACK should remain a state-owned enterprise, and the conventional accounting systems applicable to SOEs should be applied.

If it is the intention of the government (as owner) to operate the extant rail network for an indefinite period into the future, then the economic value of ONTRACK's assets is approximately zero.

Conversely, if the government's intention is to close the network, then the economic value of those assets their salvage value. This is likely to be less than the land valuation. A conservative estimate of salvage value would be around \$4bn.

In an intermediate scenario where parts of the network were closed, then the economic value of ONTRACK's assets would lie between these two values.

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