

# Unlocking rail construction

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Quantitative and qualitative  
analysis

Final report to KiwiRail  
11 September 2023



**SENSE PARTNERS**

DATA LOGIC ACTION



## Key points

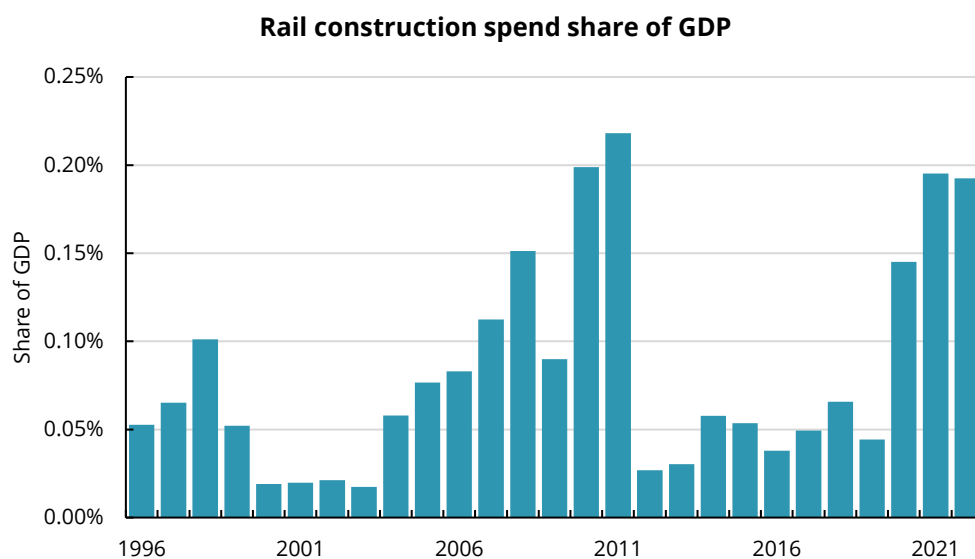
### New Zealand has long underinvested in rail infrastructure:

- New Zealand consistently ranks at or below the lower quartile of the OECD in terms of rail investment.
- Over the five years to 2021, rail investment per capita in Australia was six times that seen in New Zealand.
- The data shows that New Zealand has underinvested in rail, and the competition for rail expertise is global. This is consistent with the key theme from our interviews of rail industry stakeholders: ***there is intense demand for specialised rail talent, and the level and pipeline of work in competing countries is orders of magnitude larger.***
- To compete, New Zealand needs to have a funded and agreed programme of work to operate, upgrade and expand the rail network.

### Rail construction is currently booming – how can we avoid a bust?

- We estimate rail construction spending was \$638m in 2022, with a significant amount of additional work currently under way.
- The extended employment facilitated by rail construction was around 4,500 people in 2022, equivalent to 2% of all construction sector jobs.
- But the spending is boom-bust, as shown in Figure 1. Every time there is a sharp slowdown, workers and specialised businesses head offshore in search of more consistent work opportunities.

FIGURE 1: RAIL CONSTRUCTION IS BOOMING NOW, BUT IT IS BOOM BUST



Source: Company data, Statistics NZ, Sense Partners



## The boom-bust investment cycle is a critical issue for the sector

- Our interviewees told us the boom-bust cycle poses significant challenges in hiring and retaining skilled workers and stifles investment in specialised best-in-class capital equipment, which have long economic payback periods.
- For specialised skilled workers in particular, there is enormous global demand, with an estimated global rail investment pipeline of NZ\$8.8 trillion.<sup>1</sup>

## The rail construction sector is maturing and evolving, but greater certainty is needed

- Interviews with industry participants highlighted considerable growth and maturity in the sector in recent years.
- The sector has grown, has invested in people, training, and new equipment. They told us systems and processes at KiwiRail are maturing.
- All interviewees emphasised the importance of a transparent pipeline, coordination, and sequencing to provide greater certainty in the sector. This certainty needs to be end-to-end, from the political stage to delivery.

## How can greater certainty be delivered?

- Greater certainty will support retention of New Zealand's rail construction workforce, specialised equipment and sector expertise in the face of strong global competition.
- Key features enabling this include:
  - Political agreement on rail sector objectives
  - A transparent, long-term funding envelope
  - A detailed pipeline built up in a bottom-up way, with details around location, what needs the project will meet, prioritisation method, how they were costed and how they will be sequenced to provide efficient delivery
  - Ensuring skilled people and specialised equipment are consistently utilised for maximum long term benefit.

## Greater certainty can also unlock innovation and scale

- There are considerable opportunities for the sector to scale, innovate, and deliver efficiency gains, but the boom-bust trap needs to be avoided and greater certainty provided.

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<sup>1</sup> (Converted at PPP exchange rates) Global Data, Railway Construction Projects Overview and Analytics by Stages, Key Countries and Players (Contractors, Consultants and Project Owners), 2022 Update, accessed 26 June 2023: <https://www.globaldata.com/store/report/railway-construction-projects-market-analysis/>



## Table of contents

Key points .....	i
Table of contents .....	iii
1. Introduction .....	1
2. New Zealand infrastructure context .....	2
3. What is needed to address existing infrastructure challenges? .....	7
4. We need to do things better .....	12
Box A: Rail construction supported 4,500 jobs in 2022 .....	15
5. Key lessons from our suppliers .....	16
Box B: Case study of two recent projects .....	19
Appendix A: Defining rail construction .....	22
Appendix B: Qualitative interviews .....	24
Appendix C: Summary statistics .....	28
Appendix D Long-term picture of rail investment .....	29



# 1. Introduction

KiwiRail asked Sense Partners to explore how the rail construction sector can better meet New Zealand's infrastructure needs, with a special focus on the impact of capability and capacity building, and the impact of boom-bust investment cycles.

We took a mixed methods approach, using both quantitative and qualitative analysis. This included:

- Analysing historical data on rail investment
- Estimating the employment effects of rail construction
- Undertaking case studies of recent rail construction projects
- Interviewing recent rail construction suppliers for qualitative insights on issues and opportunities in delivering rail infrastructure efficiently and effectively
- Drawing on international literature to inform our thinking and identify opportunities for New Zealand to improve.

Our interview technique is summarised in Appendix B. To ensure openness of communication and preservation of privacy we do not use any direct quotes. Rather we paraphrase key messages, which were consistent across interviewees, and are depicted in **bolded italics**.

This mixed approach has given us a holistic understanding of the nature of the rail construction cycle, recent experience, and insights from the industry on future risks and opportunities.



## 2. New Zealand infrastructure context

### **Rail is an important part of the New Zealand economy**

The transport sector in New Zealand faces three consequential challenges:

- (i) A significant infrastructure deficit
- (ii) Worsening congestion in our urban centres
- (iii) The need to reduce transport emissions.

A well-functioning and expanded rail network can play a part in dealing with all these challenges.

### **We are starting from a \$210 billion infrastructure deficit**

Te Waihangā research shows New Zealand currently has an infrastructure deficit of around \$210 billion.<sup>2</sup> This deficit was a result of two decades of underinvestment (in maintenance and not keeping up with demand increases) until the early 2000s.<sup>3</sup>

Tackling the existing deficit, maintaining existing assets and meeting increased demand from population growth and urbanisation would require \$1 trillion of investment over 30 years.

### **Rail investment in the past decade has had to balance spending on new assets against keeping an ageing network up and running**

Recent investment by KiwiRail illustrates the scale of the historical underinvestment that needs to be recouped. KiwiRail invested \$1.15b on railway infrastructure assets in the decade to 2022.

But this was accompanied by \$1.0 billion of depreciation expense (\$0.1 billion) and impairments (\$0.9 billion), meaning much of the investment is to rehabilitate and stand still (Figure 2).

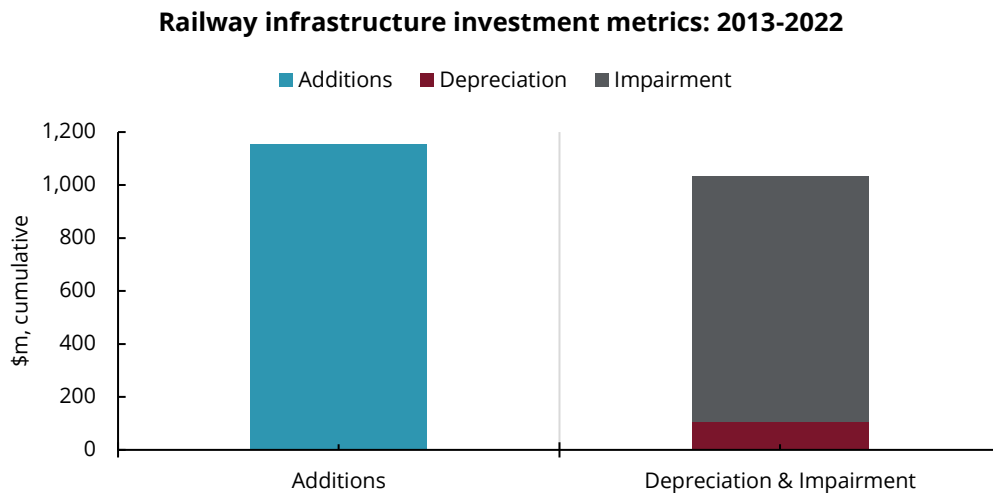
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<sup>2</sup> [New Zealand's infrastructure challenge: Quantifying the gap and path to close it | Te Waihangā](#)

<sup>3</sup> See Appendix D for a long-term picture of rail investment in New Zealand.



FIGURE 2: HISTORICAL UNDERINVESTMENT IN RAILWAY INFRASTRUCTURE MEANS THAT MUCH OF THE INVESTMENT OVER THE PAST DECADE HAS BEEN TO OVERCOME IMPAIRMENTS



Source: KiwiRail Integrated Reports 2013-2022

The national infrastructure deficit is in part made up of the underinvestment in rail. Future investment in rail is more likely to contribute to other social and economic goals in reducing congestion and reducing emissions, compared to other transport modes.

### **Congestion is a \$3.2bn cost to the economy every year**

Traffic congestion is already a significant drag on the New Zealand economy, particularly in our largest urban centres. We estimate traffic congestion across New Zealand cost \$3.2b or 1% of GDP in 2020 (Figure 3 overleaf).

To reduce this we need to unlock network benefits on modes with significant capacity. Public transport, and rail in particular, are the best candidates.

### **We need to unlock the network externalities associated with rail**

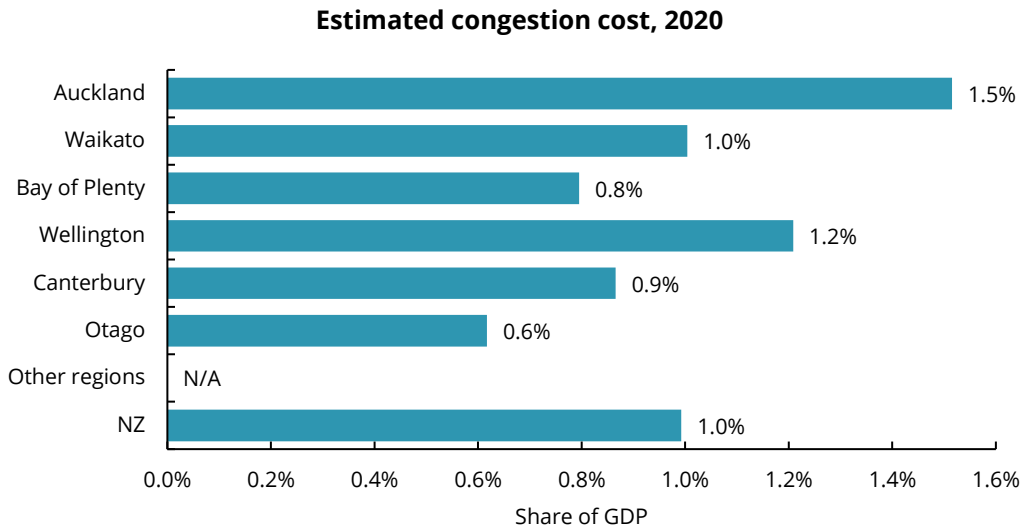
Transport infrastructure enjoys network externalities. The larger the network, the more useful it is, and the higher the benefit.

Currently the rail system, particularly in Auckland and key freight routes, is not able to reach its full potential to support mode shift aspirations. Key challenges relate to conflicts between freight and passenger use due to the existing mixed use network, and the impact of closures and network restrictions as a result of historical underinvestment in maintenance and renewals.

Investing in delivering a well-functioning network can reduce the significant congestion impost on the New Zealand economy.



FIGURE 3: 1% OF GDP CONGESTION COST IN 2020; AUCKLAND AND WELLINGTON MOST AFFECTED

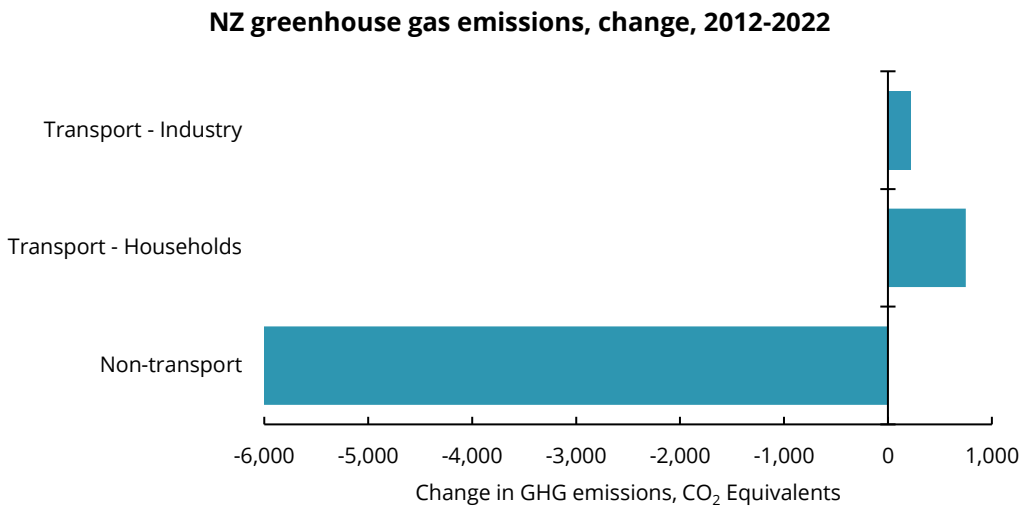


Source: Sense Partners update and extension of Ian Wallis Associates (2013)

## Cutting transport emissions is critical for our net zero aspirations

Transport emissions are difficult to reduce. Over the decade to 2022 New Zealand's overall emissions have reduced, but transport emissions have increased.

FIGURE 4: TRANSPORT EMISSIONS ARE RISING, EVEN AS OTHER EMISSIONS FALL



Source: Statistics New Zealand, Sense Partners

Mode shift to public transport (rail and bus), active transport (walking and cycling) and electric vehicles will be critical to reduce New Zealand's transport emissions. For rail, this means expanding and upgrading to a modern and well-designed network that people want to use.





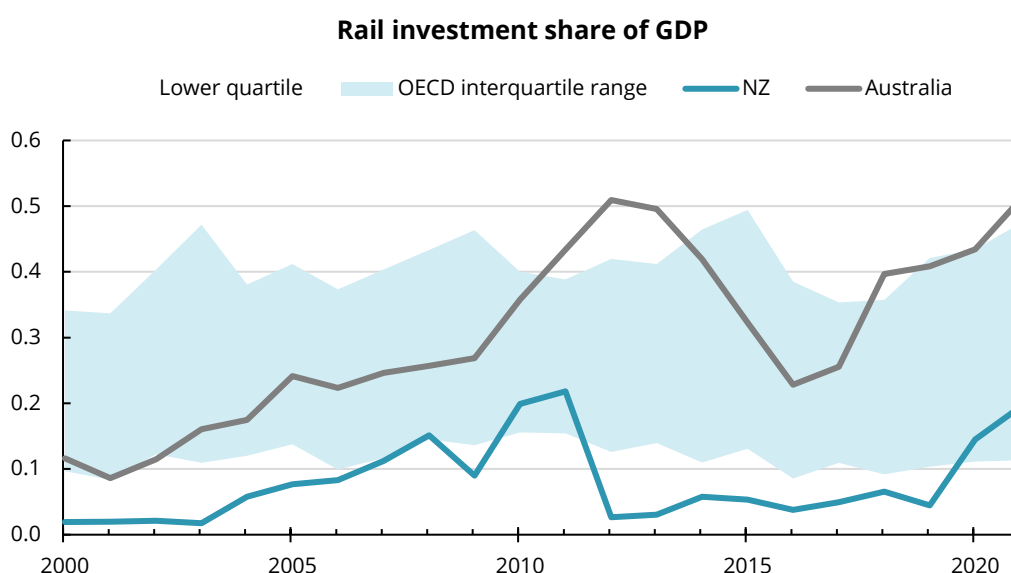
## International comparison shows New Zealand is lagging in rail investment...

According to OECD data, the most comparable international dataset available, New Zealand has long underinvested in rail.

Figure 5 shows New Zealand's rail investment relative to GDP, versus the OECD interquartile range.<sup>4</sup> We also plot Australia, which has had a similar economic development as New Zealand, although with significant differences in geography.

The data shows New Zealand's rail investment as a share of GDP over the last two decades has been below even the lower quartile of OECD countries. Recent increases put New Zealand in the low end of the OECD inter-quartile range.<sup>5</sup>

FIGURE 5: NEW ZEALAND'S RAIL INVESTMENT IS VERY LOW



Source: OECD, Sense Partners estimates for New Zealand

Australia has consistently invested more in rail than New Zealand. Australia invested 0.4% of GDP per year on average over the five years to 2021, compared to 0.1% in New Zealand. On a per capita basis Australia is investing six times that of New Zealand.

### ...and road transport too

New Zealand also underinvested in roads in the 2000s but has recovered towards OECD norms in the past decade. However, road investment as a share of GDP also remains well

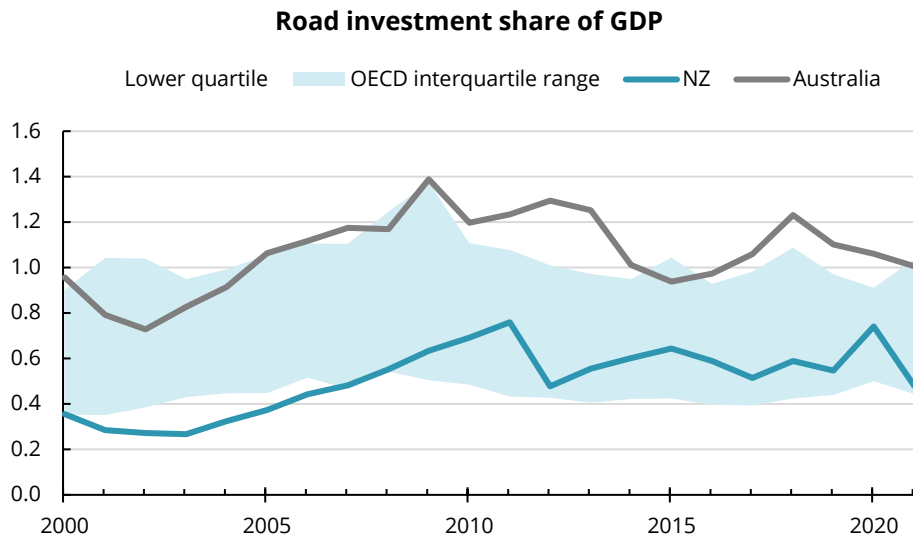
<sup>4</sup> We use our own data for New Zealand, based on analysis of KiwiRail data, which is more accurate and up to date than the OECD dataset.

<sup>5</sup> International comparisons of rail investment need to be treated with some caution, as investment is related to geography, population density, history of rail development, size and purpose of network, etc.



behind Australia. Australia invested 1.1% of GDP per year on average over the five years to 2021, compared to 0.6% in New Zealand.

FIGURE 6: NEW ZEALAND ALSO UNDERINVESTS IN ROAD, BUT BY A SMALLER MAGNITUDE



Source: OECD

This suggests New Zealand has structural issues with infrastructure investment.



### 3. What is needed to address existing infrastructure challenges?

#### The boom-bust nature of rail construction poses significant challenges

New Zealand rail construction history is one of boom-bust (Figure 7). While this is a feature of much of the construction sector, it has an amplified impact on the rail construction sector which relies on some very specialised skillsets and experiences which are not available in other industries in New Zealand.

FIGURE 7: RAIL CONSTRUCTION INVESTMENT IS BOOM-BUST



Source: Company data, Sense Partners

We heard that: **when there is a boom it takes years to build up specialist skills sets, is a drag on productivity and increases costs; when there is a bust we lose them to Australia or further afield.**

#### Significant investment may be in the pipeline...

Rail construction activity has increased significantly over the five years to 2022 (Figure 7), following a long period of much lower levels of activity. The current upswing is much larger than the investment surge in 2007-2011.

The boom-bust cycle is clearly visible in the data. Many interviewees hypothesised a link between rail investment and the political cycle, but such a relationship is not convincingly visible in the data (although it may reflect lags in the large projects already underway).

Rather there appears to be periods of significant investment followed by a similar period of under-investment across political cycles.

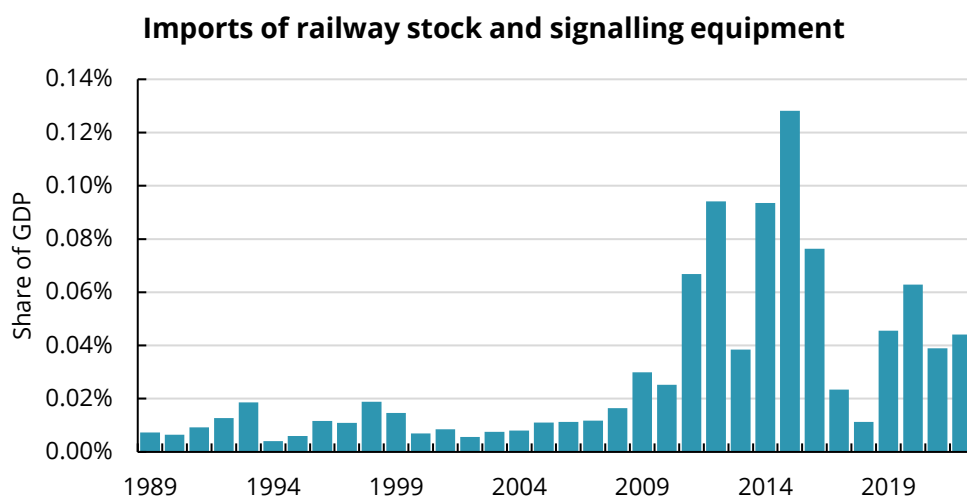


We heard: ***we don't think current pipeline of rail projects will go ahead if there is a change of government.***

### **...but past boom-bust cycles mean low visibility**

Investment data is not consistently available. Imports of railway stock and signalling equipment is a good cross-check, which tends to follow rail infrastructure investment with a five-year lag. It shows a similar pattern: a long period of low investment, followed by a surge in investment, slowdown, and another upswing currently underway (Figure 8).

FIGURE 8: RAIL EQUIPMENT IMPORTS PAINT A SIMILAR PICTURE OF BOOM-BUST CYCLES, FOLLOWING A LONG PERIOD OF LOW INVESTMENT



Source: Statistics NZ, Sense Partners

Boom-bust cycles really matter. When investment slowed in the past, many businesses lost specialised staff and know-how atrophied. So, when investment rose again, it came with considerable delays and costs.

In addition, uncertainty stopped interviewees from investing in people, skills, and technology as they cannot be confident of achieving economic payback. We heard:

- ***When work dried up we had to let go of highly skilled staff. They left for Australia and other places. They won't come back.***
- ***It took us around five years to get the teams to really hum. When our crew stopped working on rail projects they lost many of those skills and it was hard to put the same mix of crew back together.***
- ***When work came back, we had to scramble to find staff. We are competing in a global market for very specialised skill sets. We are often the third or fourth choice for candidates – they prefer markets with large and long pipelines of work, with multiple buyers and suppliers.***



- *We want to invest in new equipment. But the upfront cost is high and we aren't sure if we can make it pay.*
- *We invested in new equipment but it hasn't been used enough. We will move it to Australia.*

## Meeting New Zealand's infrastructure challenges requires transparency, coordination and staying power

New Zealand's infrastructure challenges are now well known. The solutions are also becoming increasingly clear.

Three key things come up repeatedly:

- (i) Transparency – government needs to provide a long term investment path to support investors to plan and bid for projects.
- (ii) Coordination – central and local governments need to work together to deliver joined-up infrastructure messaging and planning in order to reduce investor uncertainty.
- (iii) Staying power – the pipeline of planned investment needs to be robust enough to withstand changes in political preferences over time.

Concentrating on improving these three factors is supported by the UN. The UN recommends improving infrastructure delivery by prioritising three to five interventions.<sup>6</sup>

### Transparency around a pipeline of a package of works

The literature supporting a pipeline of work is unambiguous. A **bottom-up pipeline approach** looks at not just what is planned but what is required subject to stated goals (we highlighted three goals: reducing the infrastructure deficit, reducing congestion and reducing greenhouse gas emissions).

Strengthening the pipeline of suitable projects with clearly defined goals and trade-offs improves the financing and delivery of infrastructure.<sup>7</sup>

City or region-based analysis for infrastructure makes sense, as countries are effectively networks of regional economies.<sup>8</sup> Regional infrastructure pipelines require identification of a specific goal, meaning greater transparency around why projects were chosen, the needs they meet, and how they were prioritised.

This makes investments easier to coordinate. This is work currently being undertaken by the Infrastructure Commission and is perhaps the best way to quantify renewals, improvements, gaps and future proofing required. That is not the remit of this report.

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<sup>6</sup> Woetzel et al., 2016.

<sup>7</sup> Ibid.

<sup>8</sup> Cisneros & Fulton, 2021.



Our interviews of suppliers supported our findings from the literature. The most consistent feedback was: ***we need more certainty of the pipeline.***

The consequences of a lack of certainty identified by interviewees were also consistent. Uncertainty reduced investment in new equipment, technology, people and training: ***we want to invest, but cannot if we don't know what opportunities exist when there are competing pipelines in Australia; we don't mind taking commercial risk.***

Downturns led to a loss of capability and capacity, with one interviewee noting: ***rebuilding our team took five years and doubled our costs.***

## Coordination and staying the course

Infrastructure returns (both private and social) are uncertain both in terms of quantum and timing, and they also generally require upfront investment for long-term gains. Timing difference in costs (early) and benefits (later) can make decisions politically difficult.

Interviewees noted: ***we don't know what the pipeline of work looks like, if it will actually go ahead, we hear different things from leadership versus frontline staff, or if the pipeline will change if there is a change of government.***

Coordination is a critical pain point. Often, decisions must be coordinated across multiple agencies (such as territorial authority, education and transport agencies) or political jurisdictions (for example, contiguous territorial authorities), but incentives are siloed or local. These contribute to the underfunding of infrastructure.<sup>9</sup>

This makes the role of government policy instrumental, but this itself creates a problem: short-term political considerations and government borrowing constraints can hinder consistent long-term planning and investment. Overcoming coordination challenges is a key to better infrastructure policy.<sup>10</sup>

Quality strategic planning is necessary for a successful infrastructure programme.<sup>11</sup> Coordination is a common challenge for planning and infrastructure delivery. Challenges include the following:

- **A need for long-term, top-down, strategic coordination.**<sup>12</sup> Current planning systems do not adequately provide for effective longer-term or integrated infrastructure planning. Inconsistencies in decision making also fail to provide certainty for investment by infrastructure providers and other investors.<sup>13</sup>

The value of strategic coordination was seen in the post-quake rebuild in Canterbury. A regional strategic plan across Greater Christchurch (Christchurch City Council, Selwyn District Council, Waimakariri District Council, Environment Canterbury, Canterbury District

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<sup>9</sup> Oxford Economics, 2017.

<sup>10</sup> OECD, 2016.

<sup>11</sup> Ibid.

<sup>12</sup> Ibid.

<sup>13</sup> MFE, 2010.



Health Board and Waka Kotahi NZ Transport Agency) was readily available, which was fast tracked for the rebuild process. This coordinated approach should be a model for future rail investment.

We heard: *it is hard to know exactly what will take place and when, and what is funded with what level of certainty.*

- **Poor incentives for information sharing across silos or political jurisdictions.** Information gaps are compounded because the information is often private and valuable, as it can provide opportunities for gaming and rent seeking. This undermines the quality of decision making.<sup>14</sup>

We heard: *it is hard to get access to information. Many suppliers feel like they are in an adversarial relationship, rather than a partnership.*

- **An environment averse to risk taking and innovation.** Governments are loath to experiment with economically and politically sensitive infrastructure assets. The costs of getting it wrong are too high. When faced with uncertainty and rapidly changing technology, they tend towards traditional modes of infrastructure. This 'bakes in' older technology and creates challenges for future resilience.<sup>15</sup>

We heard: *it can be difficult to adopt international best practise. We want to bring these systems and processes to New Zealand, but can only do so with confidence of future work and use of these systems and processes.*

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<sup>14</sup> <https://infrastructure.aecom.com/infrastructure-funding>

<sup>15</sup> We Forum, 2019.



## 4. We need to do things better

### Rail construction is a little bit special...

Rail construction is a mixture of some very specialised rail aspects, and others much more substitutable to other construction sub-sectors.

The specialised aspects, especially skilled labour, and specialised kit, makes it harder to scale up quickly and use the best-in-class equipment.

We heard: ***there are some very specialised skill sets in rail that are in short supply globally. These are also critical roles, which are necessary to deliver the projects.***

Many aspects of rail construction are also easily substitutable with other construction segments. For example, heavy and civil engineering construction is comparable, with a rail overlay. Station buildings and auxiliary structures can be delivered by those who construct non-residential buildings and related trades.

We heard: ***many roles are generic, with some additional rail specific attributes. These are relatively easy to build up, but are hampered by widespread labour shortages, meaning demand is fierce for all staff.***

Interviews revealed the following key differences between rail construction and other construction sectors:

- **Access** – Working safely in a live rail environment, with moving trains and electricity for train operations. For some types of work this means the work is very anti-social in time of day (evenings) and day of week (weekends), leading to family and social compromises for workers.

We heard: ***working nights and weekends is antisocial and it is a significant barrier to staffing. But there is a small group who like it and we have to hang on to them.***

- **Training** – Specialised training to operate in the rail environment, especially around health and safety, and specialised equipment. Some respondents noted New Zealand rail induction and basic training levels facilitated by KiwiRail are below international standards, which have potential health and safety risks.

We heard: ***there is a cost and time required for training for rail work, but it can be a barrier for smaller firms. Some training aspects could improve, for example Australia has a higher standard and greater flexibility of delivery.***

- **Technical specifications/requirements** – some aspects of rail are simply different. For example, traction, signalling, and track work are specialised rail activities, and some specialised rail equipment is not used elsewhere (which typically have higher cost than comparable civil use kit, and longer lead times to bring into New Zealand).

We heard: ***these very specialised skills are in short supply globally. We need to put together the best programme of work over time to secure and keep talent.***





- **Procurement and contracting** – compared to other large infrastructure procurers and rail procurers internationally, rail construction procurement in New Zealand differs. Interviewees perceived that:
  - A ‘lowest price and conforming’ approach to procurement leading to a race to the bottom, and insufficient investment in skills, training, and technology
  - The high use of insufficiently experienced contractors in KiwiRail leading to a lack of stable and deep client-contractor relationships
  - Contractors are brought on too late to add value to design and delivery
  - There was limited visibility of the pipeline and a lack of transparency on how projects are awarded
  - There was little post-delivery assessment and accountability taken for shortcomings.

We heard: ***The rail construction programme needs to be stable and secure, so that KiwiRail can give the sector confidence in the future work programme. The sector wants to work in rail, and will invest in capital, people, systems and processes, if the pipeline is there. It will lead to be better productivity, cost efficiency and innovation.***

### **...but there are other options available to many rail construction workers**

This means there are many workers in rail construction who can also work in other sectors. However, there are also some unique attractions associated with working in the rail sector. Interviews revealed many workers had a preference for rail. For this group there is some romanticism attached to rail.

We interviewed only a small number of suppliers to KiwiRail who are specialised only in rail. Most also do other work in sectors, including non-residential construction, heavy and civil engineering construction, design, engineering, and electricity.

The biggest constraint was in specialist skills, which are global in nature. Global demand for specialist skills is intense (the global rail construction pipeline is an estimated NZD\$8.8 trillion<sup>1</sup>).

We heard: ***there is so much global demand for specialist skills, which are in short supply anyway, we aren't a serious contender for the best talent.***

Many interviewees reported a large and secure pipeline of work, as well as better pay, attracting workers to Australia. Latest available data show that in Australia, construction sector incomes are significantly higher (Figure 9). Heavy & Civil Engineering Construction weekly wages in Australia are 52% higher than in New Zealand, when adjusted for cost of living<sup>16</sup>

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<sup>16</sup> We use the purchasing power parity exchange rate database maintained by the OECD. Available here: <https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm>



(\$2,500 vs \$1,650). Construction services and building construction weekly wages are around  $\frac{1}{3}$  higher in Australia.

FIGURE 9: CONSTRUCTION SECTOR INCOMES ARE 33%-50% HIGHER IN AUSTRALIA



Source: ABS, Statistics New Zealand, OECD, Sense Partners estimates



## Box A: Rail construction supported 4,500 jobs in 2022

Rail construction is largely delivered by suppliers in construction and professional services sectors, supported by a range of suppliers.

We estimate<sup>17</sup> rail construction spending in 2022 directly supported around 3,400 Full Time Equivalent (FTE) construction jobs, across internal staff at KiwiRail, contractors, and sub-contractors working in the construction sector.

The estimate above focuses on those who are delivering the construction activity. However, rail construction activity indirectly supports jobs across a wide range of industries from aggregates to logistics, metal manufacturers and professional services (e.g. engineering and professional services).

We estimate rail construction sustained a further 1,100 FTE jobs in these supporting industries.

In total, rail construction facilitated around 4,500 jobs in 2022, equivalent to 2% of all construction sector jobs.

The jobs are well paid. The median income for workers in the infrastructure sector was \$70,500, compared to \$51,700 in building construction, \$54,300 in construction services (e.g. plumbers and electricians), and \$51,700 for all industries.

FIGURE 10: RAIL CONSTRUCTION EMPLOYMENT OF 4,500 FTES IN 2022



Source: Company data, Sense Partners estimates

<sup>17</sup> We derive this estimate using KiwiRail data where possible, a detailed look at a small sample of projects, and Statistics New Zealand's Input-Output tables.



## 5. Key lessons from our suppliers

Smoothing the boom-bust cycle in investment, improving the visibility of the pipeline, and boosting coordination and sequencing of projects and activities would help deliver a smoother and more certain profile of activity.

Interviewees identified that uncertainty also stems from a lack of certainty of objectives and funding for rail at the political level. This uncertainty has tangible consequences in their ability to hire and retain skilled workers, invest in new technology and capital, and resulted in significant cost when retooling for a boom after a bust. For specialised rail firms the bust phase could be existential.

### Experience of scaling up

Every interviewee had a special interest in rail, even if their business was more diversified. There is an enormous amount of excitement in working on rail projects and growth in recent years.

The growth in rail investment was accompanied by growth in many of the interviewed businesses, or redirection of resources from other construction segments to rail construction.

The key issues faced during the growth phase were:

- **Labour shortages:** much of the very strong growth coincided with Covid pandemic related border closures. This made it extremely difficult to recruit specialised skills, who are largely reported to be recruited internationally, typically at short notice.

Border closures led to general labour shortages, which made wider recruitment also difficult. The antisocial nature of some work (evenings, weekends, and public holidays) is a deterrent to many workers, making recruitment harder.

There is significant competition from Australia from general skills to specialised rail skills, which are in high demand and at much higher wages/compensation levels. The result was a combination of higher wages to make the roles more attractive, but also some roles were not filled.

We heard: *it's hard to get specialist staff, but it is possible over a longer period of time. What we really want is to be able to retain these people once they are here. Recruitment and training are very disruptive and expensive.*

- **Training:** rail requires specialised training for H&S and some technical aspects. This can add delay growth and add cost. International experience suggests training specifications and quality standards in New Zealand are lagging.

Many reported that learning and efficiency gains came from 'learning by doing' – with very high value placed on a core group of 'rail' loving workers who tend to have very low turnover and work to a high standard.



We heard: *there are up front investments in training required for rail that are unique. The cost and lack of future work certainty is a barrier for small firms. For larger firms, they want to see even higher health and safety standards.*

- **Technology:** investment in new capital equipment and technology to deal with rail construction work often required purchases of specialised capital, which is more expensive than comparable capital for heavy and civil engineering work.

We heard: *we want to innovate and use the best technology that's available, and train up our people to use this equipment. But we have to be able to see a way to recoup the investment, or else commercial reality means we have to move it to where there is work, like Australia.*

- **Cost:** many invested in new equipment and people, with significant upfront cost, which often take up to 5 years to recoup. Many reported that when they invested in upfront capital, they did not have any way to secure a sufficient pipeline of work to recoup their investments.

Some leased their equipment to other providers, while others intend to move their equipment to other global locations where the equipment will be gainfully used. When the outlook for work is uncertain, it creates a lack of willingness to invest in the future.

We heard: *we are willing to invest in the right kit, but we can't keep investing ahead if we don't have pipeline certainty.*

## Uncertainty has adverse consequences for rail suppliers

Interviewees were pessimistic about the certainty and size of the pipeline of future work. While KiwiRail senior leaders have spoken about the positive outlook for rail investment, interviewees did not have confidence in how that would translate into work for them to plan for their business.

This lack of confidence comes from several sources:

- uncertainty and political nature of funding for KiwiRail
- uncertainty around KiwiRail's project pipeline plans
- uncertainty around KiwiRail's prioritisation and sequencing of projects in the pipeline
- lack of confidence in accuracy of sizing projects in the pipeline
- uncertainty of the amount of rail work available (most need a minimum viable amount to maintain their skill and capital base).

Most interviewees reported little visibility of rail work in their organisation beyond a timeframe of less than a year. The uncertainty creates a stifling of hiring and investment.

We heard: *I have no work for the group after six months. If something doesn't come through soon I will have to downscale the team. I don't want to, but I need to.*



This lack of visibility of future work leads to different decisions, depending on the concentration of exposure to rail construction.

Organisations specialised only in rail had few easy choices; most cited looking to diversify into complementary industries (for example civil construction) or expanding into Australia. Those who have presence internationally questioned the opportunity cost of holding capital and qualified people in New Zealand, when there is so much demand in their other international locations.

Specialised businesses supplying to a single buyer is an inherently risky business proposition. This becomes increasingly so when there is low certainty of future work, which is in effect existential.

We heard: ***there are no other options in New Zealand for rail work. It is do or die for us.***

Diversified businesses are less affected, looking to shift their general resources into other parts of the business. There was a general desire to hold on to specialist rail staff, as there is a belief that New Zealand needs to invest in rail and recruitment is so difficult.

But retaining specialist rail staff if there is no rail work is difficult, even if their skills are sufficiently generalised to work on other projects. This is because most rail specialised people want to work in rail. International demand (especially Australia) is very high for specialist rail talent, and many reported low confidence in being able to retain specialist rail skill without rail work.

We heard: ***We pivoted into rail when other heavy and civil was slow. Now we will pivot the other way. But we may lose some of our specialist rail staff.***

Retention of people was the key business uncertainty. Quality and efficiency came from learning by doing. Growth in rail construction in recent years, while accompanied by growing pains, is now delivering quality and efficiency gains for many businesses.

An uncertain outlook for rail investment means that there is a lack of investment in people and capital, and there is a clear and present danger of losing both to international markets, or less permanently to complementary sectors in New Zealand.

We heard: ***we have got a great rail crew together, it would be a shame to break it up. It takes so long to build up these teams.***

## **Suppliers need a clear and co-ordinated pipeline to improve efficiency and productivity**

All interviewees emphasised the importance of a transparent pipeline, coordination, and sequencing. Their messages are well supported by the literature (as discussed in section 3 above).

We heard: ***we like doing rail construction work. We want to do more of it. But we can't do it efficiently and productively if we don't know what is coming down the pipe with some degree of certainty. We will take risk and make investments in our capital and people, if we know there is a commercial chance of winning secure work in the future.***



## Box B: Case study of two recent projects

We took a deep dive into two live projects:

- **Wiri to Quay Park** – KiwiRail are building a third main (set of tracks) between Westfield and Wiri. This will ease congestion, provide faster train journeys and reduce delays. Works are focused on three locations:
  - (i) Westfield and Wiri junctions - third main and track reconfiguration
  - (ii) Middlemore to Puhinui - third main
  - (iii) Quay Park - track reconfiguration
- **Papakura to Pukekohe** - KiwiRail are extending the electrification of Auckland's metro rail network from Papakura to Pukekohe. This means people travelling from Pukekohe will no longer need to switch trains at Papakura and will enjoy faster, quieter and cleaner journeys in modern electric trains. The project will:
  - (i) Extend the overhead power system from Papakura to Pukekohe
  - (ii) Upgrade the existing track, signals and level crossings in this area
  - (iii) Redevelop Pukekohe Station.

Our review of the two projects highlighted two key issues:

- Rail construction projects are large and complex, requiring different skills at different points of time (e.g., specialist design may be needed more at the beginning). This makes skills availability a key issue.
- The delivery of construction activity across projects can coincide, creating large peaks and troughs in work. Such volatility in work can lead to loss of sector capacity and capability.

### Skills needs vary by stage of project

Across the two projects we found that there is substantial preparatory work before physical construction begins. For these two projects, the pre-construction cost was around 25% of the budget and 20% in contingency and cost escalation (Figure 11). Interviewees wanted more clarity on the preparatory works and clearer signalling and coordination.

### Work can become bunched up

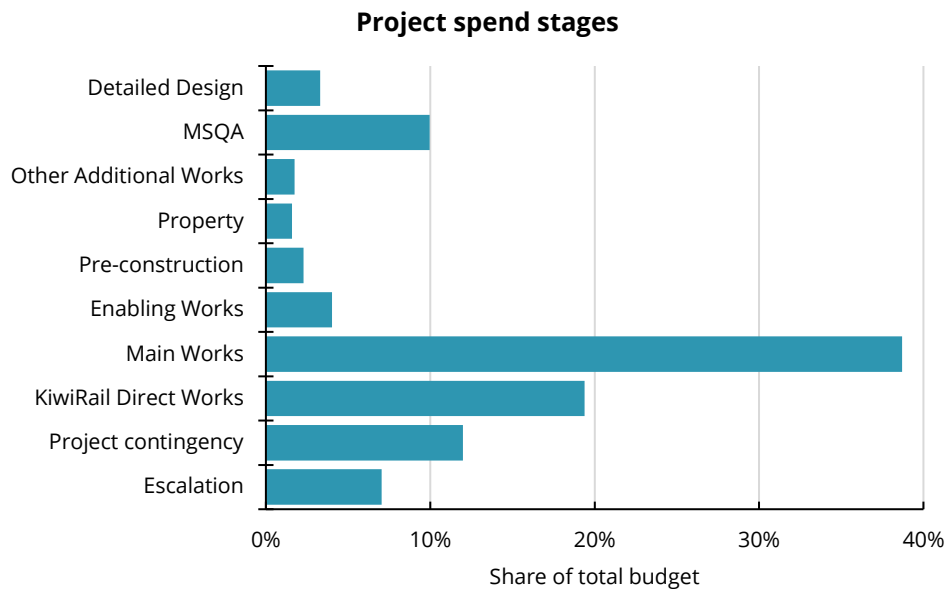
Our analysis of the two projects shows that work can often coincide, meaning there is a high peak which can lead to capacity constraints (Figure 12).

Interviewees reported difficulties in managing these peaks. There are also labour market challenges in dealing with such highs and lows. Short lived peaks become difficult to manage, as it does not make sense for the sector to scale up when future demand is not



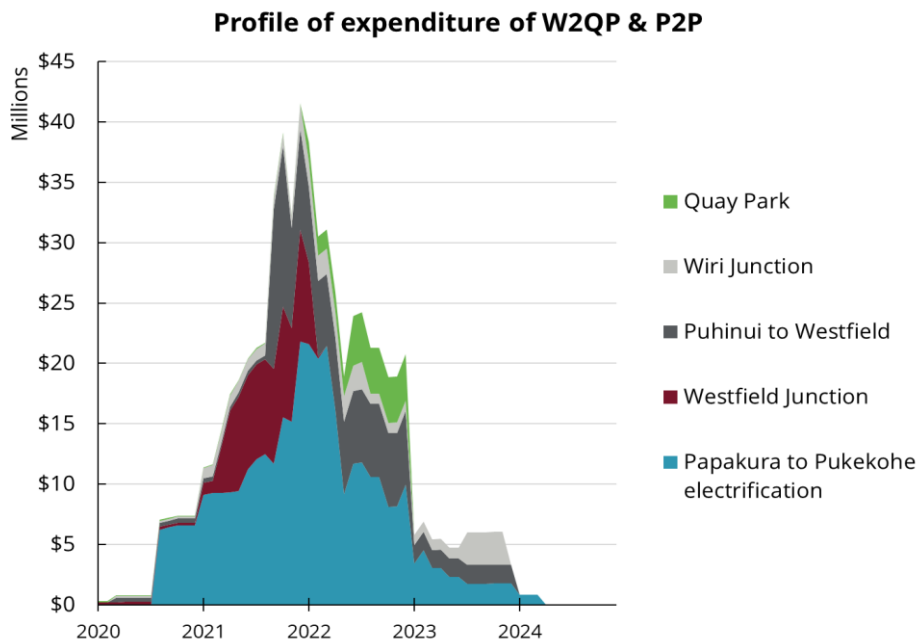
certain. Similarly, if the known pipeline of work is falling, it can further disincentivise sector investment in capacity, capability, and new technology.

FIGURE 11: LARGE INVESTMENT PROJECTS HAVE AROUND 25% OF THEIR BUDGET ON PRE-SHOVEL PHASE



Source: Company data, Sense Partners estimates

FIGURE 12: PRACTICAL AND FUNDING REQUIREMENTS CAN LEAD TO CROWDING OF INVESTMENT ACTIVITY, LEADING TO BOOM-BUST IN SPENDING



Source: Company data, Sense Partners estimates





**Greater clarity, coordination, and sequencing is needed**

Our brief look at two projects highlights two issues also echoed in the international literature and our interviews: a need for greater clarity of the pipeline of projects and activities, and greater coordination and sequencing to maintain a steady flow of work, rather than boom-busts.



## Appendix A: Defining rail construction

We define Rail Construction as all investment expenditure on the rail infrastructure by KiwiRail and CRL, including associated buildings, plant, machinery, and equipment. We exclude transport equipment: rolling stock and ships (ferry from Wellington to Picton).

Rail assets are often specialised, but also include buildings that are similar to other uses (buildings and infrastructure). There are some 3700km of track, 6 million sleepers, 3100 signals, 1500 public level crossing, 106 tunnels and 1344 bridges, and over 900 buildings.<sup>18</sup>

Investments in these assets hence involve a variety of activities, some of which are common, and some very specialised. Common elements include Heavy & Civil Engineering Construction and Non-residential Building Construction. Less common activities include specialised construction of signals, overhead traction, railway infrastructure and amenity design.

### The cost of acquisition or construction

We wanted to use a set of credible and replicable numbers to help us measure rail construction investment. Published annual reports give us an excellent reference document, which we use for the headline totals.

We relate reported accounting information to the economic concept of rail construction defined above. Annual reports give us a consistent, replicable, and reliable data source. We use KiwiRail's Integrated Report and CRL's Annual reports.

KiwiRail Holdings Limited reports activities of the group across specific asset types: rolling stock, ships, buildings, railway infrastructure, plant & equipment, and assets under construction. We exclude rolling stock and ships which are transport rather than construction.

Beginning 2020, we utilised detailed KiwiRail internal financial data on capital expenditure on rail construction.

We count all CRL's capital works in progress as expenditure directed to Railway Construction.

We link the reported financial information to the System of National Accounts, which is used to compile National Accounts or Gross Domestic Product (GDP) statistics.

There are three GDP measures: production, income, and expenditure. We use the expenditure approach here, as we want to understand the investment into rail construction, how it has changed over time and where it flows to. Specifically, we identify gross fixed capital formation, which is effectively the expenditure incurred for the purposes of rail construction.

We look at the notes to the schedule of Non-financial Assets in the annual report, which gives us the cost of 'additions', where "cost includes expenditure that is directly attributable to the acquisition or construction of the asset".<sup>19</sup>

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<sup>18</sup> KiwiRail Integrated Report 2022. Page 10.

<sup>19</sup> KiwiRail Integrated Report 2022. Page 75.



There is judgment required on what is included. For example, we have chosen to include buildings (such as rail stations) and plant and equipment (which are used to maintain and expand the network).

Regular maintenance is usually not included in measured Gross Fixed Capital Formation, as it is usually small and seen as an intermediate consumption, or a general cost of doing business. However, in our view sustained historical underinvestment in the rail infrastructure means that the maintenance works are substantial, and this maintenance work should be recognised as investment which makes up a significant portion of rail construction activity.

### **Not a Cost Benefit Analysis**

This project is not about the whole of life costs and benefits – which is ideal for assessing business cases.

Rather we are focussed on understanding railway construction investment expenditure, the scale and scope of it, and implications so that we can get clear insights on how to best scale up the capacity and capability of the rail construction sector to deliver a large pipeline of work.



## Appendix B: Qualitative interviews

KiwiRail asked Sense Partners to interview a selection of its suppliers to better understand the rail construction sector, the experience of the growth of recent years, and the risks and opportunities in planning for the future.

We used a conversational interview technique (see below) which ensured we prompted conversation on a consistent set of topics. The depth and breadth of conversation depended on the respondent.

### Research questions

We had three key research questions:

- How does rail construction differ from other construction?
- How did you scale up in the last 5 years, with special attention to investment in capital and people?
- What are the opportunities and risks in scaling up rail construction further?

### Conversational interviewing technique

We used a conversational interviewing technique for this review. A conversational interview technique is the most respectful and sensitive way to discuss issues that are often commercially sensitive and can pose risks client relationships.

In this approach, we frame the broad issues we are interested in and allow the participants to reveal as much as they are comfortable. This has the drawback of not receiving comparable answers from all respondents but has the benefit of creating a high trust and safe environment to elicit the best information within commercial and personal boundaries.

The interview conversations are confidential. No quotes are attributed to individuals or organisations, and we have summarised responses to the research questions posed by KiwiRail only, and not included topics of discussion that were not in our scope of brief.

By conducting multiple interviews to achieve theoretical saturation (where already known themes come up repeatedly and no new themes are being generated), there is less pressure on any individual to give a complete picture. Interviews are relaxed and the individual's interests guide the conversation.

We use a broadly consistent interview structure to achieve as much comparability and comprehensiveness as possible.



## Recruitment approach

KiwiRail emailed a selection of its providers, inviting them to participate in this qualitative interview process for the project. We did not recruit additional interviewees. However, our interviews led to a broad convergence of themes and issues, which gives us confidence that the sample size was large enough to be representative.

Representatives from the following organisations participated in interviews:

1. AlphaRail
2. CB Civil
3. Conslab
4. Dacan Civil
5. Downer
6. John Holland
7. Libbet
8. Martinus
9. McConnell Dowell
10. Nexans
11. Siemens
12. Total Rail Solutions
13. Mottmac
14. Vitruvius
15. WSP

## Interview protocol

We used the following interview protocol.

**Research topic:** Lessons for scaling up rail construction.

**Research questions:**

- How does rail construction differ from other construction?
- How did you scale up in the last 5 years, with special attention to investment in capital and people?
- What opportunities and risks do you see in scaling up rail construction further?

**Introduction (5 minutes).** Trust setting and background to research purpose.

- We're doing work for KiwiRail to unpick:



- how rail construction is similar or different to other construction
- what the significant increase in rail construction in recent years after decades of low activity has meant for your business
- primary drivers of your future activity in rail construction, and associated opportunities and risks.
- Your responses will be entirely confidential and non-attributable. We intend to paraphrase your comments, where relevant in a non-identifiable way, in our report.
- This will feed into a document that will help KiwiRail better articulate the size and nature of construction, and the key opportunities and risks.

**Open-ended conversation (20 minutes).** Unpack their experience of rail construction and direct conversation to opportunities and risks.

- What is your role in rail construction?
- How is it different from other work you do?
- What did you have to change to do this work?
- How does your organisation maintain its competency with working in rail? (This is in reference to KiwiRail needing to constantly teach contractors about the requirements of working in rail. This is worse when there are big gaps between jobs).
- What were the barriers to getting things done? Explore labour and investment issues in particular.
- What would you do differently if you could do it all over again?
- How are you planning for future rail construction activity?

**Clean up (10 minutes).** Get more specific on what worked really well and what can improve.

- What do you think the role of sequencing projects means for you?
- What do you think about the certainty of planned future activity?
- What do you think about the volatility of rail construction activity?
- What labour issues matter most for you?
- What business investment issues matter most for you?
- What worked well in the ramp up in the last 5 years?
- Could you elaborate on what could have been done better?

**Wrap up (5-10 minutes).** Reveal that we're hoping to tease out the lessons of certainty and stability.



- Infrastructure people (not just rail) tell us that stop-start nature of spend is a barrier to investing more in people, capital and knowledge. Do you think this is true for rail construction?
- How would you sum up rail construction from your perspective?
- Is there anything else you think we should know?
- Is there any other person you think we should speak to?

-End-



## Appendix C: Summary statistics

	Rail construction (\$m)		Economic metrics (\$m)		Rail construction as a share of (%):			
	Current data	Historical estimates*	Public investment	GDP	Public total investment		GDP	
1996		51	3,493	96,236	1996	1.45		0.05
1997		66	3,899	101,101	1997	1.69		0.07
1998		106	5,056	104,815	1998	2.10		0.10
1999		56	4,808	106,826	1999	1.16		0.05
2000		22	5,430	113,229	2000	0.40		0.02
2001		24	4,322	119,839	2001	0.55		0.02
2002		27	6,690	128,712	2002	0.41		0.02
2003		24	7,176	135,181	2003	0.33		0.02
2004		84	7,557	144,502	2004	1.11		0.06
2005		119	8,211	154,559	2005	1.44		0.08
2006		135	9,917	162,937	2006	1.36		0.08
2007		193	9,137	172,004	2007	2.12		0.11
2008		282	9,737	186,673	2008	2.90		0.15
2009		170	11,297	189,406	2009	1.51		0.09
2010		386	12,186	194,306	2010	3.17		0.20
2011		444	12,422	203,342	2011	3.57		0.22
2012		57	12,341	213,025	2012	0.46		0.03
2013	66		11,415	217,489	2013	0.58		0.03
2014	134		12,647	232,792	2014	1.06		0.06
2015	130		13,343	242,670	2015	0.97		0.05
2016	97		14,125	255,340	2016	0.69		0.04
2017	134		14,366	271,271	2017	0.93		0.05
2018	191		16,029	290,709	2018	1.19		0.07
2019	136		16,199	306,231	2019	0.84		0.04
2020	469		17,630	323,447	2020	2.66		0.15
2021	640		18,781	327,795	2021	3.41		0.20
2022	688		21,272	357,338	2022	3.23		0.19

\* From a variety of sources with varying levels of quality and comparability; use with caution

Source: KiwiRail annual reports, CRL annual reports, Statistics NZ, Sense Partners

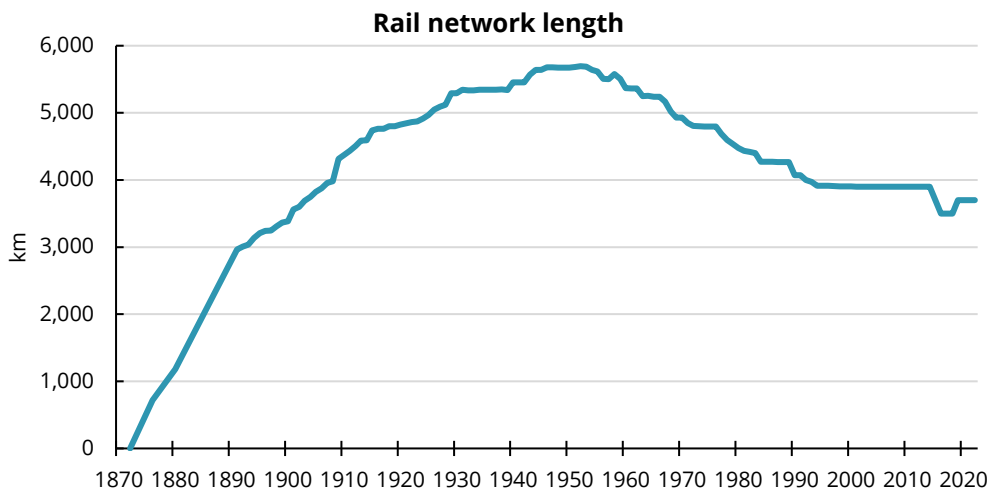




## Appendix D Long-term picture of rail investment

Figure 13 provides a sweeping historical perspective of rail investment eras in New Zealand: growth until a peak in the mid-1950s; decline until the late 1980s; stabilisation since early 1990s and renewed interest in investment more recently.

FIGURE 13: RAIL NETWORK LENGTH HAS DECLINED SINCE THE MID 1950S



Source: Te Ara, KiwiRail Integrated Reports 2013-2022, Sense Partners



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