NEW ZEALAND INFRASTRUCTURE COMMISSION
Te Waihanga

Making every dollar count

A review of the drivers of infrastructure costs in New Zealand

Te Waihanga Research Insights series

September 2026

Tewaihanga.govt.nz

New Zealand Infrastructure Commission / Te Waihanga

Te Waihanga seeks to transform infrastructure for all New Zealanders. By doing so our goal is to lift the economic performance of Aotearoa and improve the wellbeing of all New Zealanders.

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1. Cut to the chase

The enduring importance of infrastructure delivery costs

New Zealand faces significant infrastructure challenges. Our population and our demand for infrastructure is changing, our existing infrastructure needs renewing, and we face natural hazards and geological constraints. The National Infrastructure Plan suggests that to meet our infrastructure investment demand, investment will need to grow from around $20 billion per year in real terms in 2025 to $40 billion in 2055.

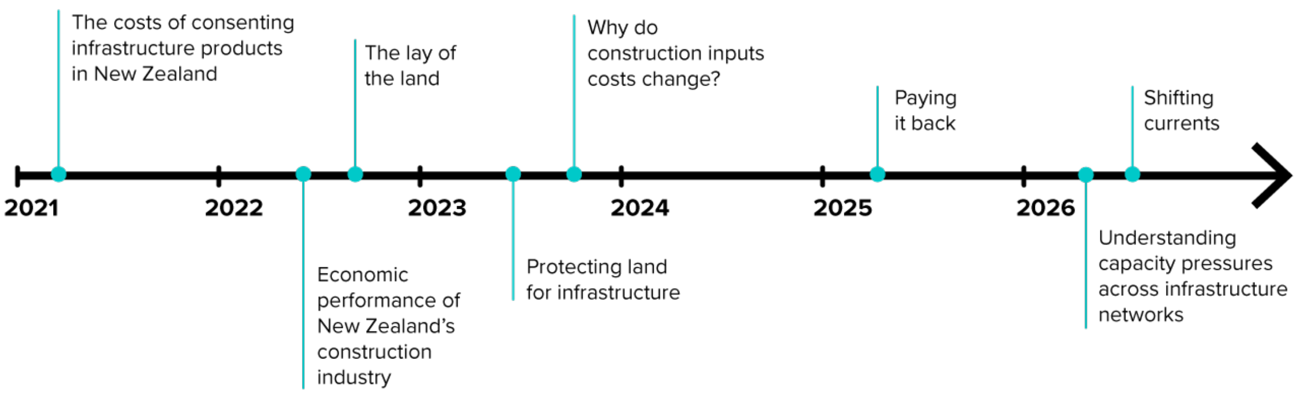
At the same time, tighter budgets and demographic changes are making these challenges harder to address. This means we need to make smarter choices about where and how we invest.

How much infrastructure our investments buys us, and at what quality, depends on a critical factor: infrastructure costs. Lower infrastructure delivery costs can increase the amount of infrastructure New Zealanders can enjoy, while maintaining affordability. But to bring down infrastructure costs, we first need to understand what drives them.

The importance of costs for our infrastructure ambitions is not a new topic for the New Zealand Infrastructure Commission, Te Waihanga. Both the 2022 Infrastructure Strategy and the 2026 National Infrastructure Plan make multiple recommendations with the goal of maximising the value of our infrastructure dollars we spend. Recommendation 46 in the 2022 Infrastructure Strategy explicitly recommends that the Commission undertake investigations for cost performance in the infrastructure sector. A key theme of the National Infrastructure Plan is getting greater bang for buck from our already elevated infrastructure investment levels.

We have written and commissioned at least eight *Research Insights* or related reports that directly or indirectly cover the issue of infrastructure costs in the past five years (Figure 1).

Figure 1: Research Insights relating to infrastructure costs



Source: Timeline of the New Zealand Infrastructure Commission's *Research Insights* relating to infrastructure costs (2026).

What we learned: Infrastructure costs are driven by input costs, productivity, and project scope

The purpose of this paper is to bring together what we know about the factors that shape infrastructure affordability, and to identify where decision-makers have the greatest ability to influence it.

The paper builds on our previous research by drawing together the existing body of work, identifying the key themes that emerge, and updating the evidence where new research is available. It also highlights gaps in our understanding and areas where further research could build our understanding.

Our previous work highlighted that infrastructure costs are a function of three factors: **input costs, productivity, and project scope/design.** Each of these drivers can impact infrastructure costs over different time horizons but also vary in the degree of control that decision-makers have. Table 1 highlights some of the key insights we found for these three factors (input costs, productivity, and scope/design), the speed at which they change, and the level of control decision-makers have over them.

Table 1: Key insights on drivers of cost growth

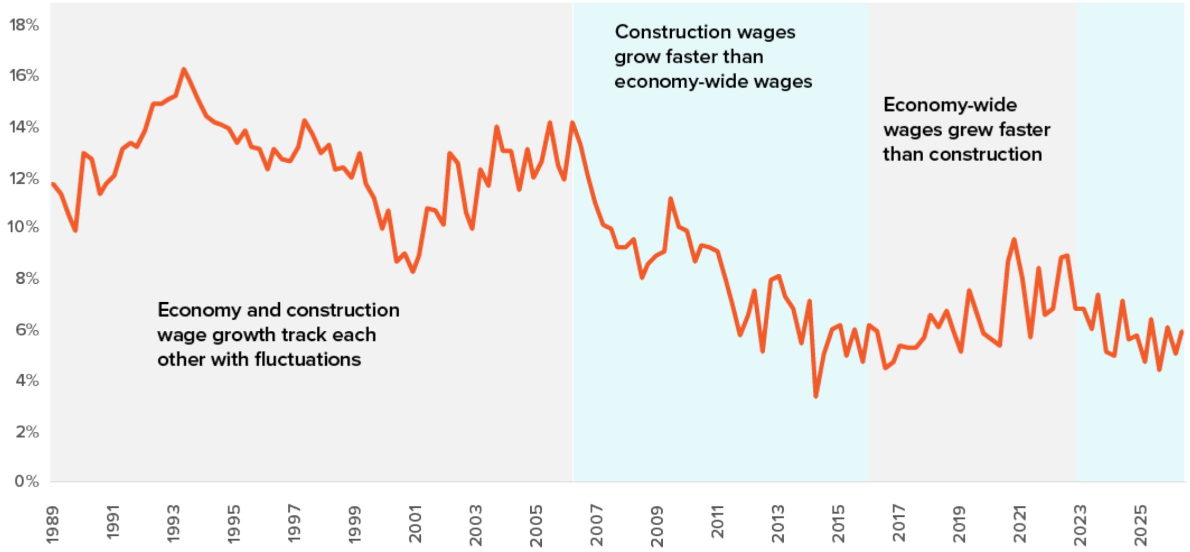
Factor	Key insights	How fast can it change?	How does NZ compare internationally?	How much influence do infrastructure providers or decision-makers have?
Input costs – labour	Construction wage growth is a function of the supply and demand for labour in the wider New Zealand economy.	Months	Construction wages in New Zealand are generally lower than other OECD countries.	Limited
Input costs – materials	Global commodity markets are the primary driver of prices for many key construction materials used in New Zealand. For goods supplied locally, like aggregates, supply constraints can drive higher costs.	Months	Concrete and steel costs, which are major material inputs for infrastructure, appear to be at similar or lower costs than other countries.	Limited
Productivity	Between 2000 and 2024, civil construction had slower productivity growth compared to other construction subsectors, likely leading to higher prices, greater workforce requirements, and potentially lower quality new infrastructure construction.	10 YEAR Decades	New Zealand is the middle of the pack for vertical and overall construction productivity compared to peer countries.	Medium
Project scope/design	Infrastructure networks with more bespoke components, such as transport, tend to display greater cost growth relative to those with standardised designs and less complexity (solar and wind farms). Robust project planning and selecting processes can limit cost increases from scope and design.	1 YEAR Years	Compared to other countries, more complex infrastructure projects, like road tunnels and bridges, tend to cost more in New Zealand.	High

Since our previous research, new information has come to light

The key findings on construction cost inputs have largely held true. Construction material prices have continued to track global prices. The Commission's research previously showed that increases or decreases to global oil prices pass through to New Zealand almost immediately, something that occurred as oil prices rose rapidly in the first half of 2026.

The gap between overall wages and construction wages narrowed a bit following a period of tight labour conditions in 2023 and 2024, but as the construction market softened, this momentum slowed (Figure 2).

Figure 2: Gap between real wages in construction and the overall economy



Note: The percentage on the y-axis indicates that real wages in the overall economy are larger than the real wages in construction. The higher the percentage the larger the gap. Wages adjusted to 2026 Q1 dollars using all groups CPI. **Source:** New Zealand Infrastructure Commission analysis of Stats NZ Quarterly Employment Survey and Consumer Price Index.

Construction productivity growth has lost steam, falling or flattening off between 2021 and 2024. Labour productivity in heavy and civil construction has continued to fall faster than other construction subsectors. It has fallen considerably since 2021 and unlike other construction subsectors it has not recovered. However, New Zealand does not appear to be alone in this trend, at least for vertical construction, as other countries also experienced declines in estimated productivity (Figure 3).

Figure 3: A multifactor productivity index for vertical construction in urban areas of 11 high-income countries, 2022 and 2024

Source: New Zealand Infrastructure Commission analysis of Turner and Townsend (2022 and 2024) data based on Langston (2013).

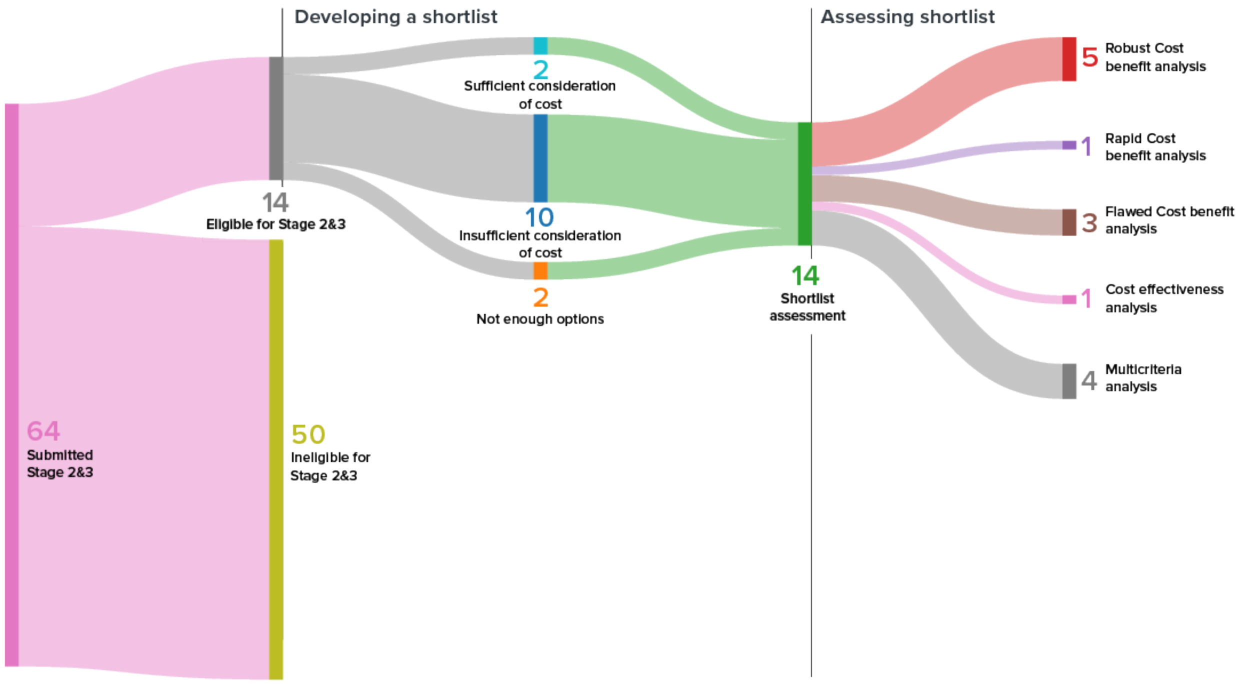
Since 2023, we've developed a stronger evidence base to understand how planning, scope, and design decisions drive infrastructure costs.

The Commission launched the Infrastructure Priorities Programme (IPP) in 2024, which independently assessed voluntary applications using a standardised investment-readiness framework. Across three rounds of assessments, we received nearly 150 proposals. Of those, we reviewed 64 proposals which were submitted at a stage where proposals needed to demonstrate that a wide range of options had been thoroughly considered. This requires using a robust method to assess the economic efficiency of options (Figure 4).[1]

What we found was proposals were often underdeveloped and had a bias towards solutions with larger scopes. These proposals tended to prioritise project benefits without giving equal consideration of project cost. For example:

- Only 14 of the 64 proposals included enough information for our team to complete an assessment at these stages, which suggests many submitters selected preferred options without using robust methods or information.
- Of these 14 proposals, only 2 used a robust process to narrow a longlist to a shortlist with sufficient consideration of project costs. In several cases, benefits were weighted much more heavily than costs, which in turn risked prematurely excluding potentially viable lower cost options.

Figure 4: Value for money assessments for Stage 2 and 3 proposals in IPP rounds 1 through 3[2]



Note: CBA denotes 'Cost Benefit Analysis'. CEA denotes 'Cost effectiveness analysis'. MCA denotes 'Multicriteria analysis'. **Source:** New Zealand Infrastructure Commission analysis of IPP assessment reports.

This finding is consistent with what we know about complex projects in New Zealand with wide scopes. While we tend to have similar unit costs to deliver some simpler forms of infrastructure like wind farms, transmission lines, and other vertical infrastructure, complex projects like urban motorways, underground rail and road tunnels tend to cost much more.[3]

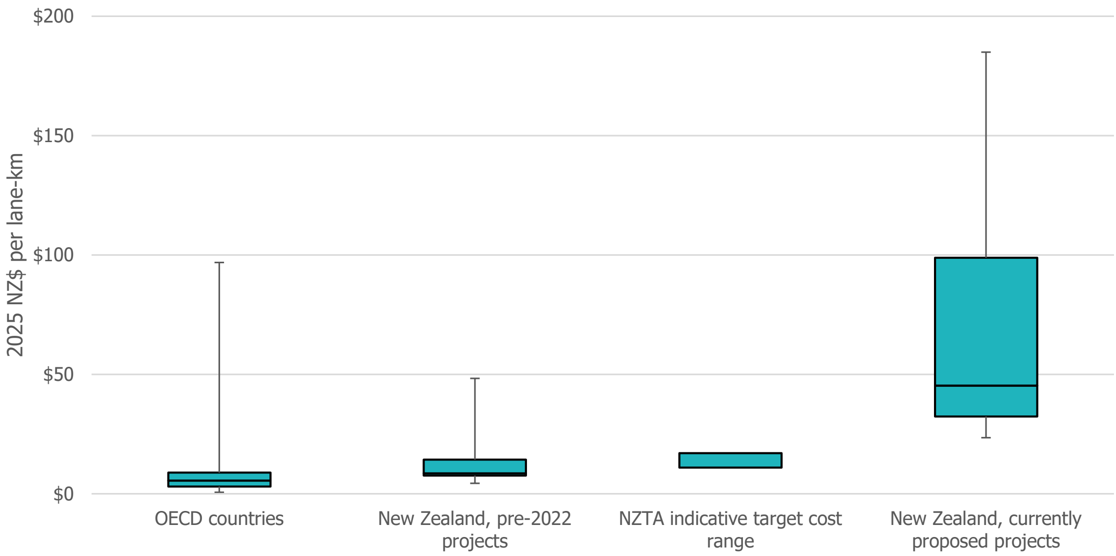
[1] The Commission is no longer accepting IPP applications while we focus on a new assurance process announced by the Government in April 2026. The Commission is working through the details of this new system with the Treasury and will provide more information over the coming months.

[2] The IPP has three stages. Stage one assesses a Strategic Alignment submission that identifies a problem or opportunity that may require an infrastructure solution. Stage two assesses an indicative/Programme Business Case submission that identifies and assesses a set of options for addressing the problem or opportunity. Stage three assesses a Detailed Business Case submission that identifies a preferred option for addressing the problem or opportunity. Infrastructure Priorities Assessment Framework | Te Waihanga

[3] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga

Complex project cost premiums have appeared to have grown more recently. New Zealand hospital upgrade costs have surpassed international benchmarks, with the weighted average cost per square metre of floorspace being around 20% greater than international benchmarks.[4] Currently proposed large major road projects have unit costs that sit well above the historical unit costs of state highway projects, internal cost benchmarks, and international benchmarks (Figure 5).

Figure 5: Inflation-adjusted per-kilometre costs to build motorways and expressways in New Zealand and other countries



Source: 'Understanding capacity upgrade pressures across infrastructure networks'. New Zealand Infrastructure Commission. (2026). Panel A: Commission re-analysis of project cost data from New Zealand Infrastructure Commission (2022) to adjust costs to 2025 values, plus analysis of NZTA indicative target costs and NZTA information releases on current Roads of National Significance (RoNS) projects.

These pieces of evidence suggest that project scope and design factors could be a leading cause of high infrastructure costs for large-scale projects. We also know that it is the cost driver that decision-makers' actions can have immediate effect.

However, it is also the factor where our evidence base could be improved the most.

...but more research is needed

Our previous research on the factors affecting project scope have largely been at a macro level or on a single factor of cost over time. Our experience with the Infrastructure Priorities Programme has highlighted that project-specific factors play a significant role. This suggests a need for greater project-level research to breakdown the drivers of cost growth that we have observed in recent years. A micro-level view is required to understand how scope elements such as regulatory standards and institutional capacity contribute to the cost of projects.

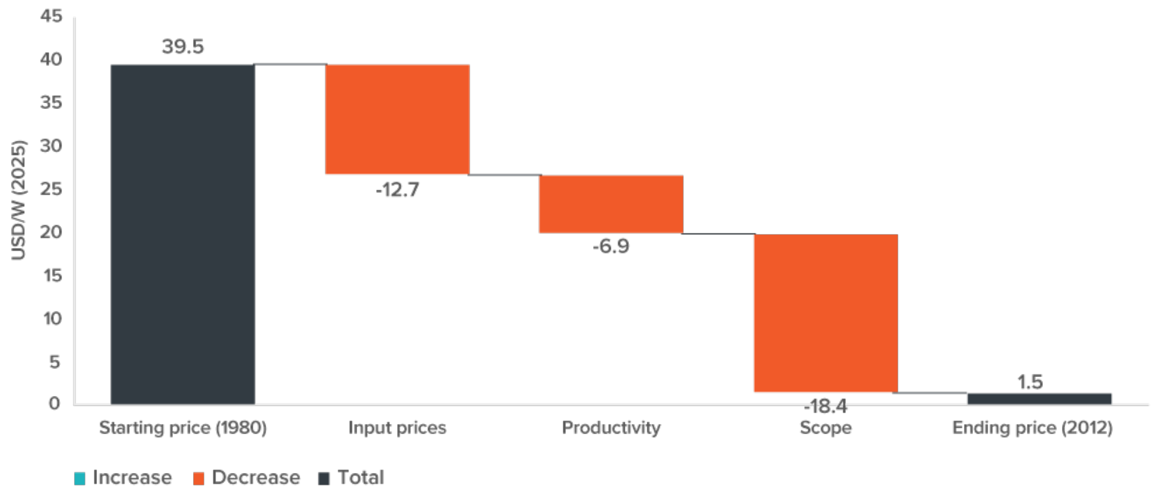
Rising infrastructure costs has felt like an inevitability over the past 20 years, but it isn't necessarily the case across all types of infrastructure. For instance, over the last several decades, the unit costs of solar panels and wind turbines have actually fallen in inflation-adjusted terms. This has been broad-based, with improvements in input prices, productivity, and design choices all moving together to bring prices down (Figure 6).

Learning the lessons from these examples could give us the path to delivering our future infrastructure ambitions in a more cost-effective way.

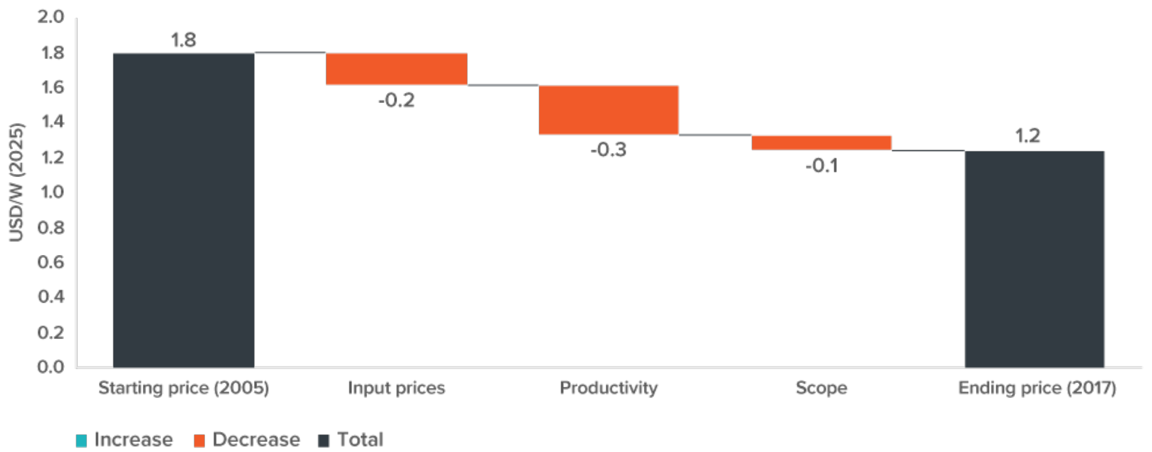
[4] Understanding capacity upgrade pressures across infrastructure networks | Te Waihanga

Figure 6: Drivers of price changes in solar and wind technologies

Panel A: Drivers of changes in photovoltaic panel prices, 1980–2012



Panel B: Drivers of changes in wind turbine prices, 2005–2017



Source: New Zealand Infrastructure Commission analysis of data from Elia et al (2020) and Kavlak et al (2018). Data adjusted to 2025 USD with U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers: All Items in U.S. City Average [CPIAUCSL].

2. Introduction

We need to get more for our infrastructure dollars...

New Zealand has long understood the value that infrastructure services provide – their economic and social benefits are foundational for our wellbeing. As a result, we have invested a large share of our gross domestic product (GDP) in building out our networks over the last 150 years.

In recent years, our public capital investment has been among the highest in the OECD, investing more on infrastructure than many comparable high-income countries on a relative basis.[5] Yet, the outcomes we get from our infrastructure don't seem to be commensurate with our spending.

Across all infrastructure networks, we are ranked towards the bottom of OECD countries for public capital investment efficiency.[5] Comparing New Zealand's infrastructure networks against our peer countries, we achieve worse outcomes in terms of the quantity and quality of infrastructure we get per dollar spent (Figure 7). On a sector-by-sector level, we seem to have high levels of investment and average to below-average quality outcomes, even after controlling for things like our sparse populations and rugged terrain.

Figure 7: Comparing New Zealand's infrastructure networks against our peer countries

NZ difference from comparator country average
(based upon simple unweighted average of multiple measures)

Network	Investment levels	Quantity of infrastructure	Usage	Quality	Comparator countries	Notes
Road	+34%	-13%	-33%	-13%	CZE, CAN, FIN, SWE, ISL, NOR, ESP	High investment levels, low usage, high amount of fatalities on the network
Rail	-64%	-43%	-23%	-90%	CHL, GRC, JPN, ESP, FIN, SWE, ISL, NOR	Low investment levels, low usage (both passenger and freight), high emissions
Electricity	-3%	+29%	-46%	-12%	COL, CRI, CHL, CAN, FIN, SWE, NOR, ISL	Large transmission network, relatively high frequency and length of outages
Health	-25%	-10%	-2%	-13%	UK, AUS, SWE, DEN, ISL, NOR	Low amounts of some medical equipment, some higher wait times, and older hospitals
Education	+1%	-10%	+6%	+4%	CHL, FIN, AUS, ISL, NOR, USA, IRL	No clear deficits or shortages
Telco	+28%	-12%	+3%	-4%	COL, CRI, CHI, CAN, FIN, SWE, ISL, NOR	High investment levels, developed fixed broadband but underdeveloped mobile broadband
Water	+70%	-3%	+99%	+9%	CHL, GRC, ESP, CZE, CAN, FIN, SWE, ISL, NOR	High levels of investment, very high usage, average levels of leakage

Source: 'Benchmarking our infrastructure: Technical report'. New Zealand Infrastructure Commission. (2025).

...because the future investment challenges are significant

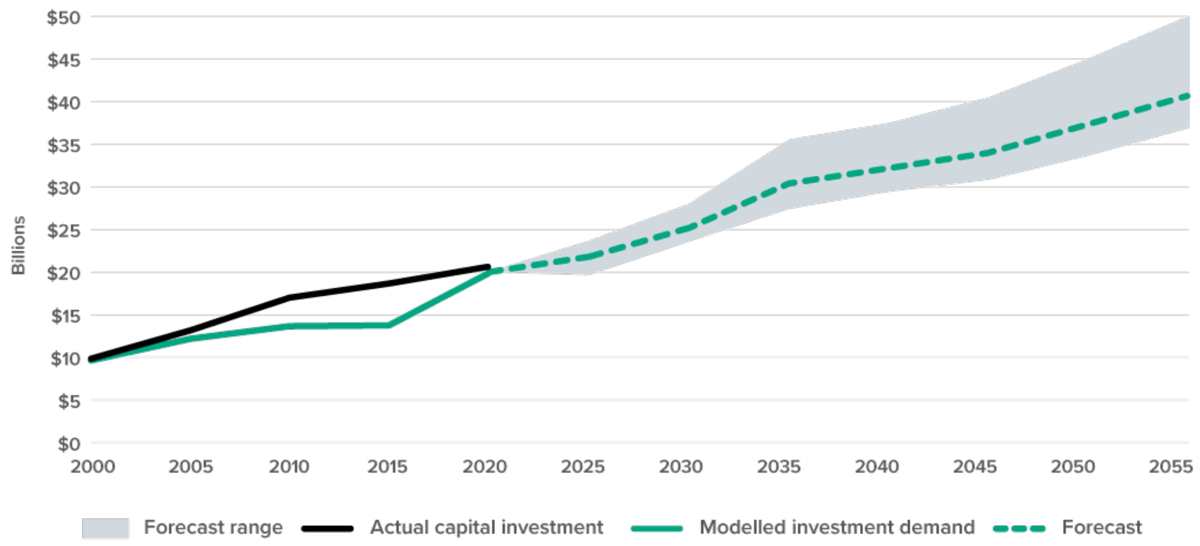
As part of the National Infrastructure Plan, the Commission produced Forward Guidance for infrastructure investment for the next 30 years. These projections are designed to show how macro-level drivers of demand are expected to lead to more, or less, infrastructure investment over time. It provides

[5] 'Public capital investment' refers to investment by central government and subnational governments, including some non-infrastructure investment, but excludes investment by private infrastructure providers. As a result, it is close to, but not the same as, more comprehensive measures of infrastructure investment that we have for New Zealand. Based on data from the International Monetary Fund.

an independent view of sustainable and affordable investment levels to help us prioritise funding between sectors in the medium and long term.

The challenge is significant. We expect that to meet investment demand, investment will need to rise from about $20 billion per year in real terms today, to over $40 billion in the 2050s (Figure 8).

Figure 8: Total infrastructure capital investment demand in Forward Guidance, 2025–2055



Source: 'Forward Guidance on Infrastructure Investment'. New Zealand Infrastructure Commission. (2026).

Our Forward Guidance is an investment forecast in dollar terms. It predicts how much New Zealanders will be willing to pay for infrastructure and its services, rather than other things, for the next 30 years. It does not, however, predict exactly how much infrastructure we get for that spending. For example, it tells us that New Zealanders will be willing to spend just over $1 billion a year building out and renewing our rail network. It does not tell us how many kilometres of track or trains sets that can buy us.

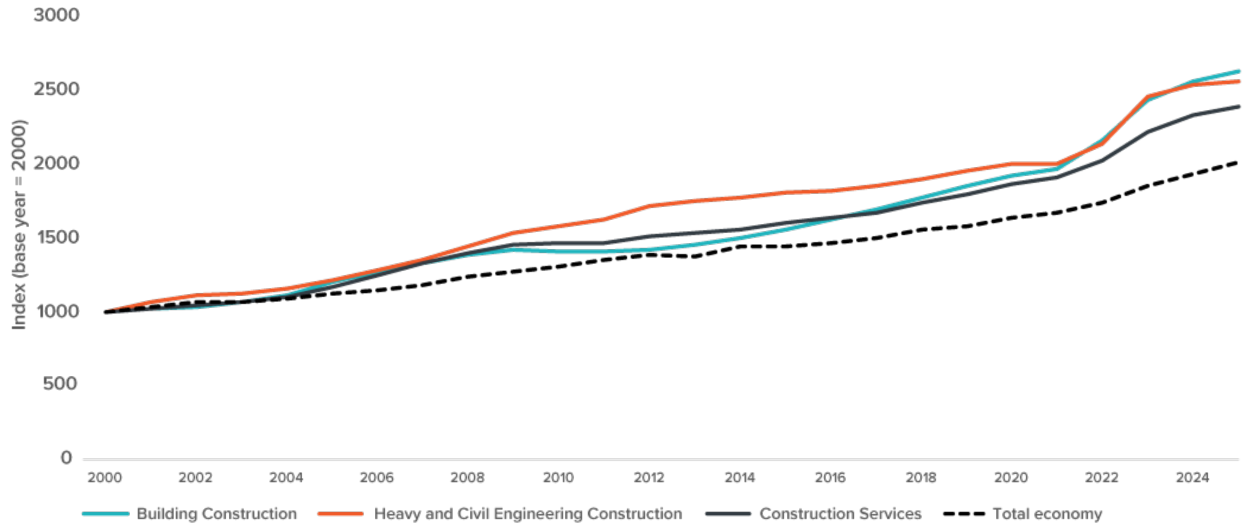
This is why infrastructure costs are important. Meeting our needs in the face of future challenges – including an ageing population and constrained public finances – will require stronger investment discipline and improved delivery efficiency. To bring unit costs down and deliver more infrastructure per dollar spent, we need to understand why infrastructure currently costs what it costs to deliver in New Zealand.

The National Infrastructure Plan contains recommendations for how New Zealand can improve the way it plans, funds, and prioritises new capital projects, while bolstering asset management practices to ensure we look after what we already have. But while these are important steps, understanding what is specifically driving cost is equally important to meeting long-term needs.

Infrastructure construction prices have outpaced prices in the overall economy for over 20 years

Infrastructure has long felt like it is just getting increasingly expensive. And for much of the last 25 years, that has been the case. Prices for infrastructure have indeed risen faster than prices in the whole economy (Figure 9).

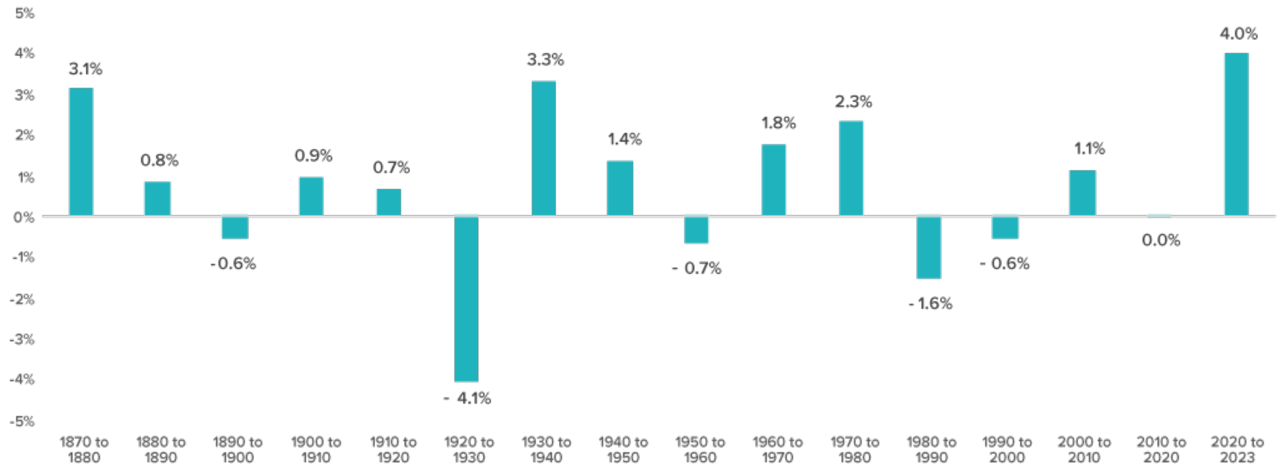
Figure 9: Growth in output prices in construction industries, relative to the whole economy



Note: Years are March year ended. **Source:** New Zealand Infrastructure Commission analysis based on Stats NZ producer price index output price indices for NZSIOC level 3 industries and Stats NZ nominal and chain volume GDP.

However, this 20-year trend is not necessarily a truism. Slower growth in infrastructure prices is possible.[6] There have been periods of time where infrastructure price growth has been slower than the growth in overall prices: during the 1920s, 1950s, 1980s and 1990s (Figure 10).

Figure 10: Average annual growth in real (inflation-adjusted) infrastructure prices from 1870s to 2023



Source: 'Nation building: A century and a half of infrastructure investment in New Zealand'. New Zealand Infrastructure Commission. (2025). New Zealand Infrastructure Commission analysis of data from Mulcare, Stats NZ National Accounts, and NZIER Data1850.

Note: This chart reflects changes in infrastructure prices, rather than unit costs.

The Commission's research over the past few years has sought to identify what decision-makers can do reduce growth in infrastructure prices so we can get better bang for our infrastructure dollars.

The Commission has developed a large evidence base on the drivers of infrastructure costs

Since our establishment in 2019, the Commission has carried out research to identify where decision-makers have the greatest ability to contain rising infrastructure costs. The research was motivated by a

[6] Note, this chart reflects changes in infrastructure prices, rather than unit costs.

desire for New Zealand to achieve improved investment efficiency, leading to more and better-quality infrastructure per dollar spent.

In 2022/23, the Commission set out a conceptual framework for understanding what drives infrastructure costs. The framework describes cost as a function of three elements: **construction input costs, construction productivity, and project scope.**

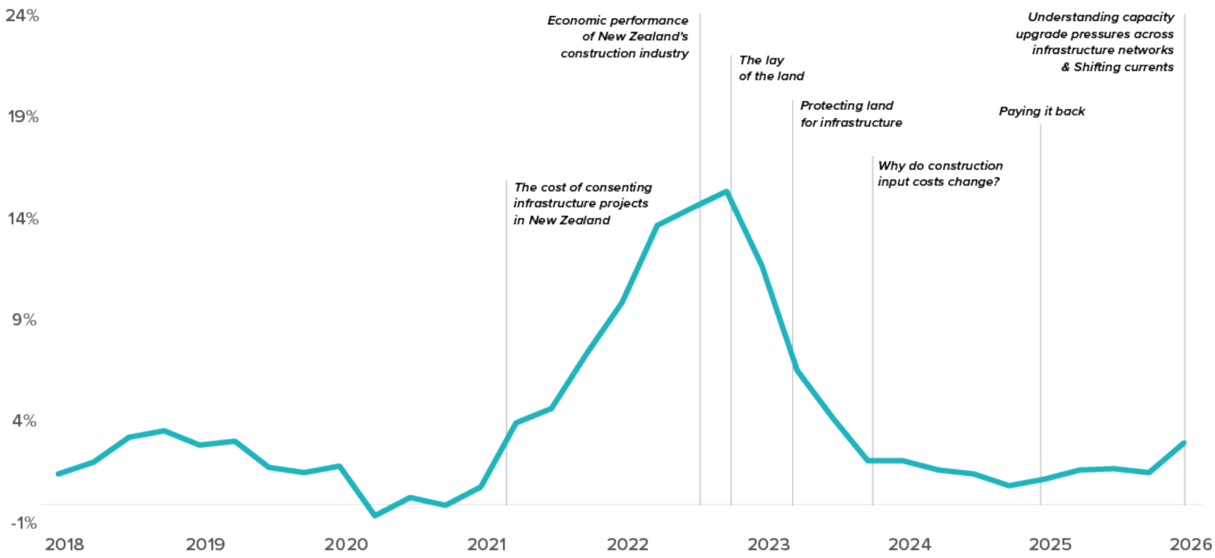
We have continued to monitor developments and collect data across these three areas, as well as broadening our evidence base by publishing further papers relevant to infrastructure costs. Examples include research on the cost of consenting infrastructure projects, the benefits of advanced land protection, and a benchmarking exercise comparing New Zealand against international best-practice guidance on selecting and planning infrastructure projects.

Economic conditions have changed since much of this research was published

The conceptual framework we derived in 2022/23 was at a time of significant upheaval in the construction industry and the overall economy. In 2023 the New Zealand economy was cooling after a period of multi-decade high inflation.

Since the original research was undertaken, inflation has eased, construction activity has softened, major reforms have been proposed or implemented across the infrastructure system, and new evidence has become available (Figure 11).

Figure 11: Year-over-year change in the civil construction capital goods price index, 2018–2026



Note: Lines denote specific New Zealand Infrastructure Commission reports with research on infrastructure costs. **Source:** Capital goods price index, Stats NZ.

Moreover, compared to 2022 and 2023, the National Infrastructure Plan gives us a much better understanding of the scale of future investment demand, the infrastructure projects currently in planning or delivery, and what needs to change for the infrastructure sector to be able to cost-effectively maintain and renew existing assets while also addressing capacity pressures.

This paper canvasses our work, updates it, and considers future research

This paper covers our previous work, structured around the three cost drivers summarised in 2023: **construction input costs, construction productivity, and project scope.**

It revisits our work in light of new developments. Each section summarises key findings from the previous research, provides updated data where possible, and describes relevant developments that have occurred since 2022/23.

By examining the factors that affect delivery costs, this research aims to identify gaps in the research and highlight areas where decision-makers have the greatest ability to influence infrastructure affordability.

As the National Infrastructure Plan makes clear, containing infrastructure cost inflation and avoiding overbuilding relative to demand will be crucial if New Zealand is to achieve its infrastructure ambitions. Cost inflation is not a given. The goal of this paper is to set a baseline of evidence that identifies areas where decision-makers can take action to reduce costs or slow future cost growth.

3. Input costs: How do construction input costs move?

It takes a lot of labour and materials to build an infrastructure project. For example, the $683 million Christchurch stadium required 32,700 cubic metres of concrete, nearly 16,400 tonnes of steel and around 2.4 million hours of labour.[7] The scale of these inputs illustrates why even modest changes in wages, material prices or equipment costs can have significant effects on overall project costs.

There are four main types of inputs for an infrastructure project:

- **Labour inputs:** wages paid directly to construction workers and other specialised types of labour, such as project managers or civil engineers, some of whom work for the client, some of whom work for the main contractor, and some of whom work for subcontractors.
- **Material inputs:** the cost of materials such as structural steel, concrete, timber, and aggregates.
- **Machinery and equipment inputs:** the costs of physical capital used in construction such as cranes, tunnel boring machines or excavators.
- **Land:** the cost of leasing or purchasing the land needed to build a project.

The composition of costs varies across project types and individual projects, reflecting differences in project scope decisions, physical conditions and short-term price movements. For example, based upon data from Australia, for an average major road project:[8]

- Labour costs make up roughly one-third of total project costs. Planning/design and project management labour accounts for 13% of this, while construction labour accounts for 20%.
- Material costs make up roughly 40% of total project costs. Bulk commodities (concrete, asphalt, and aggregates) make up 32%, while other materials account for the remaining 8%.
- Equipment costs make up roughly one-fifth of total project costs.
- Land costs make up around 7% of total project costs, although this can vary substantially depending on the context, and in some cases exceed 20% of total project costs.

3.1. What we know

This section summarises what we know about construction input costs, drawing on research from the Commission published in 2022 and 2023.

New Zealand's input costs appear to be middle of the pack

Based upon our research, New Zealand has similar construction input costs to other high-income countries. International input cost benchmarking carried out by the Commission in 2022 compared New Zealand to 10 other countries. We found that New Zealand had lower construction wages than the median comparator country, but higher costs for equipment, bare land, and concrete. Overall costs for non-residential and residential buildings, or vertical construction, were similar.[9]

Land prices can significantly increase the cost to build infrastructure, particularly in valuable urban locations. In densely populated areas, horizontal infrastructure such as roads or rail projects may need to be elevated on viaducts or tunnelled and buried. Both options increase cost. Buying land at current

[7] The making of Christchurch's glitzy new stadium: How much it cost, why it took 15 years and the key figures behind it | The Press
[8] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga
[9] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga

market prices in an urban or suburban context could potentially account for half of the total project cost, compared to 5% in rural locations.[10]

New Zealand does not appear to be disadvantaged by higher construction input costs relative to other developed countries. There may be cost premiums in some areas, but these are largely offset by lower labour costs. If certain types of infrastructure projects are more expensive to deliver in New Zealand relative to peer countries, the benchmarking research suggests this cannot be explained by input costs alone.

Global factors play a significant role in material prices

International commodity markets are the primary driver of prices for many construction materials used in New Zealand infrastructure projects. This places project funders and construction firms in a reactive position. They can attempt to secure advance delivery contracts when prices are favourable, but beyond that they have little control over prices.

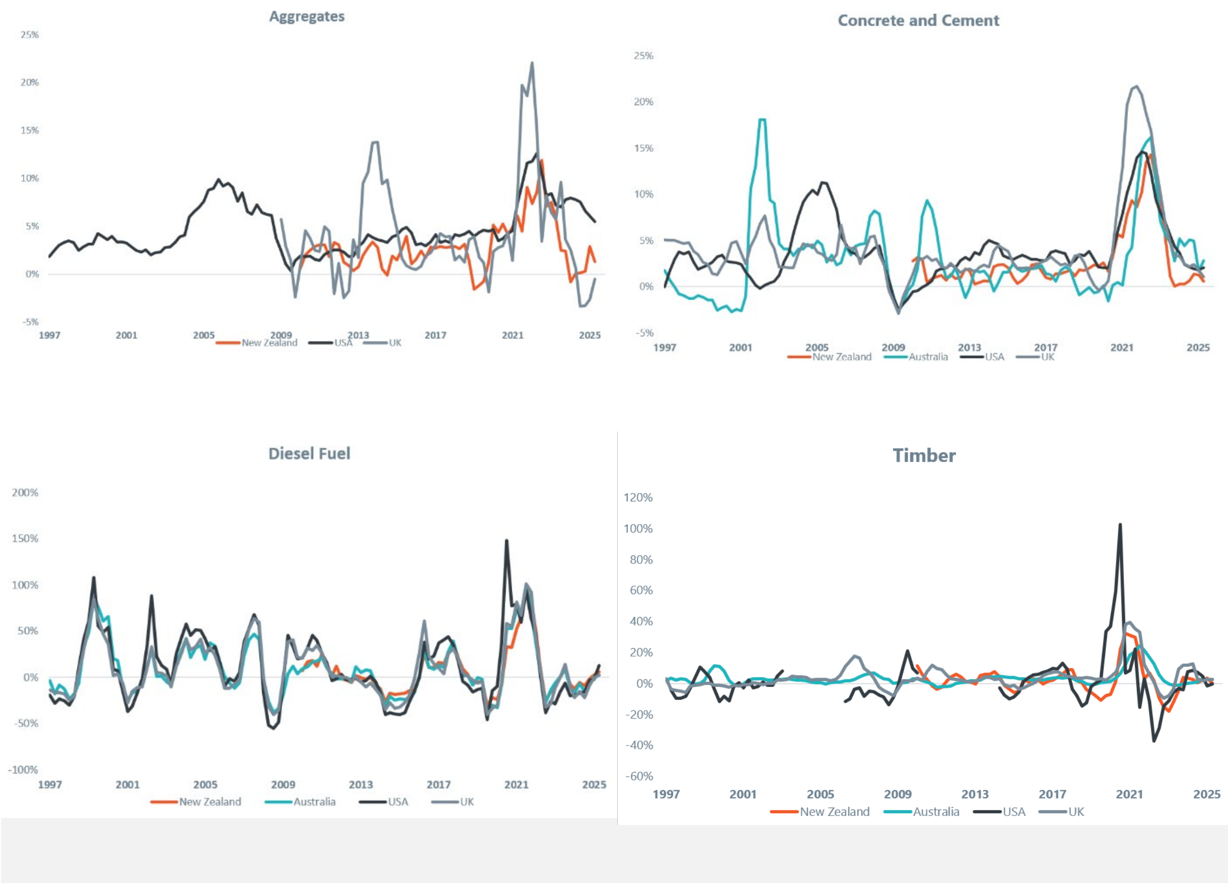
Our research identified that the five most important construction materials for infrastructure by value are: structural steel, aggregates, concrete and cement, diesel fuel, and timber. Collectively, they account for around three-quarters of material inputs needed for infrastructure construction.[11]

Cement and aggregates tend to be produced locally. For these inputs, local supply pressures are more relevant for prices. Proximity to a project site is particularly important for aggregates. Transport costs account for a significant share of their delivered price, as they are heavy and relatively low value.[12]

New Zealand imports large quantities of steel, diesel, and timber. These are tradeable goods. For more tradeable materials, international commodity prices are quickly reflected in New Zealand prices. Our analysis of price movements for these commodities in New Zealand mirrored the trends from Australia, the United Kingdom, and the United States, emphasising the international pricing dynamic (Figure 12).

[10] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga
[11] Why do construction input costs change? | Research & insights | Te Waihanga
[12] Infrastructure resources study | Te Waihanga

Figure 12: Year-over-year price fluctuations in various construction inputs across countries



Note: Structural steel graph not updated due to the capital good price index time series used in the previous research ending in September quarter 2022. **Source:** Stats NZ capital goods price index and producer price index, US Bureau of Labor Statistics producer price index: commodity series, Australia Bureau of Statistics producer price index, UK Office of National Statistics producer price index time series, and New Zealand Infrastructure Commission analysis.

Modelling carried out for our previous research found a 1% increase in world commodity prices is estimated to lead to a roughly 0.6% increase in New Zealand prices for steel, diesel, and timber.[13] We also found that New Zealand prices tend to reflect global prices quite rapidly: if the prices for these products increases globally, we should expect New Zealand prices to increase within three months.

Finally, material prices can be highly volatile making it difficult to plan for cost estimation. In the 53 quarters from 2010 to 2022, quarterly price movements greater than 2%, or 8% per year, occurred in almost half of all quarters.[14] These movements were more pronounced post-Covid, when supply chain disruption and high demand pushed prices up and caused project cost overruns.

Domestic factors are important for understanding labour costs

As discussed, relative to international comparators, our labour costs do not appear to be significantly out of line. Our research also has explored the implications of wage growth for construction projects and sought to examine what causes movements in wages over time.

A key insight from that research is that wage growth in the construction sector appears to be function of supply and demand for labour in the New Zealand economy as a whole, rather than factors specific to

[13] Why do construction input costs change? | Research & insights | Te Waihanga
[14] Why do construction input costs change? | Research & insights | Te Waihanga

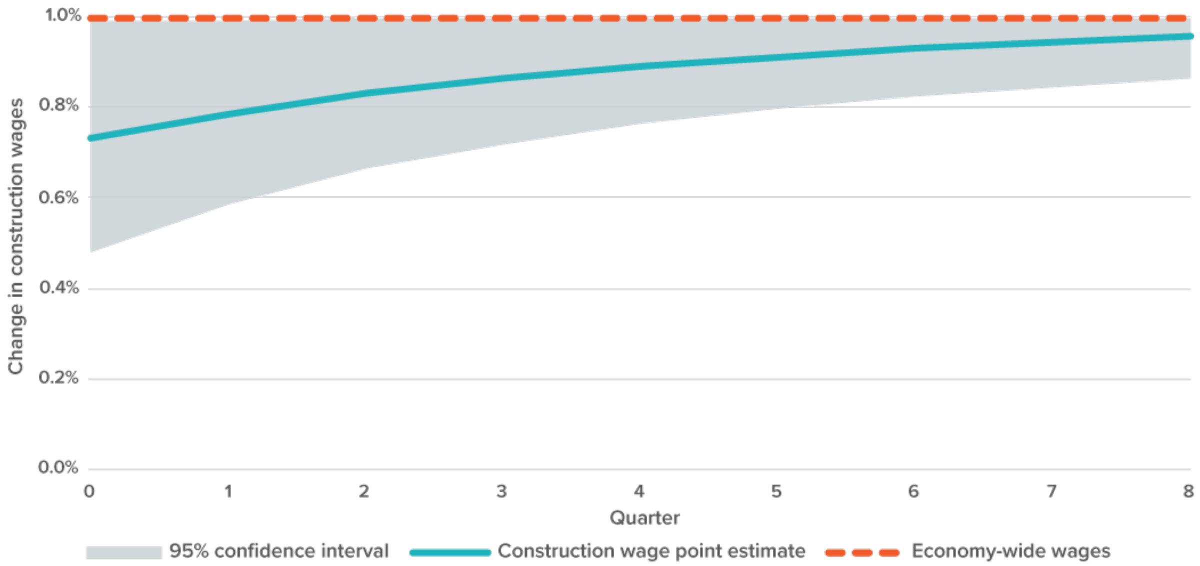
the construction market. Our research shows evidence of a long-run equilibrium, with construction wages closely tracking economy-wide wage growth for at least the past 25 years.[15]

During periods of high demand for infrastructure, construction firms report difficulty attracting enough skilled workers. This leads to competition and upwards pressure on labour costs. In the short term, construction sector wage growth may outstrip economy-wide wage growth, but our research suggests any divergence is temporary and tends to resolve within a matter of years, not decades.

Figure 13 illustrates modelling undertaken for our previous research suggesting, when economy-wide wages rise by 1%, wages in the construction sector rise by 0.73%.[16] The relationship is strong but not perfect, as the increase is not fully or immediately passed through.

Frictions, such as the time required for new workers to meet occupational licensing requirements, or more stringent immigration settings, may explain this lag effect. However, as the Figure 13 illustrates, construction wages tend to converge to their long-run relationship with economy-wide wages over the course of eight quarters.

Figure 13: Change in construction wages following a 1% increase in economy-wide wages



Source: 'Why do construction input costs change? The role of global and local factors'. New Zealand Infrastructure Commission. (2023).

Further, our research found that growth in wages in Australia did not seem to impact *changes* (rather than levels) in construction wages in New Zealand. Other research has found that overall relative economic performance to be a driver of overall immigration between Australia and New Zealand.[17]

The implication for decision-makers is that long-run cost growth driven by increases in construction sector wages is largely outside their immediate control. Short-term interventions are possible, however, when there is an imbalance between supply and demand. In these instances, interventions may include support for apprentice and training programmes, or increased visa availability for skilled workers.

[15] Why do construction input costs change? | Research & insights | Te Waihanga
[16] Why do construction input costs change? | Research & insights | Te Waihanga
[17] Jed Armstrong and Chris McDonald, 'Why the drivers of migration matter for the labour market'. *RBNZ analytical note AN2016/02*, available at https://www.rbnz.govt.nz/hub/publications/analytical-note/2016/an2016-02

Planning and design are a material part of overall infrastructure cost

Building infrastructure doesn't happen overnight. Plans need to be made, land acquired, and consents sought. Only once these are completed can construction begin. Our research has highlighted that the size of this phase, which is almost entirely labour, is an important part of overall infrastructure costs.

In 2023, the Commission released a baseline study on the infrastructure workforce capacity in New Zealand. Part of the report identified the various components of labour cost as a share of the total project costs.[18]

One of the ways the report broke down the share of labour was by project stages: planning and design, construction, and maintenance. Labour associated with the planning and design stage, which includes design, consenting, and property and procurement, made up between 10–14% of the total project cost for 22 work types (Table 2).[19]

Table 2: Workforce demand model input: Project labour costs breakdown

	Percentage of total project cost associated with labour in the following stages	
	Planning and Design	**Construction**
Lower Bound	**10%**	**24%**
Median	**12%**	**32%**
Upper Bound	**14%**	**36%**

Note: These numbers are as of the infrastructure workforce capacity baselining study 2023. The table shows the minimum, median and maximum of the 22 work types. **Source:** 'Infrastructure workforce capacity baselining study: Technical introduction to modelling methodology and calibration'. Scarlatti and Alta Consulting prepared for the New Zealand Infrastructure Commission. (September 2023).

Within the planning and design phase, depending upon the infrastructure:

- Design itself makes up 50–80% of the labour in the planning and design phase, translating to between 6–10% of the total project.
- Consenting makes up 15–30% of the labour in the planning and design phase, translating to between 2–4% of the total project cost. A separate piece of research by the Commission identified consenting as totalling about 5.5% of total project costs on average.[20]
- Procurement makes up the remaining 5–25% labour costs in the phase, translating to 1–4% of total project costs.

By contrast, labour costs of the construction phase make up between 24–36% of the total project costs depending on the type of infrastructure (Table 2). Some of the tasks included in the construction labour component are such things as traffic management, laying pipes, constructing buildings and installing electrical equipment.

[18] The report was prepared for the New Zealand Infrastructure Commission by Scarlatti and Alta.
[19] The 22 work types are airports, communication networks, energy generation, energy transmission and distribution, gas generation, land development and general civils, liquid fuels generation, port, rail, roads – improvements, roads – new, stormwater, waste, water protection, water storage, water transmission and distribution, water treatment, commercial facility, public facility, education and research facility, other facility and social facility.
[20] 'The cost of consenting infrastructure projects in New Zealand'. Sapere, commissioned by the New Zealand Infrastructure Commission. (July 2021).

3.2. What has changed?

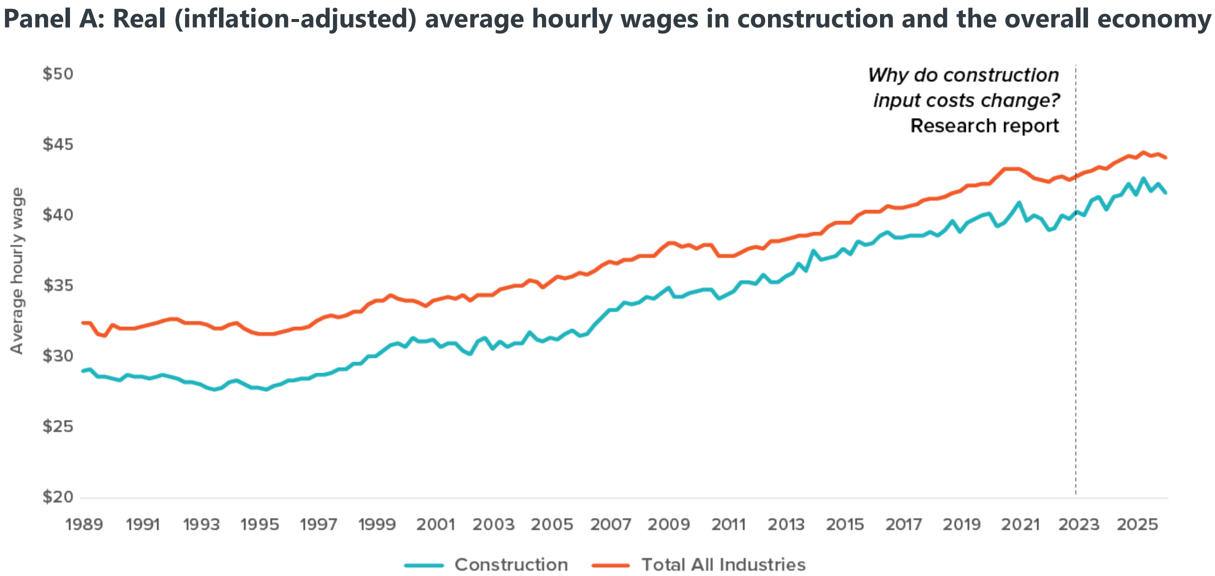
This section provides an overview of construction labour and material cost trends since 2022/23, including updates to some of our previous research inputs.

Labour capacity constraints have eased after a period of tightness

The post-Covid period was characterised by high demand, a tight labour market, disrupted supply chains, and multi-decade high inflation. The Reserve Bank of New Zealand responded with a rapid monetary tightening cycle, raising borrowing costs. These pressures led to rising construction costs and budget overruns, which occurred on high-profile projects such as the City Rail Link.[21]

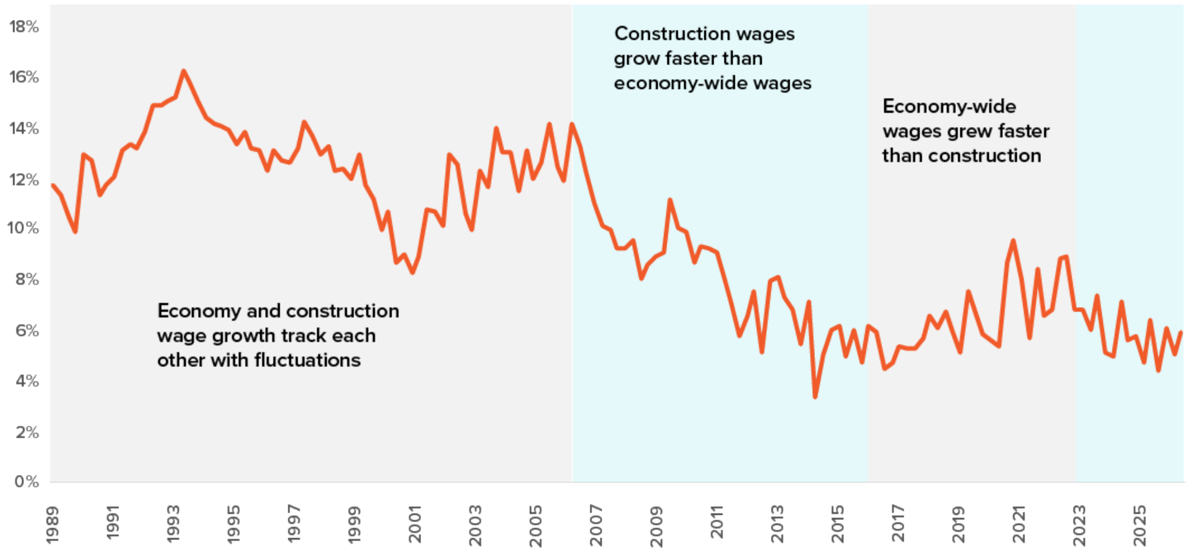
At the time, construction firms were reporting a high degree of difficulty finding labour. As a result, over that period, the gap between construction wages and economy-wide wages began to narrow, as predicted by our research. Since the publication of our research, the difference between economy-wide wages and construction wages narrowed to around 6%, which is the lowest it's been on a consistent basis since roughly 2016 (Figure 14).

Figure 14: Construction and economy-wide wages since 1989



[21] Benefits and costings — City Rail Link

Panel B: Gap between real wages in construction and the overall economy



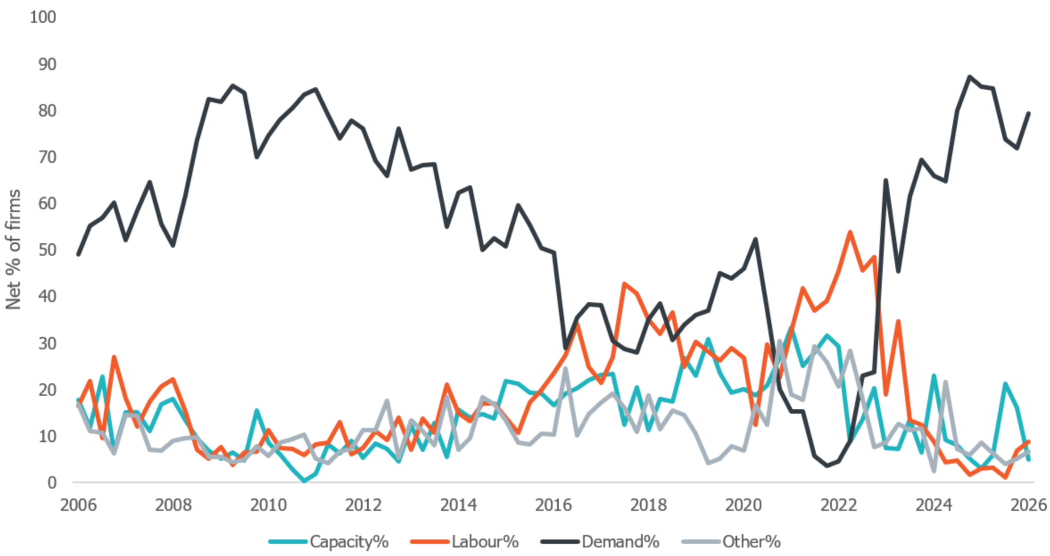
Note: The percentage on the y-axis indicates that real wages in the overall economy are larger than the real wages in construction. The higher the percentage the larger the gap. Wages adjusted to 2026 Q1 dollars using all groups CPI. **Source:** New Zealand Infrastructure Commission analysis of Stats NZ Quarterly Employment Survey and Consumer Price Index.

The recent narrowing of the wage gap between construction and the overall economy continues a broad trend observed since 2006, with a brief pause from 2016 through 2022. This is despite firms not necessarily reporting tight labour conditions over this period. This could reflect rising relative quality of construction workers (greater training or experience) over time. This period also coincides with a period of accelerating labour productivity growth compared to the overall economy (see Figure 21 below in the next section).

The infrastructure sector is experiencing markedly different conditions at present. As of June 2026, economy-wide unemployment was at 5.6%,[22] placing downwards pressure on wage growth relative to the tight post-Covid labour market. Since 2023, the construction sector has been reporting subdued demand for infrastructure and other building activity. With demand down, the proportion of building firms reporting difficulty finding labour as their primary concern has fallen to very low levels (Figure 15).

[22] Unemployment rate. Retrieved 7 August 2026, from https://www.stats.govt.nz/indicators/unemployment-rate/

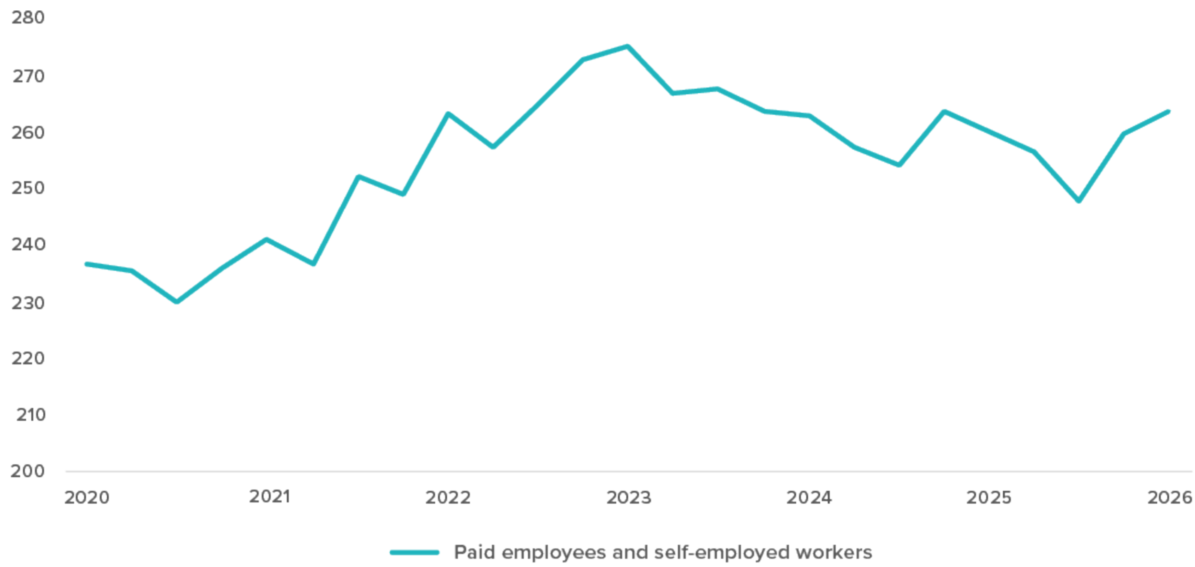
Figure 15: Factor constraints faced by building firms



Note: 'Other' includes supplies, finance and other categories. **Source:** Seasonally adjusted Quarterly Survey of Business Opinion. NZIER. (2026).

Overall employment in construction reflects this downturn. While the sector experienced real-wage growth post-Covid pandemic, overall employment in 2026 is lower than it was in 2022 (Figure 16).

Figure 16: Persons employed in the construction sector, 2020Q1–2026Q1

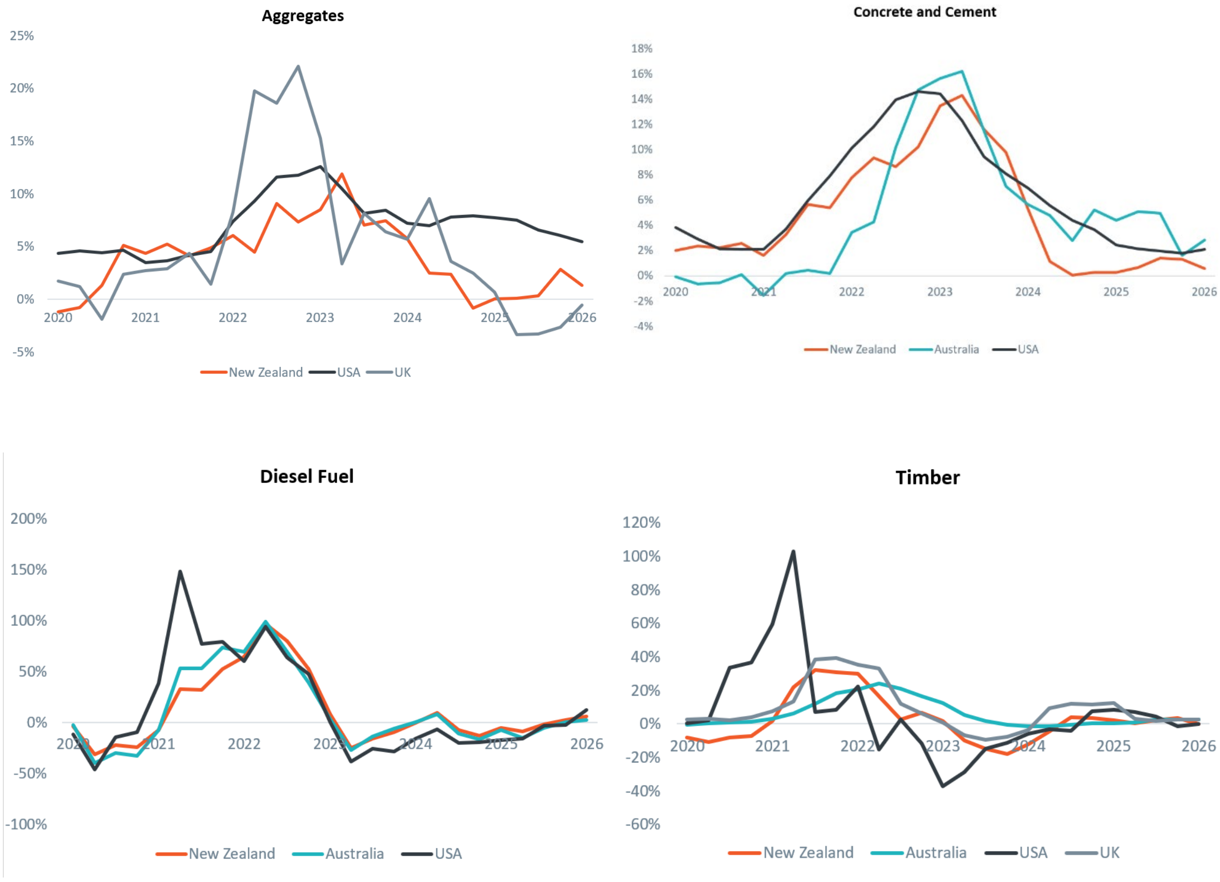


Source: Stats NZ, Household Labour Force Survey, table HLF192AA.

Tradeable material costs remain volatile and tightly linked to global price movements

Since our previous analysis, price movements for tradeable construction inputs in New Zealand have continued to track movements in other countries. Figure 17 provides the same data as Figure 12 but zooms in on price movements since 2020. New data from 2023 onwards suggests the same positive correlation between construction inputs price movements. Diesel prices continue to show a particularly close correlation, emphasising how global commodity prices quickly diffuse into domestic pricing (Figure 17).

Figure 17: Year-on-year price fluctuations in various material inputs across countries since 2020



Note: Structural steel graph not updated due to the capital good price index time series used in the previous research ending in September quarter 2022. **Source:** Stats NZ capital goods price index and producer price index, US Bureau of Labor Statistics producer price index: commodity series, Australia Bureau of Statistics producer price index, UK Office of National Statistics producer price index time series, and the New Zealand Infrastructure Commission analysis.

This global pattern was more recently evident after the outbreak of conflict in the Middle East, affecting shipping through the Strait of Hormuz in early 2026. Oil prices rose to over USD100 globally, almost immediately flowing through to diesel and bitumen prices. Modelling by the New Zealand Transport Agency (NZTA), which relies on diesel and bitumen for constructing roads found that oil prices of around USD100 a barrel could result in 5% annual cost inflation for capital projects with active cost fluctuation clauses. This rose to 10% annual inflation with oil prices at around USD150 a barrel.[23]

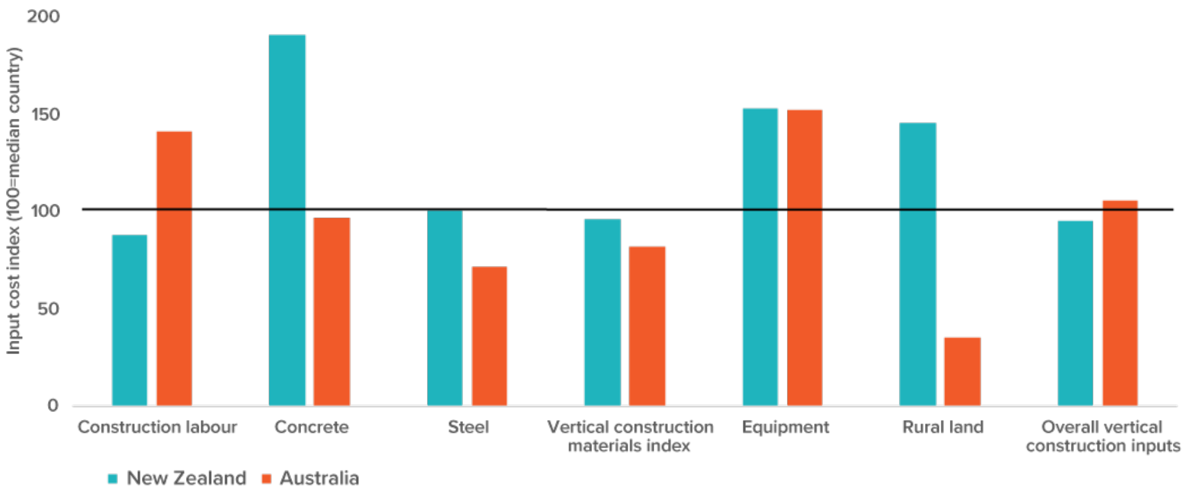
Non-tradeable input cost growth has slowed

Conversely, the slowdown in construction activity since 2022 appears to have benefitted New Zealand's *relative* costs compared to other countries, particularly for concrete and labour. Most significantly, concrete costs have fallen closer to median-country levels. In 2022, we faced average costs for steel, but in 2024 that dropped to below the median country (see Appendix A for more detail and full data for other countries) (Figure 18).

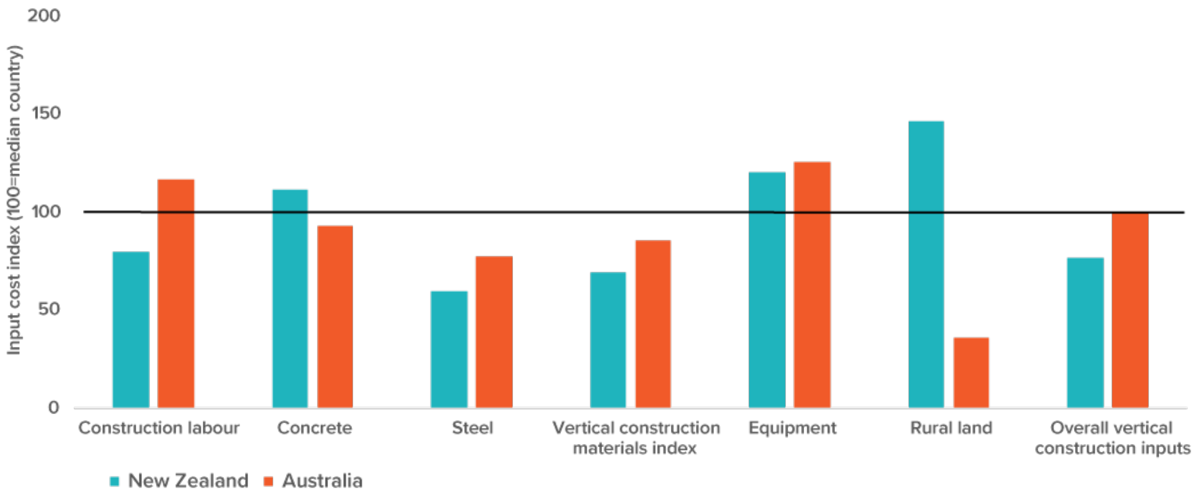
[23] Tensions and price increases ahead for getting roads built | RNZ News

Figure 18: New Zealand's construction input costs relative to 10 other high-income countries

Panel A: 2022



Panel B: 2024



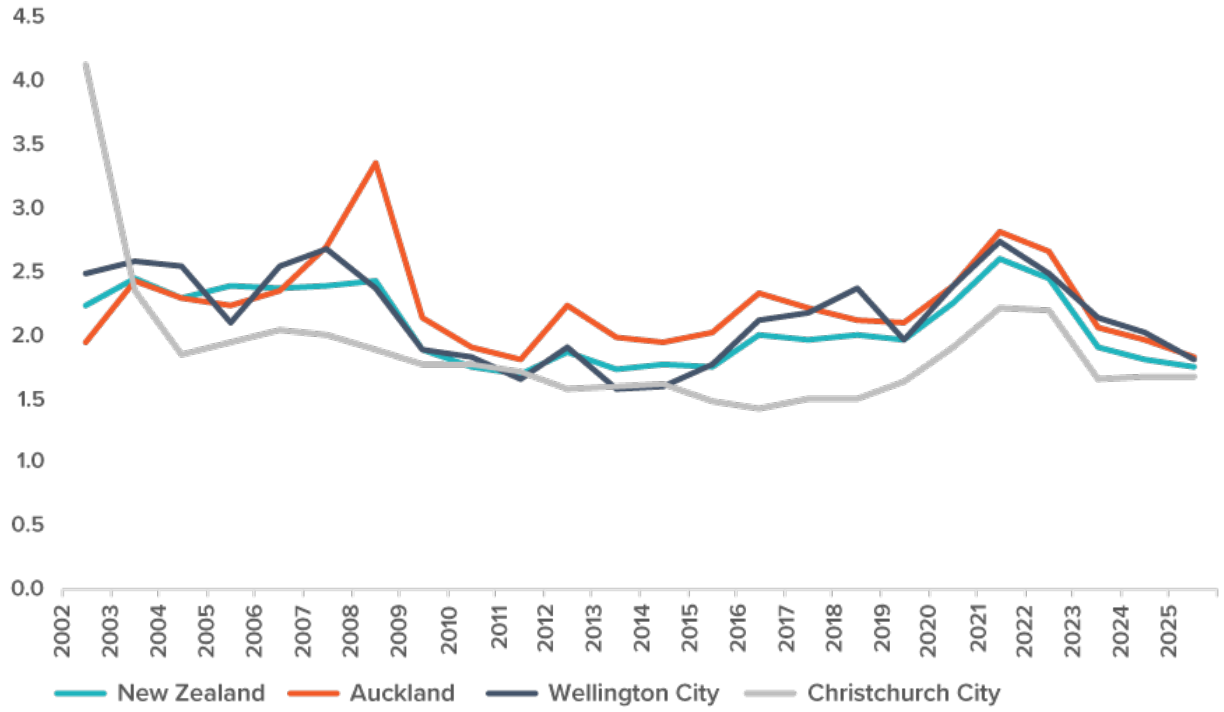
Note: The index for rural land was not updated between the 2022 and 2024 graph. The data comes from Savills Research (2020) and is the same for both graphs. **Source:** New Zealand Infrastructure Commission analysis of data from Turner and Townsend, international construction market survey (2022 and 2024) and Savills Research, global farmland index (2020).

Similarly, it appears land cost growth is moderating, at least in absolute terms. Land prices in New Zealand rose significantly during the Covid pandemic and in the couple years immediately after. However, over the last two years, land price growth has softened.

Long-run series on land prices across New Zealand are not available, but the price-cost ratio, which shows the ratio of house sales to construction costs, has fallen. When this ratio rises, it signals that the price of land is rising relative to construction costs, and vice versa. This is a useful proxy for land prices, although it doesn't measure it directly.

The falling ratio since 2021 implies that the cost of land for an infrastructure project likely declined relative to the cost of building the physical infrastructure (Figure 19).

Figure 19: Price-cost ratios in New Zealand, 2002–2025



Source: Ministry of Housing and Urban Development (now Ministry for Cities, Environment, Regions and Transport), Urban Land Dashboard, accessed on 19 June 2026.

4. Construction productivity: How efficiently do we use inputs to build infrastructure?

Productivity is a key determinant of infrastructure costs. It describes how efficiently an industry transforms inputs, such as labour and equipment, into outputs. In the infrastructure sector, outputs include assets such as bridges, wastewater treatment plants, and wind farms. Higher productivity allows firms to deliver more outputs from a given set of inputs.

Productivity is commonly measured in two ways. Labour productivity growth measures output per worker or per hour worked. Multifactor productivity growth is broader, measuring output relative to a combination of inputs, including labour and capital such as machinery and equipment. Achieving a sustained lift in productivity typically happens over decades, not years.

4.1. What we know

This section summarises what we know about construction productivity, drawing on research from the Commission published in 2022 and 2023.

Construction sector productivity improved in recent decades

The New Zealand construction sector experienced three decades of stagnant productivity growth from the 1970s onwards. Since 2009, however, the sector reversed this trend. Rather than lagging economy-wide productivity growth, construction productivity roughly matched the growth for the rest of the economy.[24]

William Baumol's unbalanced growth model explains why this matters. The theory and real-world evidence suggest that as industries become more productive, they can produce more without expanding their workforce.[25] Industries with slower productivity growth, by contrast, must expand their workforce to increase production. Attracting workers requires these industries to match wages in higher-growth-productivity sectors. To do this, firms need to raise their prices.

Previous research by the Commission looking at labour productivity growth rates and output prices for 27 New Zealand industries supports this finding. Across two business cycles – 2000 to 2008 and 2008 to 2020 – industries that experienced faster labour productivity growth tended to experience lower rates of price inflation. The construction sector, for example, had lower average annual price inflation in the second business cycle when productivity growth was higher.[26]

Analysis carried out for this research illustrates the importance of productivity growth for containing prices and easing capacity pressures. For all industries, we estimate that a 1% increase in labour productivity over the long run reduces prices by 0.6%, increases real output by 0.3%, and reduces labour requirements by 0.7%.[27]

[24] Economic performance of New Zealand's construction industry | Te Waihanga
[25] Baumol, W.J., Blackman, S.A.B., & Wolff, E.N. (1985). 'Unbalanced Growth Revisited: Asymptotic Stagnancy and New Evidence'. *American Economic Review*, 75(4), 806–817.
[26] Economic performance of New Zealand's construction industry | Te Waihanga
[27] Economic performance of New Zealand's construction industry | Te Waihanga

New Zealand is middle of the pack for construction productivity

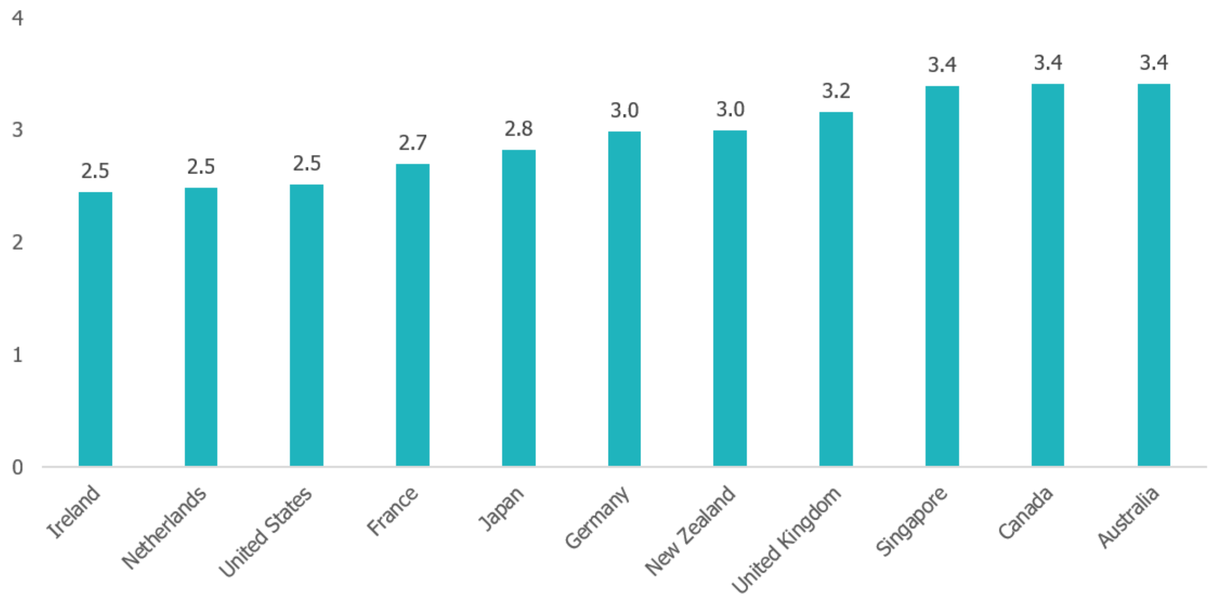
Productivity can be split into the level of productivity, such as the amount of output that can be produced per hour worked, and the growth of that productivity over time. Both are important for considering New Zealand's performance. Our research shows that relative to its peers, New Zealand's construction sector is not a star performer, but certainly not a laggard.

Looking first at the growth in productivity, the Commission previously carried out benchmarking comparing construction productivity growth in New Zealand with other high-income countries. Between 2000 and 2008, construction labour productivity grew at an annual average rate of 0.2% in New Zealand, the 13th fastest in the OECD. New Zealand was also ranked 13th in the 2008–2020 business cycle, when average annual growth rates accelerated to 1.2%.[28]

Several countries, including the United States and Japan, experienced declining construction labour productivity rates over the period. This challenges the idea of larger countries having a productivity advantage due to economies of scale. More rapid, sustained growth was observed in lower-income OECD countries, including Lithuania, Latvia, and Estonia. This demonstrates the importance of catch-up growth potential, with nations able to learn from other countries or improve training and equipment from a lower starting point.

Later research by the Commission examined the overall level of productivity, focusing on vertical construction. The analysis compared multifactor productivity levels for 11 countries, focusing specifically on how many units of high-rise office floor space could be built using a standard bundle of construction inputs. New Zealand was around 12% less productive than Australia, with roughly average productivity levels for a high-income country (Figure 20).[29]

Figure 20: A multifactor productivity index for vertical construction in urban areas of 11 high-income countries



Source: New Zealand Infrastructure Commission analysis of Turner and Townsend (2022) data based on Langston (2013).

[28] Economic performance of New Zealand's construction industry | Te Waihanga
[29] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga

Civil construction productivity lags

The overall growth in construction sector labour productivity masks important differences. Stats NZ collects productivity data for three construction subsectors: **building construction**, which includes residential and non-residential buildings (referred to as 'vertical infrastructure'); **heavy and civil engineering construction**, which includes road and bridge construction and other civil engineering projects (referred to as 'horizontal infrastructure'); and **construction services**, which includes a range of subcontractor services, including roofing, plumbing, and concreting.

Between 2000 and 2020, labour productivity increased by 21% in building construction, 27% in construction services, but just 7% in civil construction.[30] All subsectors experienced faster annual productivity growth rates in the 2008–2020 business cycle following the global financial crisis (GFC), complicating the narrative that market boom-bust cycles have detrimental impacts on productivity growth.[31]

Weak labour productivity growth in the civil construction sector has significant implications for infrastructure delivery. If the sector had matched the performance of building construction over the 2000–2020 period, we estimate that infrastructure construction prices would be about 10% lower, the quantity and quality of new infrastructure construction would be about 5% higher, and workforce requirements would be about 11% lower.[32]

Further research is needed on why the civil construction sector has not kept pace with other construction subsectors. A possible factor may be heightened risk associated with uncertain ground conditions, which is more prevalent for horizontal infrastructure projects. They also tend to be larger and more complex than vertical builds, reducing opportunities to 'learn' by repeating standardised designs.

No single factor explains productivity differences

Research from the Commission and elsewhere points to several possible explanations for differing growth rates for construction labour productivity, both between countries and subsectors.

Beyond catch-up growth potential, faster labour productivity growth appears to be associated with more efficient construction regulation. Conversely, countries that shifted the composition of their construction output towards road building appear to experience slower labour productivity growth, possibly reflecting the underperformance of the civil construction sector.[33]

In New Zealand and other OECD countries, productivity growth rates accelerated after the GFC. One possible explanation is 'creative destruction', where lower-productivity construction firms ceased trading and the remaining firms increased their output while retaining similar-sized workforces. The downturn in construction activity was also tempered by the 2011 Canterbury earthquakes, which created demand for replacement horizontal and vertical construction. Post-disaster zoning reforms and emergency consenting powers may have reduced regulatory friction, allowing for increased delivery efficiency.

However, productivity improvements post-GFC contradict the idea of market cycles being responsible for productivity growth rates. Other common narratives, including economies of scale, and housing market dynamics, were not substantiated by our previous research; however, this does not rule out their potential importance. For example, recently published research has linked labour productivity

[30] Due to revisions to historical nominal GDP from Stats NZ, the figures differ from the 2000–2020 labour productivity figures in the Economic performance of New Zealand's construction industry. The previous figures were building construction 23%, construction services 25%, and civil construction 5%.

[31] Economic performance of New Zealand's construction industry | Te Waihanga

[32] Economic performance of New Zealand's construction industry | Te Waihanga

[33] Economic performance of New Zealand's construction industry | Te Waihanga

improvements in the vertical construction sector to zoning reforms that allowed more dense housing typologies.[34]

Competition is another possible factor. The building construction sector, which is characterised by many smaller firms, significantly outpaced labour productivity growth in the civil construction sector, which is dominated by a smaller number of large firms.

Using standardised designs has also been linked to increased productivity, as firms can 'learn' by doing and become increasingly efficient over time. Better training and workforce capability may also help, as does the uptake and diffusion of new technologies.

Taken together, the evidence suggests that no single factor determines construction productivity outcomes. What is more certain is the importance of productivity growth for infrastructure delivery. Higher productivity can reduce costs, increase output, and moderate workforce pressures, making it a key determinant of whether New Zealand can meet current and future infrastructure needs.

4.2. What has changed?

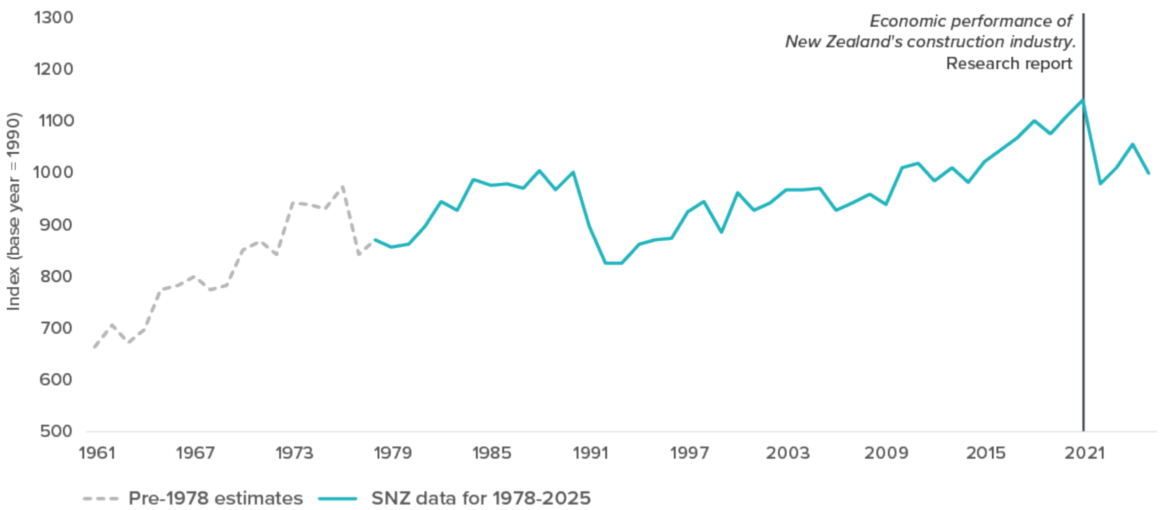
This section provides an overview of construction sector productivity trends since 2022/23, including updates to some of our previous research inputs.

Construction sector productivity gave up some of its gains in the 2020s

After a decade of sustained growth in multifactor productivity, which accounts for labour and capital inputs such as equipment, the construction sector saw some of these gains erode during the 2020–2025 period.

Multifactor productivity dropped sharply from 2021 onwards. After a modest bounce back in 2023 and 2024, multifactor productivity declined in 2025, falling by 5.3% (Figure 21).

Figure 21: Construction industry long-run multifactor productivity growth since 1961



Note: Years are March year ended. **Source:** Pre-1978 estimates were compiled from Carson and Abbott (2012); 1978–2025 estimates are from Stats NZ's Industry Productivity Statistics. Series have been indexed to 1990 = 1000. Due to revision in Stats NZ industry productivity statistics from 2009 onwards, the graph differs slightly from 2009 from the same graph in the Economic performance of the New Zealand construction industry.

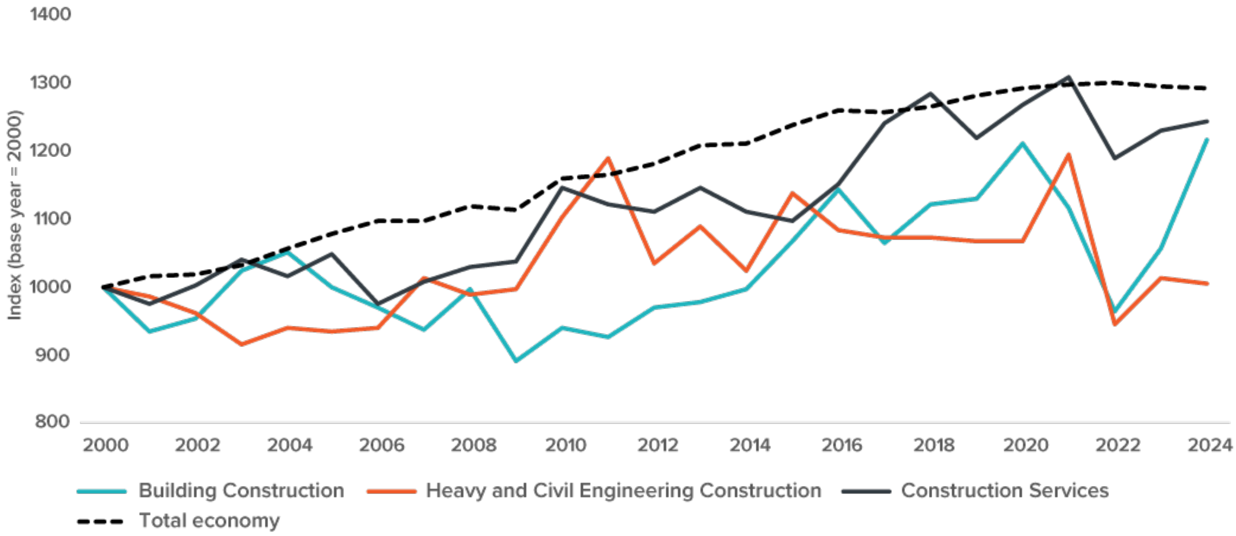
The labour productivity trend tells a similar story. Post-Covid economic growth in New Zealand began to slow in 2022/23 as the Reserve Bank of New Zealand began tightening monetary policy in response to

[34] Can zoning reform increase construction productivity? Suggestive evidence from New Zealand. — One Final Effort

multi-decade high inflation. For the construction sector, real output over the four years grew at a slower rate than the growth in labour inputs, resulting in declining productivity. Firms may have attempted to retain their workforce or at least reduce shrinkage in the context of declining demand, resulting in less output per worker.

At a subsector level, labour productivity for building construction and construction services did fall between 2020 and 2022, but both sectors have recovered, to some extent, to their pre-pandemic trend. Heavy and civil engineering construction, on the other hand, fell 6% over the 2020–2024 period and has not recovered (Figure 22).

Figure 22: Labour productivity growth, 2000–2024



Note: Years are March year ended. Due to revisions in Stats NZ nominal GDP series from 2009 onwards, the graph differs slightly from 2009 onwards than the same graph in the Economic performance of New Zealand's construction industry. **Source:** New Zealand Infrastructure Commission labour productivity estimates for construction subsectors using Stats NZ data. Appendix C directs to the data sources and methods. Labour productivity growth for the 'total economy' is estimated using Stats NZ's labour productivity index for the 'measured sector', which excludes some public services where productivity is difficult to measure.

Zooming in on the past four years reveals that the primary driver of the slower productivity growth for heavy and civil engineering construction was that while output dropped during the Covid era for all subsectors, it recovered more rapidly in building construction and construction services. At the same time, all sectors added roughly the same amount of labour inputs. The result is productivity performance being worse in heavy and civil infrastructure (Table 3).

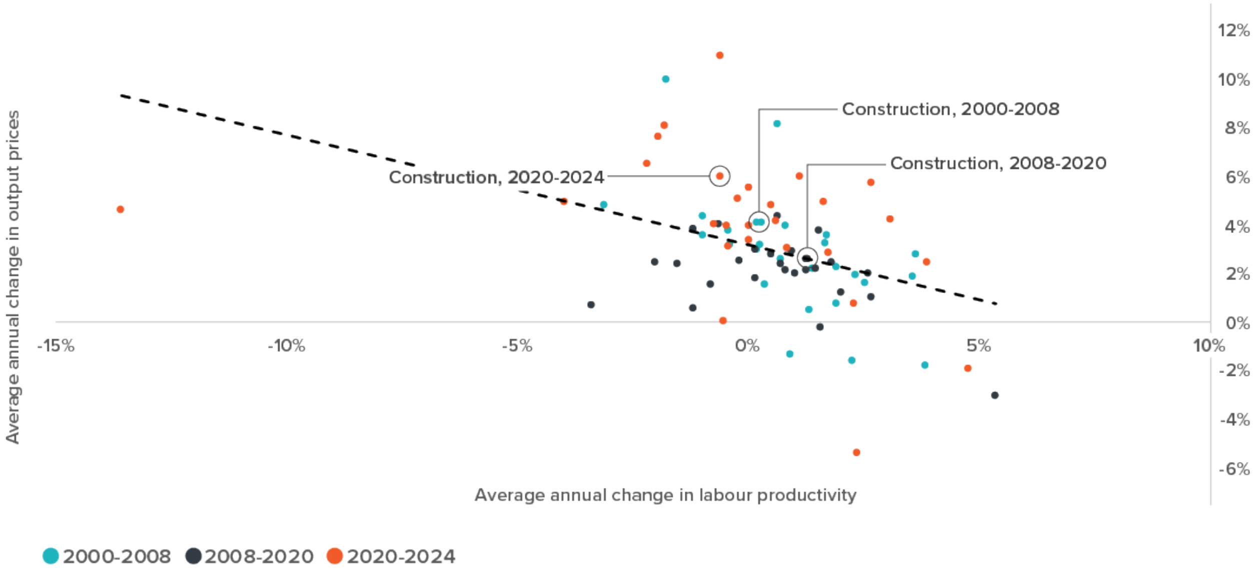
Table 3: Analysing labour productivity components, changes from 2020 through 2024

Subsector	Nominal Output Growth	-	Price Growth	-	Labour Inputs Growth	=	Labour Productivity
Building Construction	58%		32%		19%		8%
Heavy and civil engineering construction	35%		26%		15%		-6%
Construction Services	44%		26%		17%		2%

Note: Percentage changes are estimated by calculating the difference in natural logarithms between the two years. This enables columns to be added and subtracted to derive the total change in productivity. Figures do not add up perfectly due to rounding. **Source:** New Zealand Infrastructure Commission labour productivity estimates for construction subsectors.

The Baumol effect appears to be present in the new data included for 2020–2024. What we observe during this time is a period of relatively slow or negative productivity growth, coupled with higher prices (Figure 23).

Figure 23: Labour productivity and output price growth in 27 New Zealand industries, 2000–2024



Note: Years are March year ended. **Source:** New Zealand Infrastructure Commission analysis of Stats NZ productivity and producer price index data for 27 industry sectors covered in Stats NZ's productivity statistics. The performance of the construction industry is highlighted on the chart. The dashed black line shows a linear trend-line through the data.

Updating the Commission's multifactor productivity for a vertical office building, we find that for high income countries, productivity fell between 2022 and 2024. New Zealand's productivity fell 14% but continued to stay around average compared to other high-income countries. Japan had the largest drop in productivity at 35%, while in Ireland and the United Kingdom productivity stayed constant (Figure 24).[35]

Figure 24: A multifactor productivity index for vertical construction in urban areas of 11 high-income countries, 2022 and 2024

Source: New Zealand Infrastructure Commission analysis of Turner and Townsend (2022 and 2024) data based on Langston (2013).

[35] Note that these comparisons are likely not valid over a longer period, as higher prices for inputs might induce substitution.

5. Project scope: How complex is the infrastructure that we're building

Project scope is a key driver of infrastructure costs. It determines the quantity of inputs required to deliver a project – land, labour, equipment, and materials – and the complexity of the infrastructure being built.

Infrastructure providers make decisions about the form an asset takes, the capacity it must provide, and the standards it must meet. For example, a transport corridor could be delivered as a tunnel or a bridge, designed for two lanes or four, or built to different levels of service and resilience. These decisions all have significant cost implications.

As we have seen, material and labour costs are largely a function of global commodity prices and domestic economic trends. Decision-makers can make interventions at the margins, but they have limited control over price movements in these areas. Productivity is more controllable, but it can take several years or decades for sustained improvements to be realised.

Project scope, by contrast, is often the most controllable cost driver affecting infrastructure in the short-to-medium term. Decision-makers have several tools at their disposal to influence scoping decisions, which are impacted by policy and institutional settings, as well as more intractable factors, such as geological conditions.

Reducing the scope of a project will almost certainly reduce its cost, but determining whether a project is overengineered is more complicated. Scope decisions typically involve trade-offs between cost and a range of other objectives, including future capacity requirements, resilience, safety, and environmental outcomes. Stakeholders and decision-makers will value these kinds of objectives differently.

Project scope is central to infrastructure affordability but quantifying and explaining the many 'hard' and 'soft' factors that shape scoping decisions is more complicated than tracking changes in construction input costs or labour productivity. For New Zealand to meet its infrastructure challenges, improving discipline around scope definition – and ensuring assets are appropriately sized to the problems they are intended to solve – will be critical.

5.1. What we know

This section summarises what we know about the factors that influence project scope, drawing on research from the Commission published in 2022 and 2023.

Standardised designs can lead to greater scale, learning, and lower costs

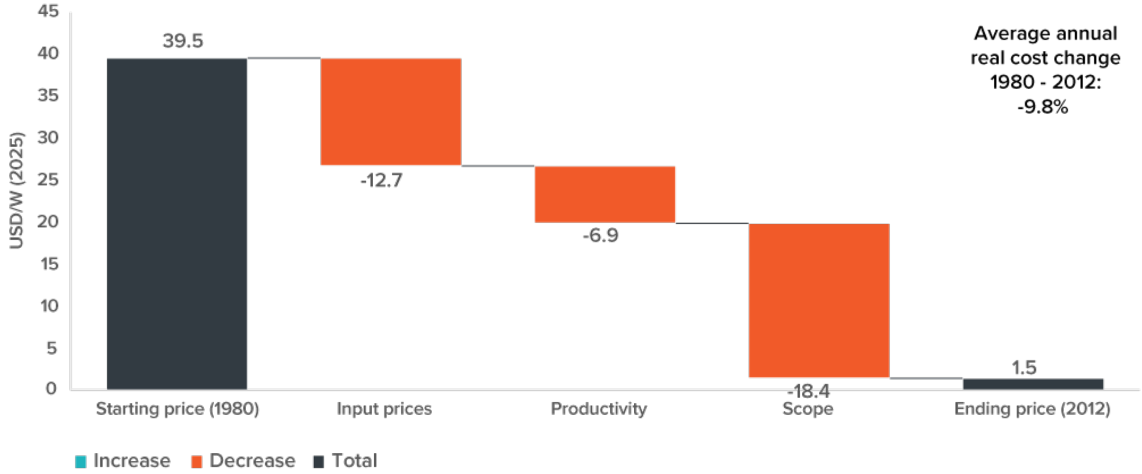
While overall construction prices may have increased, the unit cost of delivering some types of infrastructure has risen more slowly or even fallen.

An example is how some electricity generation and storage technologies have become cheaper over time, while others have not (Figure 25).[36] Engineering studies have examined the underlying drivers of cost increases or decreases for four energy technologies –photovoltaic panels, lithium-ion batteries, wind turbines, and nuclear containment building. We use results from these studies to understand the relative contribution of input price changes, productivity improvements in manufacturing or construction, and scope changes to these project categories (see Appendix B).

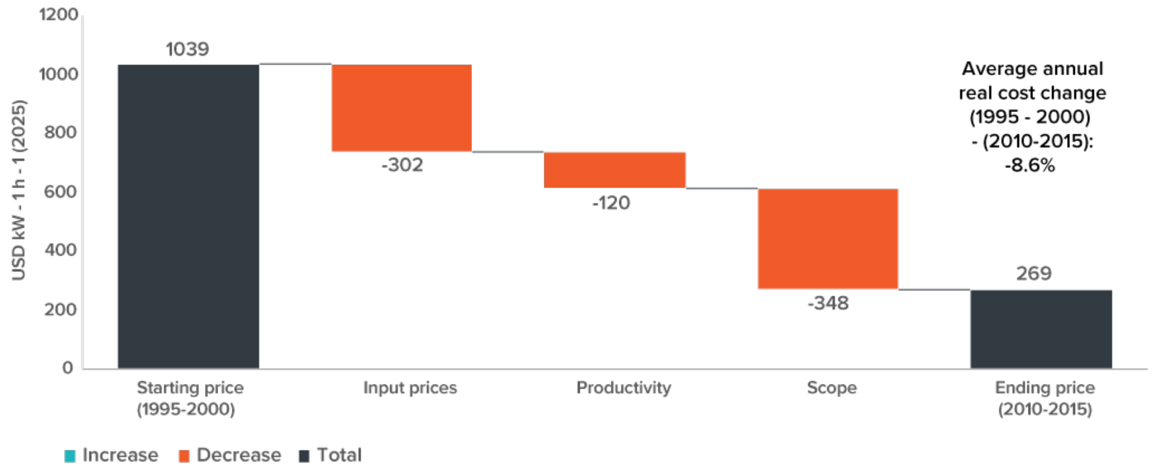
[36] New Zealand Infrastructure Commission, 2026c.

Figure 25: Underlying drivers of cost changes for low-emissions technologies

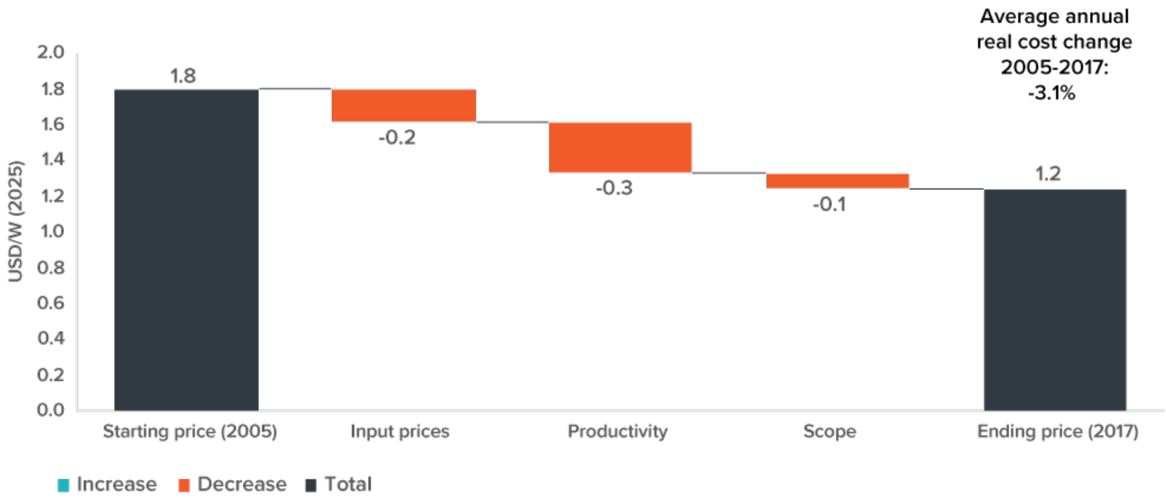
Panel A: Drivers of changes in photovoltaic panel prices, 1980–2012



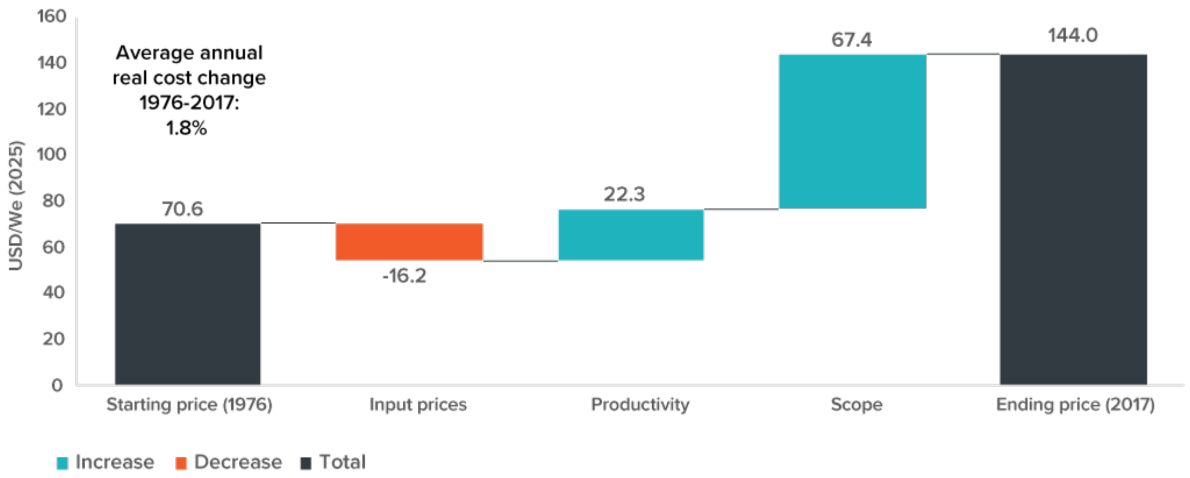
Panel B: Drivers of changes in lithium-ion battery costs, 1995–2000 to 2010–2015



Panel C: Drivers of changes in wind turbine prices, 2005–2017



Panel D: Drivers of changes in nuclear containment building costs, 1976–2017



Note: The cost changes only include changes relating to the direct costs of constructing the nuclear containment buildings, where direct costs are the cost of materials, labour and equipment. The total cost appeared to have increased by more when the authors had included an estimation of indirect costs. Indirect costs related to construction support activities such as engineering, administration, field supervision, etc. **Source:** New Zealand Infrastructure Commission analysis of data from Elia et al (2020); Eash-Gates et al (2020); Kavlak et al (2018); and Ziegler et al (2021). Data adjusted to 2025 USD with U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers: All Items in U.S. City Average [CPIAUCSL].

Three of these energy technologies decreased in cost, while the fourth experienced cost increases. Over the relevant analysis periods, inflation-adjusted costs for photovoltaic panels and lithium-ion batteries reduced at an average rate of 9.8% and 8.6% a year, respectively, inflation-adjusted costs for wind turbines reduced by 3.1% a year, and inflation-adjusted costs for nuclear containment buildings increased by 1.8% a year.

All four energy technologies saw reductions in input prices – meaning that the cost of the materials used in their construction was generally decreasing. However, the first three technologies also benefitted from cost improvements from productivity growth and scope redesign that made them simpler and cheaper to manufacture. Nuclear containment buildings became more expensive to build due to declining construction productivity and scope redesign that made them costlier to build.

Rapid cost reductions for photovoltaic panels and lithium-ion batteries are mostly attributed to scope improvements that have reduced materials and labour required to build them and improved their ability to generate or store energy.

These examples suggest that infrastructure technologies that are relatively simple and which don't require significant customisation to individual sites have more scope for cost reductions over time. Larger studies confirm this relationship, showing that reduced design complexity and lower customisation requirements are correlated with faster cost reductions, and vice versa (Malhotra and Schmidt, 2020).[37] Other authors have argued that simpler, less customised projects have more predictable costs, regardless of where they are built.[38]

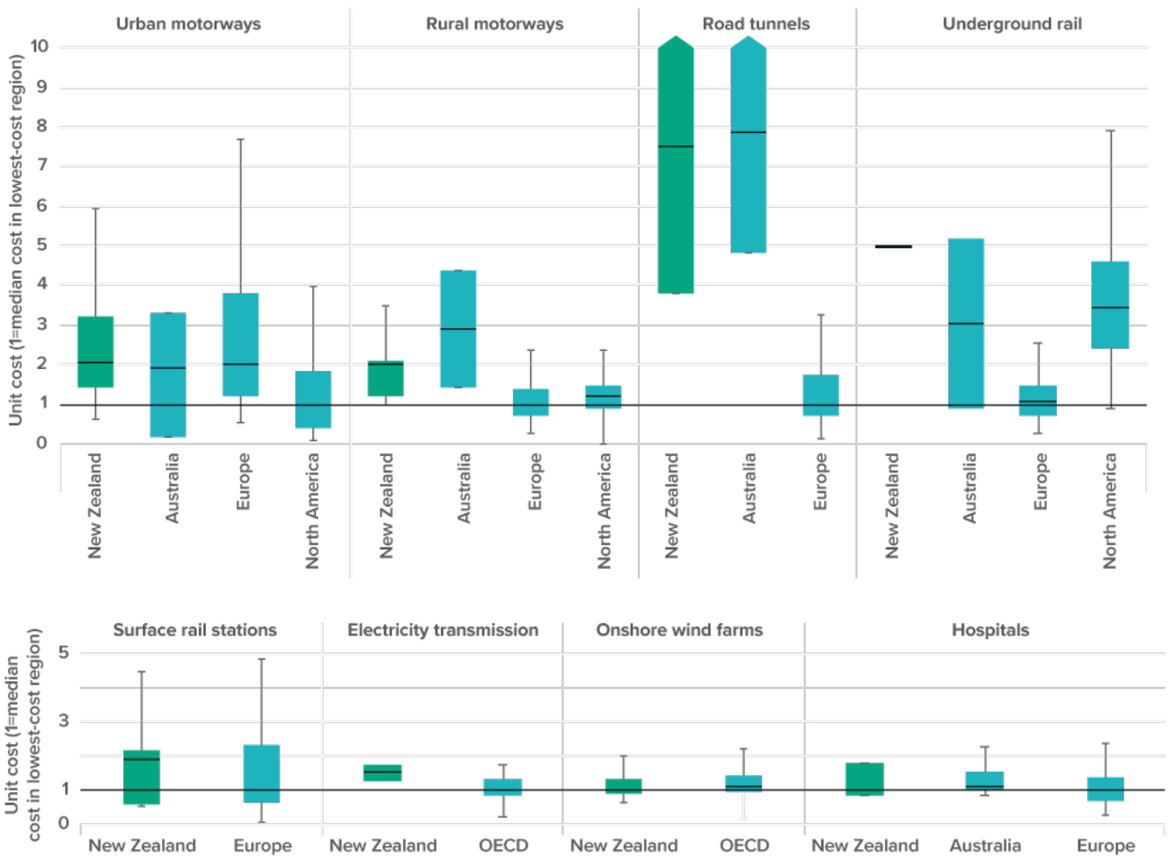
[37] Malhotra, A., & Schmidt, T. S. (2020). Accelerating low-carbon innovation. *Joule*, *4*(11), 2259–2267. https://doi.org/10.1016/j.joule.2020.09.004
[38] Flyvbjerg, B., & Gardner, D. (2023).

Complex and bespoke projects have higher costs and greater variability

At a broad level, we found that New Zealand had similar infrastructure delivery costs to other high-income countries. Where cost premiums exist however, they are associated with large-scale, complex projects rather than smaller, more standardised projects.

There were statistically significant cost premiums for four types of infrastructure project: urban and rural motorways, road tunnels, and underground rail tunnels. New Zealand had similar delivery costs for four other project types: surface rail stations, electricity transmission lines, and onshore wind farms (Figure 26).[39]

Figure 26: Distribution of unit costs for eight infrastructure project types



Note: The shaded 'box' shows the 25th percentile value (lower end of box), 50th percentile/median value (black line in middle of box), and 75th percentile value (top end of box), while the 'whiskers' show the minimum and maximum values, excluding outliers. Costs are scaled relative to median costs in the lowest-cost country grouping. **Source:** 'The lay of the land: Benchmarking New Zealand's infrastructure delivery costs'. New Zealand Infrastructure Commission. (2022). New Zealand Infrastructure Commission analysis of data from Oxford Global Projects (2022) and Transit Costs Project data from Goldwyn et al. (2022).

What are the reasons why complex projects experience greater costs? Denicol et al (2020) highlight several different factors ranging from greater visibility of large projects, complex governance arrangements, larger number of stakeholders, and institutional factors.[40]

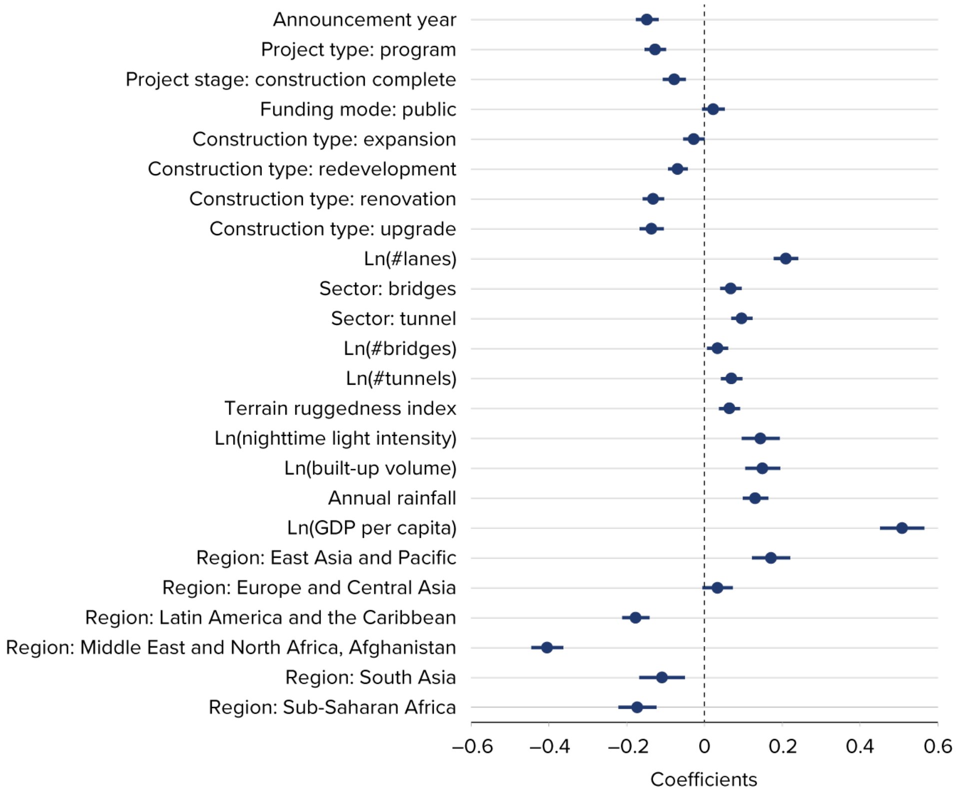
More recent research by the World Bank examined 5,327 road projects and 3,341 rail projects across various countries and found that unit costs varied significantly across countries. It also found that more

[39] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga

[40] Denicol, Juliano & Davies, Andrew & Krystallis, Ilias. (2020). What Are the Causes and Cures of Poor Megaproject Performance? A Systematic Literature Review and Research Agenda. *Project Management Journal*. 51. 875697281989611. 10.1177/8756972819896113.

complex and bespoke elements to a project, like additional lanes, stations, tunnels, and bridges were strongly associated with higher unit costs. Projects that were upgrades or renovations to existing infrastructure were cheaper on average (Figure 27).

Figure 27: Modelling results for the unit costs of roads, by project characteristics, income, level, and region, adopted from World Bank (2026)



Source: Reproduced from Infrastructure foundations: From current assets to future growth (Figure 5.8, p. 107), by S. Straub et al., World Bank. (2026).

Robust project selection processes can limit cost increases from scope and design

Robust assurance processes and planning guidelines help to ensure that public infrastructure providers are selecting the best value projects to fund and deliver. Making providers undertake cost-benefit analysis of various different options and providing external scrutiny makes it more likely that projects will be right-sized relative to the problem they are trying to address.

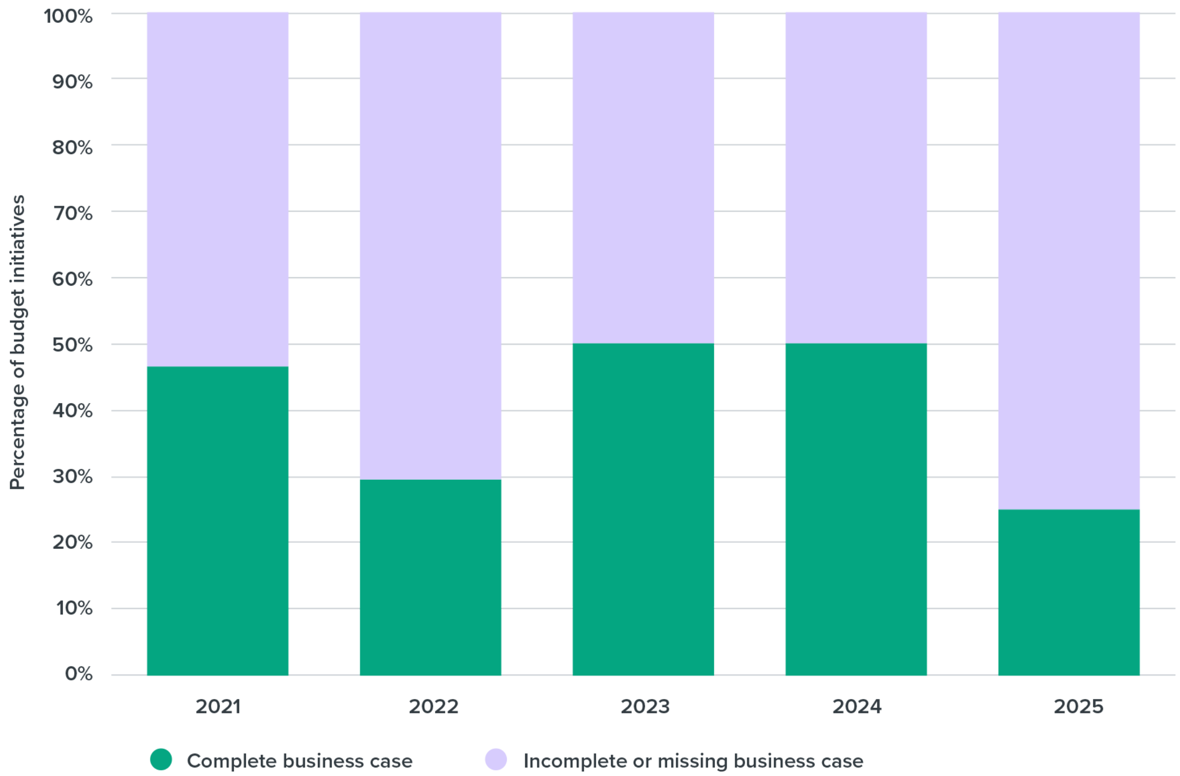
Better project planning and options analysis goes hand-in-hand with better management of scope creep and cost inflation. Merrow (2011) highlights that projects with better planning and design were much more likely to succeed than those built without good processes. In Australia, the Grattan Institute found that prematurely announced projects – initiatives with incomplete financial or regulatory approvals – were responsible for three-quarters of all cost overruns over a 20-year period.[41]

Research by the Commission identified several areas where New Zealand is falling short of best practice planning and project selection guidance developed by the International Monetary Fund.[42]

For example, many capital investment proposals seeking Budget funding do not comply with business case and cost-benefit analysis guidance, making it harder for decision-makers to target investment towards the highest value projects (Figure 28).

[41] The Rise of Megaprojects: Counting the costs
[42] From plans to projects | Research & insights | Te Waihanga

Figure 28: Proportion of Budget bids reviewed by the government's Investment Panel found to have completed business cases, 2021 to 2025



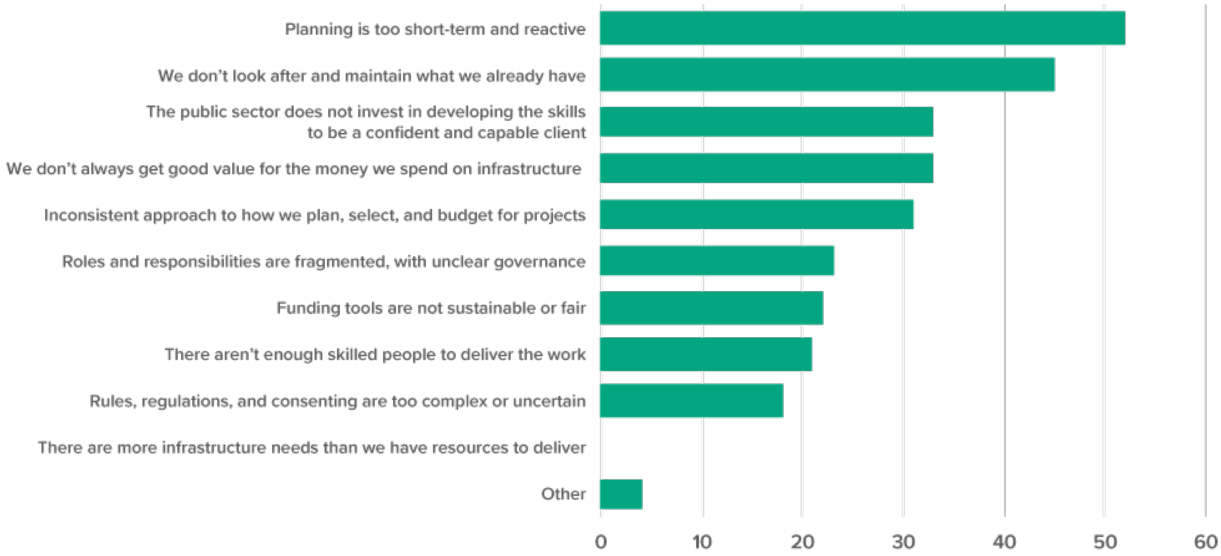
Source: From 'Annual Report'. New Zealand Infrastructure Commission. (2024, 2025).

Greater institutional capacity is associated with tighter cost control over scope and design

Infrastructure projects involve a project sponsor, such as government, contracting out various portions of the planning, design, and the delivery phases of the project. However, ensuring scope and design decisions are appropriate for the budget requires sufficient in-house technical and managerial capacity and experience.

Our work has highlighted that this could be an issue in New Zealand public infrastructure. The Commission surveyed senior responsible officers (SRO) across government as part of its leadership development programme. These leaders emphasised that the public sector lacks capacity to be a capable client (Figure 29).

Figure 29: SRO responses for the top three challenges facing New Zealand's infrastructure in New Zealand



Source: 'Public Sector Infrastructure Leadership Survey – Technical Appendix'. New Zealand Infrastructure Commission. (2026).

New York University's Transit Costs Project highlighted that lack of institutional capability was a key factor in cost differences between countries.[43] For example, for major transit projects, lack of internal expertise led to key parts of the project like setting objectives, design, stakeholder management, and delivery being largely outsourced to consultants, as opposed to a process where these consultants and contractors are simply executing a scope the agency has developed. This has resulted in pre-construction costs being much higher in the United States than in countries like France, Italy, and Turkey.

Recent research by Liscow, Slattery, and Nober (2025) has also showed that larger and more highly capable US state Departments of Transportation are associated with lower roading costs.[44] A striking finding is that strong construction managers alone are not associated with lower project costs, but instead also require a strong project leader. This is because the project leader controls early-stage planning around scope and procurement. Greater use of consultants was associated with an almost 20% increase in road per-mile costs relative to states that limited their use.

Challenging physical contexts can drive complex scopes and costs

New Zealand faces an in-built 'penalty' when it comes to delivering infrastructure cost-effectively: challenging terrain and natural hazards often require infrastructure to be built to a higher engineering standard to meet these challenges.

Ground conditions are particularly important for horizontal infrastructure projects which traverse long distances. As a country on the boundary of two tectonic plates and within the Pacific Ring of Fire, New Zealand is seismically active, susceptible to volcanic activity, and prone to erosion.[45] This creates heterogeneous rock types and variable ground conditions, which can make tunnelling and earthworks more complex and expensive. For example, the City Rail Link is only 3 kilometres long, yet it encountered several different geological formations.[46]

[43] https://transitcosts.com/
[44] Liscow, Zachary D. and Slattery, Cailin and Nober, William, 'State Capacity and Infrastructure Costs' (August 23, 2025). Yale Law & Economics Research Paper, Available at SSRN: https://ssrn.com/abstract=4522676 or http://dx.doi.org/10.2139/ssrn.4522676
[45] Ballance, 2017.
[46] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga

Seismic engineering standards and other resilience measures also add cost. Flooding from rainfall and coastal inundation, for example, may require infrastructure to be raised or defended by stop banks. Traversing mountainous and slip-prone terrain adds similar costs, as transport corridors such as roads or railway lines may need to be elevated on viaducts. Forward Guidance produced as part of the National Infrastructure Plan forecasts resilience-related infrastructure investment to increase in the coming decades.[47]

As well as natural hazards, infrastructure providers operating in urban environments must consider how their project will interface with existing networks. Building a new transport corridor at-grade, for example, is far less expensive than other options if land is available. Raising a transport project on an elevated structure may increase costs by a factor of 1.5 to 2.5, while tunnelling can increase costs by a factor of 2 to 10, depending on conditions.[48]

Cost trends in other countries with challenging terrain such as Chile and Switzerland suggest it may be possible to overcome this with a focus on good institutions, robust investment decision-making processes, and a credible pipeline of future investment intentions.[49]

Policy and regulatory factors can drive scope expansion

Infrastructure providers are required to meet legislated standards, which reflect changing societal attitudes towards objectives such as health and safety or environmental mitigation.

For example, wastewater discharge standards intended to protect freshwater quality have become stricter over time. Many wastewater treatment plants around New Zealand are nearing the end of their consented operating periods.[50] Meeting the new standards will require communities to either invest in new treatment plants or refurbish their existing facilities to achieve higher service levels. This will lead to better environmental outcomes, albeit at a higher cost.

In New Zealand, infrastructure providers have cited the cost and complexity of consenting under the Resource Management Act (RMA) as an influence on project scope. A previous study commissioned by the Commission found infrastructure providers were collectively spending $1.29 billion annually to get consent for their projects. Quantifiable direct and indirect consenting costs accounted for 5.5% of the total project budget for typical infrastructure projects, rising to as much as 15.9% for small projects costing under $200,000.[51]

These indirect costs are often cited by infrastructure providers as significant drivers in scope expansion. This includes the consequences of delay, costs created by uncertainty of outcome, and the cost of designing and redesigning projects to improve the prospect of a favourable decision and – in some cases – to avoid a public hearing, which can increase consenting costs by a factor of 10.[52]

For example, a wind farm developer might voluntarily fund additional landscape planting, underground sections of transmission lines, noise mitigation measures, or community amenities such as walking tracks and local infrastructure upgrades to reduce opposition from nearby residents. This results in additional cost.

Previous research by the Commission referenced an example from the United States, where highway construction costs rose faster than construction labour and material costs between the 1960s and the 1990s. Researchers Leah Brooks and Zachary Liscow link this to changing environmental and community mitigation requirements. Between 1965 and 2001, an average of 1.4 new environmental laws and

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[47] Forward Guidance | Research & Insights | Te Waihanga
[48] The lay of the land: Benchmarking New Zealand's infrastructure delivery costs | Te Waihanga
[49] Investment gap or efficiency gap? | Te Waihanga
[50] Simpson Grierson - New wastewater standards reshape consent pathways from December 2025
[51] The cost of consenting infrastructure projects in New Zealand | Te Waihanga
[52] The cost of consenting infrastructure projects in New Zealand | Te Waihanga

executive orders were enacted every year.[53] These new requirements resulted in changes to project scope to mitigate negative impacts.

Environmental mitigation is not the only factor driving cost. Infrastructure providers also make decisions about the performance and safety standards that can drive costs.

An example of this is cross passages in underground rail tunnels in the United States. These tunnels, connecting parallel-running train tunnels, are installed for safety purposes: if there is a fire in one tunnel, passengers can escape via the cross passage to the adjacent rail tunnel.

In the United States, cross passages are required to be spaced every 244 metres, whereas European requirements are at every 500 metres. This additional safety requirement leads to higher subway construction costs in the United States without clear evidence that it has significantly improved safety.[54]

5.2. What has changed?

This section provides an overview of project-scope related changes since 2022/23, including updates to some of our previous research.

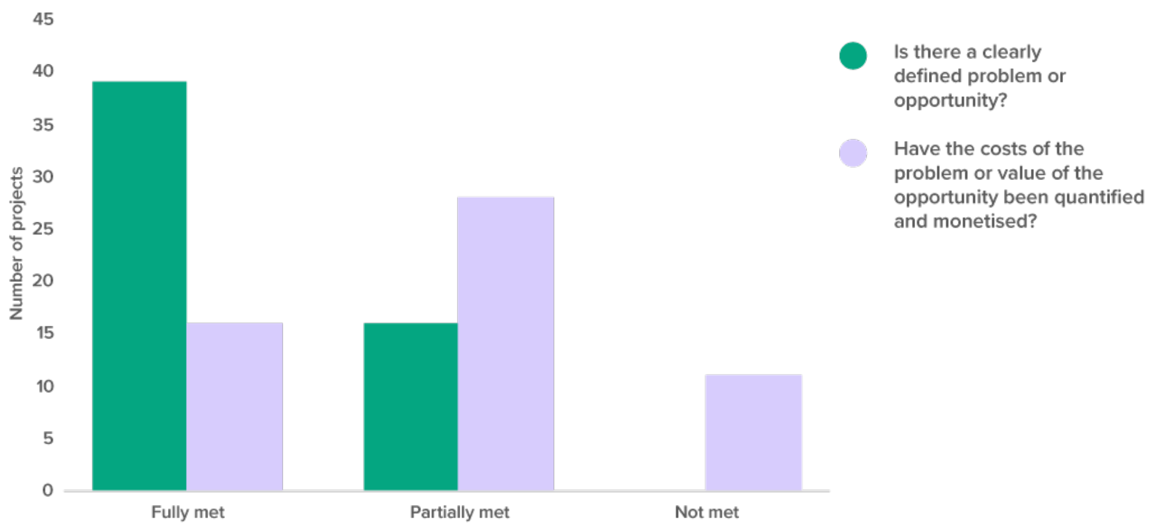
Project selection planning and processes may be biased towards expanding scope and costs

New Zealand has begun developing more robust investment assurance processes for infrastructure proposals in recent years. In 2024, the Commission launched the Infrastructure Priorities Programme (IPP), which independently assessed voluntary infrastructure proposals for deliverability, strategic alignment, and value for money.[55] This process led to greater understanding of how investment proposals are planned, shaped and delivered.

Across three rounds, the Commission identified several common shortcomings in how sponsors plan and scope infrastructure proposals.

One issue we identified is that project proponents are very good at identifying when a problem exists, but they often do not quantify the size of the problem. Without the size of the problem quantified, setting the scope and scale of the project is more difficult (Figure 30).

Figure 30: IPP assessment results for problem definition and quantification



Source: New Zealand Infrastructure Commission analysis of IPP assessment reports and results.

[53] Infrastructure Costs by Leah Brooks, Zachary D. Liscow: SSRN
[54] Institute for Progress, Transit Abundance Playbook.
[55] Infrastructure Priorities Programme (IPP) | Te Waihanga

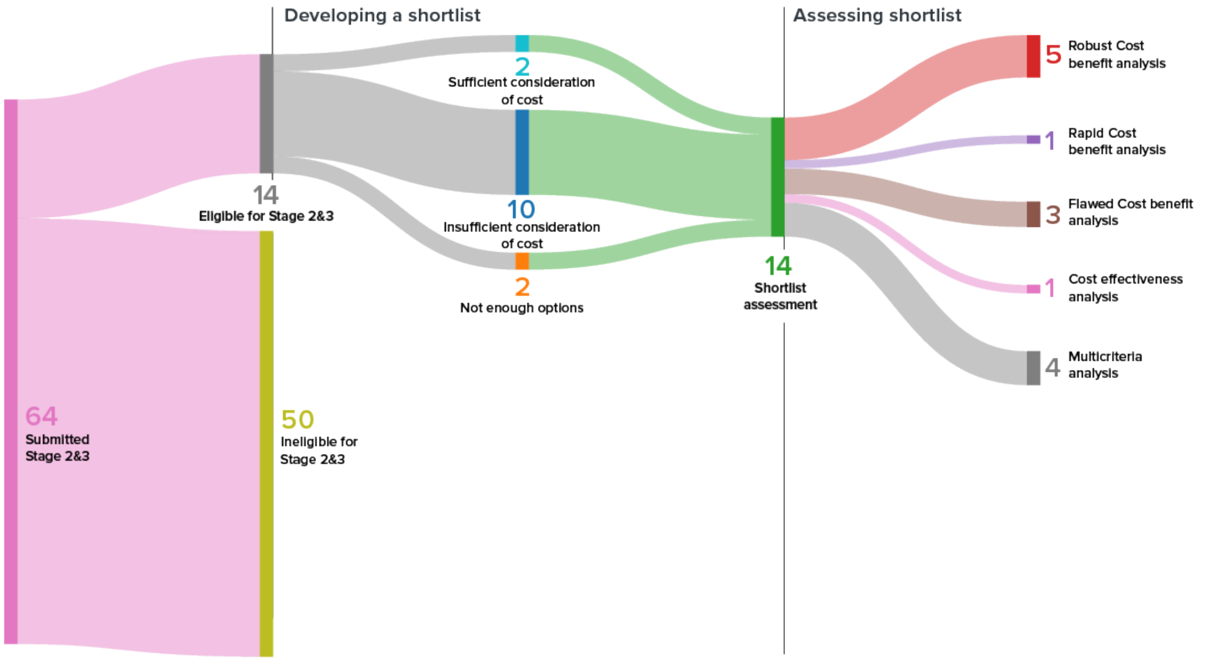
Not having a comprehensive understanding of problem sizing also impacts which solutions are assessed and considered. More than half of projects assessed did not or only partially considered non-built options when examining solutions to the problems identified. Over a quarter of written assessment feedback cited the lack of low-cost options being considered. Insufficient consideration of lower-cost or non-built solutions may be contributing to general cost growth over time.

Sixty-four projects were submitted at a stage where proposals need to demonstrate a robust level of options analysis and thorough economic analysis. However, only 14 proposals provided us with enough information to complete an assessment at these stages.

For those 14 that were assessed, assessors saw a bias towards projects with larger scopes leading to more benefits without equal consideration given to higher associated costs (Figure 31).

- Only two used a robust process to narrow a longlist to a shortlist with sufficient consideration of project cost. Ten used multicriteria analysis (MCA) and did not weight costs appropriately (i.e., costs received a low weight relative to benefits).
- The use of analysis tool to assess shortlists of options also gave disproportionate weight to benefits relative to costs. A robust cost-benefit analysis (CBA) gives equal consideration to benefits and costs. However, only five of proposals used CBA, while four used MCA.

Figure 31: Value for money assessments for Stage 2 and 3 proposals in IPP rounds 1 through 3[56]



Source: New Zealand Infrastructure Commission analysis of IPP assessment reports.

Bigger projects tend to experience cost increases throughout the project life cycle

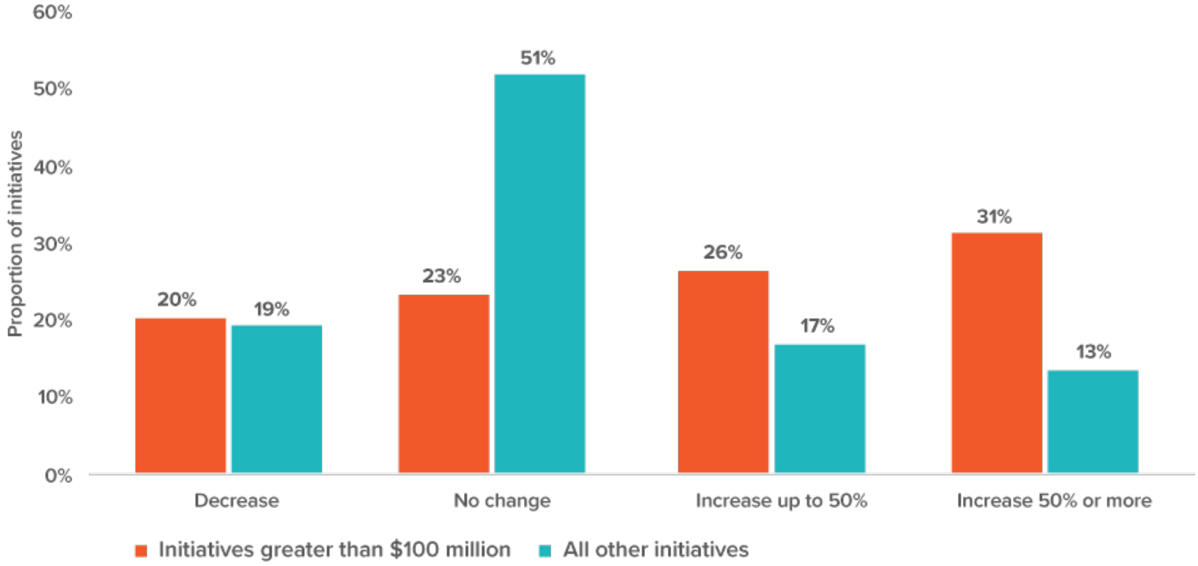
In 2020, the Commission launched the National Infrastructure Pipeline, a national dataset of infrastructure initiatives. It captures information on infrastructure projects across the planning and delivery stages.

[56] The IPP has three stages. Stage one assesses a Strategic Alignment submission that identifies a problem or opportunity that may require an infrastructure solution. Stage two assesses an indicative/Programme Business Case submission that identifies and assesses a set of options for addressing the problem or opportunity. Stage three assesses a Detailed Business Case submission that identifies a preferred option for addressing the problem or opportunity. [Infrastructure Priorities Assessment Framework | Te Waihanga]

To understand whether larger and more complex projects experienced greater cost variability, we examined how projects changed their cost estimates submitted to the Pipeline at various points in the planning and delivery stages. These can be broken down into two periods. The first period is from opening to financial decision[57] of the project. The second period is the financial decision to the closing or delivery of the final project.

In the first stage, the Pipeline has captured data on 3,700 initiatives moving through planning to financial decision worth a total of $43 billion.[58] These are initiatives that were in early scoping and planning stages. What we found is that during this period, projects tend to experience wide variation in cost changes, with similar proportions of projects experiencing cost decreases as well as increases. High value initiatives, measured as being more than $100 million at financial decision, tended to experience greater cost variability (Figure 32).[59]

Figure 32: Reported cost changes in the National Infrastructure Pipeline from opening to financial decision

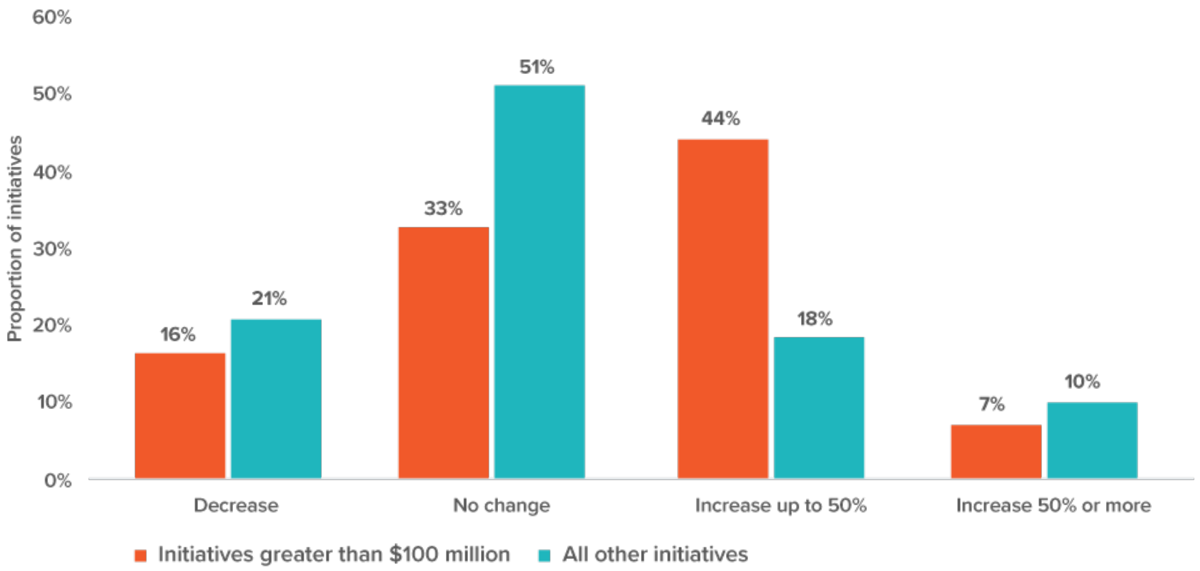


Note: Total projects for each category: 65 in greater than $100m category, 3,626 in all other initiatives. **Source:** National Infrastructure Pipeline and New Zealand Infrastructure Commission analysis. Data as of 5 August 2026.

In the second stage between financial decision and completion of the project, the Pipeline has tracked 2,500 projects moving from construction to completion worth about $27 billion.[60] Like the first stage, higher-value projects[61] saw increases to their cost estimates more than 50% of the time after their financial decision was made, compared to 28% of the time for all other initiatives (Figure 33).

[57] Financial decision was when an initiative's status was reported as in procurement or in construction.
[58] Value at financial decision, rather than closing.
[59] We also tested this analysis where the greater than $100 million threshold was defined as the project's opening cost. The results are sensitive, where high-value initiatives by this definition experience greater decreases than the overall project set. This suggests that project opening costs for higher-value projects may reflect rough estimates of cost.
[60] Value at closing stage.
[61] Defined as being greater than $100 million at financial decision.

Figure 33: Reported cost changes in the National Infrastructure Pipeline from financial decision to close



Note: Total projects for each category: 43 in greater than $100m category, 2,443 in all other initiatives. **Source:** National Infrastructure Pipeline and New Zealand Infrastructure Commission analysis. Data as of 5 August 2026.

A finding in the existing literature on large infrastructure projects is that they are more likely to experience cost and schedule overrun.[62] This analysis suggests this is likely to be the case in New Zealand.

Unit costs for major transport projects appear to be increasing

New Zealand now has a better understanding of the scale, cost, and drivers of future infrastructure demand than it did in 2022/23.

Research by the Commission released alongside the National Infrastructure Plan examined how infrastructure providers can practically respond to these demand pressures to cost-effectively upgrade networks.[63] It emphasised the importance of scoping and timing projects in line with demand.

We examined whether this was the case for planned major transport projects in New Zealand. What we found is that one barrier to future deliverability and affordability of these projects was the significant increase in unit costs experienced in the past few years. We identified that future proposed major roading and public transport costs had unit costs that well-exceed international benchmarks, NZTA's own internal benchmarks, and historical unit cost measures (Figure 34).

The reasons for this are unclear. The 2024 Government Policy Statement on Land Transport specified scope and design requirements for most of these major roading projects, stating they must be four-laned, grade-separated highways regardless of current traffic volumes or physical contexts, possibly leading to higher unit costs.[64]

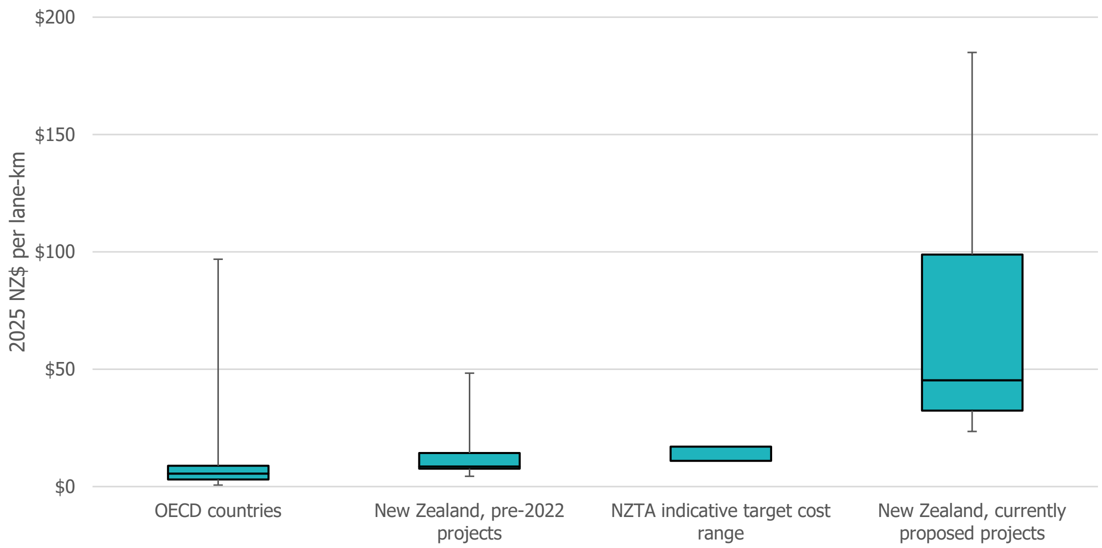
Additionally, discussions with NZTA suggest that this could be partly due to their inclusion of generous contingency or future cost escalation allowances in the published cost ranges. These factors, by

[62] Flyvbjerg, B. (2014). What you should know about megaprojects and why: An overview. *Project management journal*, *45*(2), 6-19.
[63] Forward Guidance | Research & Insights | Te Waihanga
[64] Page 11: https://www.transport.govt.nz/assets/Uploads/Government-Policy-Statement-on-land-transport-2024-FINAL.pdf

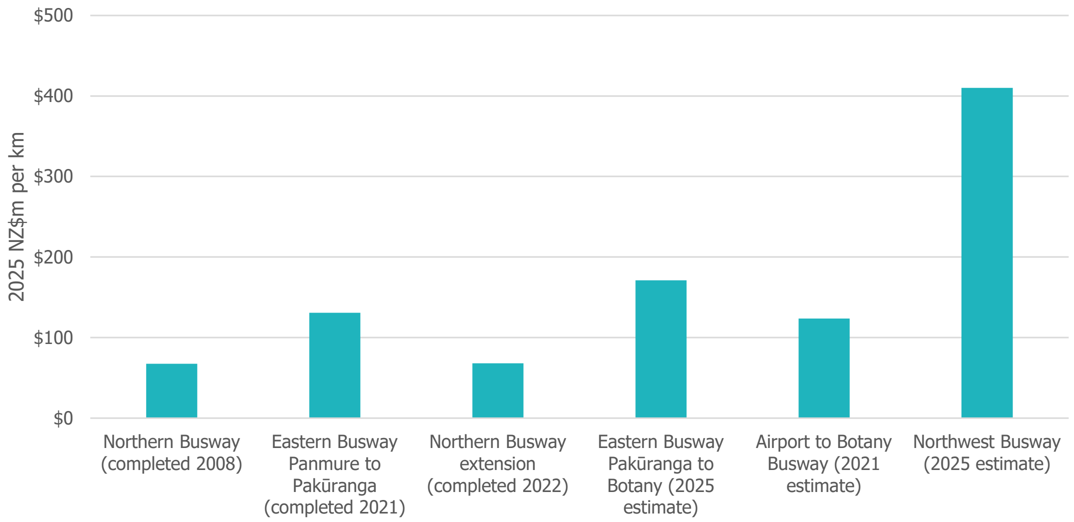
themselves, seem unlikely to explain the full magnitude of the difference.[65] It is more likely that these cost increases reflect, to some extent, the scope and design requirements for these projects.

Figure 34: Comparison of estimated unit cost ranges for motorway, and rapid transit projects in New Zealand and other OECD countries

Panel A: Inflation-adjusted per-kilometre costs to build motorways and expressways in New Zealand and other countries



Panel B: Inflation-adjusted per-kilometre costs to build busways in New Zealand



Source: 'Understanding capacity upgrade pressures across infrastructure networks'. New Zealand Infrastructure Commission. (2026). Panel A: Commission re-analysis of project cost data from New Zealand Infrastructure Commission (2022) to adjust costs to 2025 values, plus analysis of NZTA indicative target costs and NZTA information releases on current RONS projects. Panel B: New Zealand Infrastructure Commission analysis of contract cost data or business case estimates released by transport agencies, adjusted to 2025 values using Stats NZ's civil construction capital goods price index.

[65] A simple example suggests why this is unlikely. In recent decades, civil construction prices have risen by around 3% per annum. As a result, a project that is expected to be built 20 years in the future would be expected to cost 80% more in future due to inflation than the same project built today. This suggests that escalation over a multi-decade period might be sufficient to explain escalated unit costs that are around twice as high as present-day costs, but not costs that are considerably higher than that.

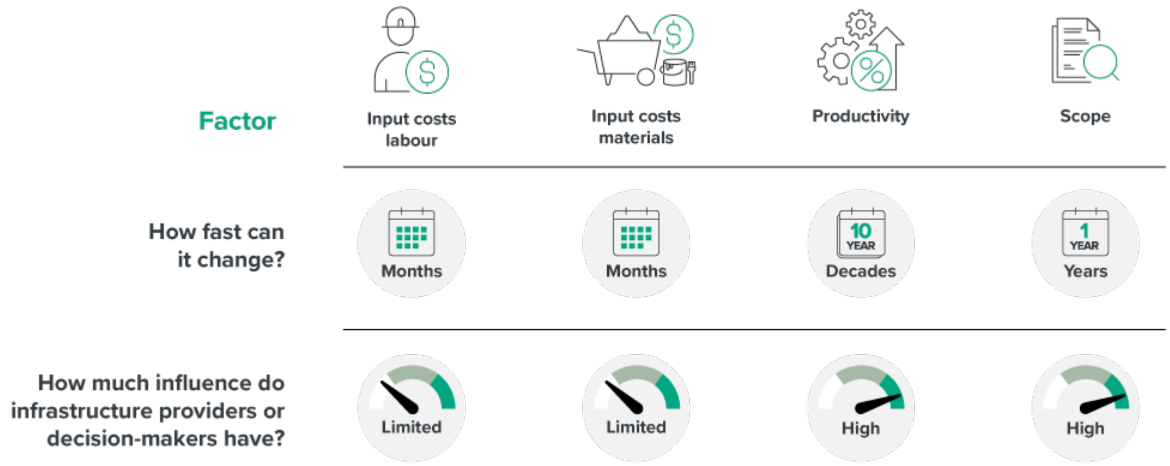
Our work then went on to highlight that meeting these transport ambitions is possible, but it requires two conditions. First, they must be built only when the capacity of the existing route is exceeded. Second, they must be built at a unit cost that is consistent with international benchmarks. Both conditions require properly scoping a project and discipline on costs.

To help protect the capital budget and ensure it is used efficiently, our research outlined an intervention hierarchy for infrastructure investment decisions. Lower-cost options, such as early land acquisition and demand management, should be considered first. Targeted upgrades that optimise existing networks should usually come before higher-cost capital projects aimed at expanding capacity. To support this approach, our research suggested developing clear demand triggers – for example, daily average traffic volumes reaching defined thresholds that prompt planning for roading upgrades.

6. Conclusion

This *Research Insights* paper, which summarises and updates our previous work on the drivers of infrastructure costs, challenges the idea that ever-increasing delivery costs are inevitable. Multi-decade high inflation in the aftermath of the Covid-19 pandemic – a global phenomenon – coincided with budget overruns on several high-profile projects, contributing to concerns about the cost-effective delivery of public infrastructure in New Zealand.

Our research presents a conceptual framework for understanding infrastructure costs, comprising three drivers: input costs, construction productivity, and project scope and design factors.



Source: 'Why do construction input costs change? The role of global and local factors'. New Zealand Infrastructure Commission. (2023).

New Zealand appears to have broadly similar input costs to other high-income countries. What we observe, however, is that decision-makers often do not have high levels of control over the domestic and international factors that influence labour and materials costs. Construction sector wage growth, for example, tracks wage growth in the wider economy, while prices for more tradeable materials such as structural steel, diesel, and timber, are largely a function of international commodity markets. This is a finding that has not changed with new data or information.

On infrastructure construction productivity, New Zealand is also middle of the pack. Productivity growth for the heavy and civil engineering subsector may have been outpaced by the construction sector as a whole during the 2010s, when productivity accelerated after a long period of stagnant growth, but New Zealand outperformed many other high-income countries, including larger economies such as the United States. Construction productivity appears to have declined in recent years, with outputs shrinking faster than labour inputs, but this trend is not unique to New Zealand.

Unlike input costs, decision-makers have more control over construction productivity. Improving productivity in the sector – particularly for heavy and civil engineering – would put meaningful downward pressure on infrastructure cost growth. But policy choices that lead to faster productivity growth – for instance, easing regulatory barriers to facilitate the diffusion of new technologies or incentivising greater competition – can take several years or decades to eventuate.

This leaves project scope and design choices as the most controllable near-term factor influencing infrastructure costs. Compared to other high-income countries, New Zealand has statistically significant cost premiums for complex, large-scale infrastructure, such as roading and underground rail projects. Recent information has only reinforced this finding.

Understanding why this is the case and examining the different factors influencing project scope in this country relative to elsewhere in the world, represents an opportunity to contain costs and bring them more in-line with our peers.

Much of our previous research has taken place at a macro level. However, one key conclusion of this report is that greater project-level research is required to better understand the various drivers of cost growth that we observe in recent years.

Observing project-level components would allow for a better understanding of the importance of higher standards, regulatory requirements, input costs, weak institutional capacity and poor planning for growing infrastructure costs. In New Zealand, previous research attempting to decompose these factors often explores and quantifies only a single factor at a time, as the Commission did with its *Cost of Consenting* report.

What is clear across our work and the existing literature on infrastructure projects is the nature of their complexity. Cost growth is rarely attributable to a single issue. Future research that looks at these components holistically would be beneficial to understand relative importance of these cost drivers. Useful examples for this type of work include work by New York University's Transit Costs Project, which used transit projects from all around the world to investigate transit costs. Other examples include Elia et al (2020), Kavlak et al (2018) and Ziegler et al (2021), which examined the drivers of cost decline for solar, wind and lithium-ion batteries technologies.

Finally, analysing these cost drivers and their relative significance can also identify where policy can make the greatest difference. For much of the two decades, infrastructure costs outpacing costs of other goods has felt at times uncontrollable and inevitable. History has shown this doesn't always have to be the case. Reducing delivery costs is not only possible; with an ageing population placing pressure on public finances, it will be essential if New Zealand is to meet its future infrastructure needs.

Appendix A. New Zealand's relative construction costs

In this paper, we presented a comparison of input costs relative to other high-income countries. This appendix details the methodology for deriving the comparison, as well as the underlying raw data.

A. 1. Methodology

Our approach remains consistent with previous Commission research.[66] This methodology replicates Langston's methodology for comparing vertical construction productivity in different cities.[67] This methodology has been widely accepted for use when comparing international jurisdictions.[68]

The methodology has four steps:

1. Identifying the standard 'bundle' of materials, labour, and equipment inputs for a given type of project (such as a road). This bundle is called a BLOC (basket of locally obtained commodities).
2. Estimating the cost for each input (for example., the cost for a tonne of concrete, or the cost for an hour of skilled labour) in each jurisdiction.
3. Multiplying the cost of each input by the quantity in the BLOC and averaging across all inputs to obtain an overall input cost index.
4. Estimating the relative construction productivity levels for each jurisdiction by dividing the total cost of the BLOC by the cost of one unit of output (for example, one square metre of high-rise office construction). This results in a multifactor productivity index as it considers all types of inputs to construction.

This is conceptually similar to conventional purchasing power parity methodologies but diverges in a few ways. Critically, the composition of the BLOC is held constant across all jurisdictions, even though different input mixes may be used in response to relative price differences.[69]

[66] New Zealand Infrastructure Commission. (2022). *The lay of the land: Benchmarking New Zealand's infrastructure delivery costs.*
[67] Langston, C. (2013). The Application of Data Envelopment Analysis to the Benchmarking of Construction Performance in Australian and American High-Rise Buildings. *International Journal of Construction Management*, 13(3), 55–75. https://doi.org/10.1080/15623599.2013.10773216
[68] As seen by both the Australian Productivity Commission (2014) and the Asian Infrastructure Investment Bank (2020).
[69] For instance, if concrete increases in price, it may be substituted with more steel and wood.

A. 2.Raw data

Table 4 presents the data used for developing the BLOC, both in terms of composition, and in terms of input unit prices. We present this data for New Zealand and Australia, noting that our investigation has extended to other jurisdictions.

Table 4: BLOC data – composition and prices for New Zealand and comparable jurisdictions

Input	Unit	BLOC quantity	Auckland (USD)	Melbourne (USD)	Sydney (USD)	All cities minimum (USD)	All cities maximum (USD)
Materials							
Concrete (30 Mpa,1500m3 job)	$/m3	45	$319	$128	$195	$89	$319
Structural steel beams (100 tonne +job)	$/tonne	6.8	$3,402	$1,874	$2,999	$1,874	$5,287
Glass pane (10mm, tempered)	$/m2	44	$217	$187	$255	$103	$409
13 mm plasterboard	$/m2	1300	$9.0	$7.5	$9.7	$4.6	$14.5
Softwood framing timber (100mm x 50mm)	$/m	2750	$3.8	$4.8	$5.8	$3.5	$15.7
Labour							
Group 1 Tradesman e.g. plumber / electrician	$/hour	150	$59	$98	$83	$29	$153
Group 2 Tradesman e.g. carpenter / bricklayer	$/hour	185	$49	$88	$75	$21	$115
Group 3 Tradesman e.g. carpet layer / tiler / plasterer	$/hour	200	$49	$83	$71	$26	$113
General labourer	$/hour	275	$38	$68	$60	$22	$90
Equipment							
50t mobile crane and operator	$/day	5	$2,673	$2,339	$2,999	$1,315	$4,943
Input cost index	**$/BLOC**		**$12,065**	**$12,729**	**$14,092**	**$9,021**	**$19,962**

Source: New Zealand Infrastructure Commission analysis of data from Langston (2013) and Turner & Townsend (2024).

Table 5 presents the data used to calculate productivity indexes across jurisdictions. This details the cost components for the input cost index, as well as the output cost for each area.

Table 5: Productivity index calculations

		Input cost index					
City	Country	Materials	Labour	Equipment	Total input index	Output cost (CBD offices high rise prestige, $m2)	Productivity index
Melbourne	Australia	$5,432	$5,236	$1,142	$11,809	$3,718	3.2
Sydney	Australia	$6,007	$5,136	$1,044	$12,186	$4,775	2.6
Toronto	Canada	$6,803	$5,013	$1,035	$12,851	$4,019	3.2
Vancouver	Canada	$7,656	$4,498	$1,269	$13,422	$4,154	3.2
Paris	France	$5,859	$4,601	$674	$11,133	$4,875	2.3
Munich	Germany	$7,406	$6,537	$809	$14,752	$5,608	2.6
Dublin	Ireland	$7,821	$3,898	$674	$12,392	$5,069	2.4
Tokyo	Japan	$6,308	$2,195	$321	$8,823	$4,845	1.8
Amsterdam	Netherlands	$6,185	$4,452	$766	$11,402	$4,929	2.3
Auckland	New Zealand	$4,586	$3,543	$1,047	$9,176	$3,560	2.6
Singapore	Singapore	$6,690	$2,057	$872	$9,619	$3,041	3.2
Birmingham	United Kingdom	$8,458	$3,718	$694	$12,870	$4,038	3.2
Glasgow	United Kingdom	$8,137	$3,592	$915	$12,644	$3,754	3.4
Leeds	United Kingdom	$8,657	$4,041	$978	$13,676	$3,912	3.5
London	United Kingdom	$10,590	$4,556	$1,893	$17,039	$6,036	2.8
Manchester	United Kingdom	$9,760	$4,007	$961	$14,727	$4,107	3.6
Chicago	United States	$6,910	$7,733	$2,250	$16,893	$8,840	1.9
Houston	United States	$6,450	$4,929	$1,558	$12,937	$5,654	2.3
Los Angeles	United States	$7,106	$7,841	$2,250	$17,197	$8,000	2.1
New York City	United States	$8,053	$11,333	$2,623	$22,008	$10,660	2.1
San Franscisco	United States	$7,767	$10,840	$2,450	$21,057	$9,277	2.3

Source: New Zealand Infrastructure Commission analysis of data from Langston (2013) and Turner & Townsend (2024).

Appendix B. Energy technology cost component breakdown

In this paper we presented the components of price decreases for photovoltaic panels, wind turbines and lithium-ion batteries. We also presented the components of cost increases for nuclear containment buildings. The appendix details the data sources and methodology used in the analysis.

B. 1. Data sources and methodology

We used variables from the data sources in Table B1 and put them into three categories: input prices productivity and scope.

Variables were categorised as input prices if they broadly related to labour and material prices and market dynamics that would influence labour and material prices. Variables were categorised as productivity if they related to manufacturing and labour efficiency in the manufacturing process. Variables were categorised as scope if they related to the quantity of inputs used and efficiency of the end product (e.g. efficiency of the actual energy technology).

Table B1 outlines which variables we assigned to each category.

Table B2 indicates the time period covered for each energy technology as well as additional notes on where within the sources the variables and figures are found.

Table B1: Data sources and variable categorisation for energy technologies

Energy Technology	Data source	Input prices (Variables)	Productivity (Variables)	Scope (Variables)
Photovoltaic panels	Kavlak et al. (2018). *Evaluating the causes of cost reduction in photovoltaic modules.* Table 2 and 3	Δ Non-Si materials costs Δ Silicon price Δ p0	Δ Plant size Δ Yield	Δ Efficiency Δ Silicon usage Δ Wafer area
Wind turbines	Elia et al. (2020). *Wind turbine cost reduction: A detailed bottom-up analysis of innovation drivers.* Table 5, 6 and 7	Material market price Energy market price Salary 25% Supplier & Others 20% Delivery cost 25% Supplier & Others Company Profit	Energy consumptions 50% Delivery costs Financial and legal 50% Supplier & Others Capital depreciation Employees productivity	Steel material quantity Fiberglass material quantity Concrete material quantity Other material quantity R&D costs Delivery costs (30%)
Lithium-ion battery	Ziegler et al. (2021). *Determinants of lithium-ion battery technology cost decline.* Figure 6	Δ Cathode materials prices Δ Electrolyte solution price Δ Anode materials prices Δ Separator price Δ Other hardware price Δ Current collectors prices	Δ Plant size and p0 Δ Materials and manufacturing yields	Δ Cell charge density Δ Charge capacity utilization Δ Cell voltage Δ Cathode foil area
Nuclear containment building	Eash-Gates et al. (2020). *Sources of Cost Overrun in Nuclear Power Plant Construction Call for a New Approach to Engineering Design.* Figure 5	Labourer wages Material prices	Deployment rates	Structure thicknesses Material composition Thermoelectric design Other plant geometry

Table B2: Time period and average annual real costs changes for energy technologies

Energy Technology	Time period	Average annual real cost change	Notes
Photovoltaic panels	Price changes between 1980–2012	**-9.8%**	The starting price and ending price came from table 2 and the cost component breakdowns came from table 3 in the source.
Wind turbines	Price changes between 2005–2017.	**-3.1%**	The starting price and ending price came from table 5 and the cost component breakdowns came from table 7 in the source.
Lithium-ion battery	Price changes between the period in the late 1990s (1995–2000) and the period in the early 2010s (2010–2015).	**-8.6%**	The starting price and ending price came from within the text of the paper and the cost component breakdown was estimated from figure 6 in the paper.
Nuclear containment building	Price changes between 1976–2017.	**+1.8%**	The starting price and ending price came from supplementary information to the paper, document S1. Supplemental Experimental Procedures, Figures S1–S12, and Tables S1–S8. The cost component breakdown was estimated from figure 5 with the source.

Appendix C. Labour productivity estimates in construction subsectors

In this paper, we presented updated figures and graphs for labour productivity in the construction subsectors.

The data sources and methods used to estimate these were the same as our previous analysis for our 2022 research insight Economic performance of New Zealand's Construction Industry. The data sources and methods are outlined in Appendix 2: Labour productivity estimates for construction subsectors.

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