



Estimating the Costs of an Uncertain Infrastructure Pipeline



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Authorship

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Foreword



Aotearoa New Zealand must gear up and build more infrastructure to support a strong economy, social progress and transition to net zero.

Underinvestment in our crucial infrastructure is one of our greatest long-term economic challenges. New Zealand has around \$100 billion worth of infrastructure projects planned and in its pipeline of upcoming work but this needs to more than double over the next 30 years to meet our current infrastructure deficit.

Our infrastructure pipeline suffers from uncertainty over project timing, funding and outcomes which is driven by a range of factors including changes in government policy, delays resulting from inefficient legislation, and limited decision-making and infrastructure procurement capability within government.

We know that the uncertainty around the infrastructure pipeline creates confusion for industry, limits their ability to invest in labour and capital, and limits the number of potential suppliers for projects. It also sends the wrong signals to important international markets that New Zealand is not open for business as a place to fund or establish business.

We commissioned Infometrics to undertake this work to help us understand the quantifiable costs associated with uncertainty around the timing, scope and funding for New Zealand's infrastructure pipeline and how a more certain pipeline might benefit the infrastructure sector.

We are pleased to publish this important contribution to enable a better understanding of the impacts of one of our sector's greatest challenges — and how we address it. We encourage the government to consider the findings of this work and urgently act on our recommendations for creating a more certain pipeline. The infrastructure sector is willing and ready to partner with the incoming government to ensure certainty and delivery.

Nick Leggett
Chief Executive

Policy recommendations

What did we find?

Our current pipeline provides some short-term certainty which erodes quickly beyond the next 3 years

Infometrics found that our current infrastructure pipeline contains only half of expected infrastructure investment in the short-term and this certainty falls away rapidly beyond the next 3 years.

The Pipeline is more certain for water, waste, and environment spending, while the pipeline for energy and communications is highly uncertain. The pipeline for transport spending, the largest spending category, is moderately uncertain compared to other spending categories.

The infrastructure sector is suffering as a result of this lack of certainty

The productivity of the infrastructure sector is impacted by the lack of certainty as evidenced by our lower return on equity, return on total assets, and surplus per employee, analysed by using the heavy and civil engineering construction industry as a proxy for infrastructure providers relative to the wider construction sector.

Increasing the certainty of the current infrastructure pipeline would better enable infrastructure stakeholders across the spectrum (from funders, to regulatory agencies, consultants, suppliers, and contractors) to plan better and integrate infrastructure investments for better scale. Most importantly, more pipeline certainty would enable better confidence for strategic investment in plant and equipment, which would boost productivity in the sector.

Better long-term investment in talent and skills would also be possible with a more certain pipeline, helping increase the skill level across the infrastructure sector closer to the industrywide average. That workforce would also be more efficient, having the right skills that can better move from project to project with more certainty that there is a next project to move to.

Greater pipeline certainty can unlock productivity benefits and improvements to enable between \$2.3 to \$4.7 billion more capital investment each year

Analysis of international literature suggests that between 13.5% and 26.5% savings could be achieved on infrastructure projects (unlocking more projects to be undertaken) through streamlining delivery. This could see between \$2.3 and \$4.7b more a year on average being delivered. Over a 30-year period, this could close a significant proportion (if not all) of our current infrastructure deficit.

Policy recommendations

There are two broad responses Infrastructure New Zealand expect to see from Government.

Take action now to create a more certain pipeline

A clear, certain and deliverable pipeline is essential for the wellbeing of Aotearoa New Zealand. The infrastructure sector needs better clarity of when projects will be brought to market and confidence that timeframes and priorities will be predictable. Government should undertake the following changes within its first term:

- accelerate the development of a clear and certain pipeline of infrastructure projects
- identify priority projects, sequence and plan significant projects more effectively, and enable early investigative works and protection activities to be undertaken where appropriate
- empower Te Waihanga – the New Zealand Infrastructure Commission to provide independent advice on the infrastructure priority list to build consensus on key projects and initiatives
- ensure project planning and prioritisation processes within government follow robust right-sized business case processes and consider a broad range of benefits including around climate resilience to ensure we are investing in the right projects.

Partner with the industry to ensure it can gear up to deliver on the pipeline

We also need to ensure the industry is in a strong position to deliver our future infrastructure pipeline. Government has an important role to play in partnering with the sector, including through:

- continuing to work with the industry, including through the construction sector accord, to develop capability and capacity within the industry and actively considering opportunities to bring skills from overseas which can't be sourced locally into the country
- developing government's own maturity as a procurer of infrastructure, building on the steps many government agencies have taken to improve asset management and long-term planning, by improving commercial decision-making, management of risk and consideration of alternative delivery and financing models
- ensuring that we have a pipeline of projects that enable us to continue to utilise specialist skills we have gone to great efforts to establish in New Zealand and for which there is high demand globally (e.g. tunnelling).



Key highlights



Pipeline highly uncertain in long term

The current Te Waihangā/New Zealand Infrastructure Commission Infrastructure Pipeline is an important element in New Zealand's ability to plan and deliver infrastructure. Although the Pipeline clearly provides more certainty than having no pipeline, the Pipeline also does not have full coverage.

Infometrics analysis shows that the adjusted Te Waihangā Infrastructure Pipeline contains nearly half of expected infrastructure investment in the short-term, but this certainty rapidly falls away in 3 years' time.

The Pipeline is more certain for water, waste, and environment spending, while the pipeline for energy and communications is highly uncertain. The pipeline for transport spending, the largest spending category, is moderately uncertain compared to other spending categories.



A 13%+ uplift in investment might be possible

Analysis of international literature suggests that between 13.5% and 26.5% savings could be achieved on infrastructure projects (unlocking more projects to be undertaken) through streamlining delivery.



More certain pipeline could enable \$2.3b a year

Analysis of potential productivity and savings improvements shows that achieving a 13%-26.5% uplift in infrastructure investment through a more certain infrastructure pipeline could see between \$2.3 and \$4.7b more a year on average being delivered, over the period 2025-31.

Interviews of select infrastructure leaders in New Zealand highlighted that skills development is also required and could be enabled through a more certain pipeline. Infometrics analysis shows that the infrastructure workforce is of a generally lower average skill level than the national average.

One key remaining question is **how** certain a pipeline might need to be, and over what forecast horizon, to achieve the outcomes sought and modelled in this analysis.



Infrastructure sector financially less efficient compared to other major industries

The infrastructure sector has a lower return on equity, return on total assets, and surplus per employee than the wider construction sector.

Introduction

Objective

Infrastructure New Zealand has commissioned Infometrics to examine the costs of an uncertain infrastructure pipeline on the New Zealand economy. These costs include both the monetary and non-monetary costs of uncertainty about the timing, scope, type, and funding of the pipeline of future infrastructure work in New Zealand.

This analysis is expected to be used to help inform and develop a more certain pipeline to create a more efficient and effective infrastructure subsector, which has a larger capacity to complete infrastructure projects, and where firms can invest in developing their workforce and growing their business.

Overview

Having a pipeline of work to plan around has been a frequent measure requested by the wider infrastructure sector across New Zealand for a number of years. Such pipelines provide transparency of upcoming projects across the sector, with construction and infrastructure-related businesses being better able to plan for what are usually major projects.

For central and local decision makers, pipelines allow for better strategic planning and integration, so that different major projects can be better sequenced to best utilise the resources and equipment required, rather than doubling up and having periods of high and low utilisation which becomes inefficient.

Although New Zealand now has an Infrastructure Pipeline, the infrastructure sector remains limited and cautious in its approach to planning for future investments. Often, major infrastructure projects are seen to be political, and there is a question mark about the certainty of current infrastructure investment decisions and the degree to which infrastructure-related businesses (including construction companies and contractors, as well as legal, project management, engineering, financial, and related wider parts of the infrastructure sector) can plan around an uncertain pipeline, and the restraint on investment into equipment and people that might result from an uncertain pipeline.

This report provides:

- An overview of the current infrastructure pipeline in New Zealand, and the level of uncertainty in the system.
- A literature review of international and local analysis
- Estimates of the potential uplift possible for infrastructure delivery in New Zealand if more certainty can be enabled.
- A discussion of current lower financial returns in the infrastructure sector.
- Conclusions around the need for a more certain pipeline and the ability for this greater certainty to enable better investment, more delivery, and lower costs.

Estimating current pipeline uncertainty

The New Zealand Infrastructure Pipeline

In 2019, Infrastructure Minister Shane Jones announced the launch of a “prototype” Infrastructure Pipeline, developed by the Treasury’s Infrastructure Transactions Unit (ITU) and then by the New Zealand Infrastructure Commission, Te Waihanga.¹

At launch, the Pipeline had a focus on major infrastructure projects out over the next five years, with the intention over time to expand coverage over a longer period.

The Pipeline has since expanded, and is seen as supporting four major objectives:

- **“Enhanced transparency: A single trusted source of project information across sectors, regions, and nationwide detailing credible investment intentions.**
- **Enhanced coordination: Organisations, sectors and regions communicating, collaborating, driving innovation, efficiencies, and cost reduction.**
- **Informed decisions and planning: Fit for purpose infrastructure projects being sequenced better and delivered on time and on budget.**
- **A smoother market: Workforce and industry capacity and capability being available when and where it’s needed. More consistent and predictable future demands on the construction sector.”²**

The Pipeline is updated quarterly, with updates usually included new projects from existing contributors, revised project details from existing contributors, and new projects from new contributors. In the most recent update available, the Pipeline at the start of 2023 had 66 contributing organisations, up from around 20 at launch.³

1 Jones, S. (2019). Infrastructure Pipeline launched. New Zealand Government. Retrieved from <https://www.beehive.govt.nz/release/infrastructure-pipeline-launched> (accessed 25 August 2023).

2 Te Waihanga (n.d.). About the Pipeline. Te Waihanga, New Zealand Infrastructure Commission. Retrieved from <https://tewaihanga.govt.nz/the-pipeline/about-the-pipeline> (accessed 25 August 2023).

3 Te Waihanga (2023). Pipeline snapshot (January – March 2023). Te Waihanga, New Zealand Infrastructure Commission. Retrieved from <https://tewaihanga.govt.nz/media/ga2pafrd/infrastructure-qr-march23.pdf> (accessed 25 August 2023).

Understanding the certainty of the current pipeline

The fact that New Zealand has an Infrastructure Pipeline clearly provides more certainty than having no pipeline. However, general expectations from the construction sector are that the pipeline is not full coverage of all the possible projects and work expected to be undertaken in the infrastructure space. This expectation isn't a criticism of the current Pipeline but is instead an expression of the still-growing profile and coverage that the Pipeline has.

To assess just how certain the current Pipeline is, Infometrics has undertaken an evaluation of the likely coverage of infrastructure investment in the Pipeline. To do this, we have taken a download of the Pipeline Snapshot in May 2023 and evaluated the data available.

In the March update of data included in the Infrastructure Pipeline, there were 4,736 individual projects listed, with around \$96b in infrastructure work profiled over the period 2010 to 2071.

The Infrastructure Pipeline includes a wide variety of infrastructure projects, including numerous vertical infrastructure (schools, hospitals, etc), as well as more network infrastructure (horizontal infrastructure). Horizontal infrastructure here includes water assets, transport assets, communications infrastructure, energy infrastructure, and more.

The Infometrics Infrastructure Pipeline Profile

Infometrics also maintains insights into the expected level of infrastructure investment across New Zealand, in our Infrastructure Pipeline Profile ("IPP").

The IPP is an 8 – 10-year profile of the expected level of network infrastructure that is expected to be invested in over the coming decade. It explicitly excludes vertical infrastructure investments.

The IPP includes both project-specific and wider expected infrastructure investment which is not tied to a specific project. For example, Infometrics Infrastructure Pipeline Profile incorporates forecasts of electricity distribution infrastructure investment using the distributors' expectations published in their own Asset Management Plans, alongside local government investment expectations laid out in Long Term Plans every three years.



Estimating future infrastructure investment

Te Waihanga’s infrastructure pipeline is an aggregation of specific infrastructure projects. Therefore, the pipeline excludes anticipated infrastructure investment which is not yet apportioned to a project.

The IPP includes wider anticipated infrastructure investment, and for this analysis, we have used the Infometrics Infrastructure Pipeline Profile as a proxy for total expected infrastructure investment. We can then evaluate the completeness of Te Waihanga’s pipeline against the total expected level of infrastructure investment.

The Infometrics Infrastructure Pipeline Profile is estimated in June years from 2010 to 2031, so the following analysis was undertaken in June years over this period. For alignment, the Te Waihanga Infrastructure Pipeline and the IPP needed to be comparable.

Current pipeline is around 66% network infrastructure

To do this, Infometrics analysed both the Pipeline and the IPP, removed vertical infrastructure projects from the Pipeline (to align with the IPP), and then aggregated both Pipeline and IPP categories to a common, examinable, set of data.

Both the Pipeline⁴ and the IPP include public and private sector investments (although predominantly public sector-related investments).

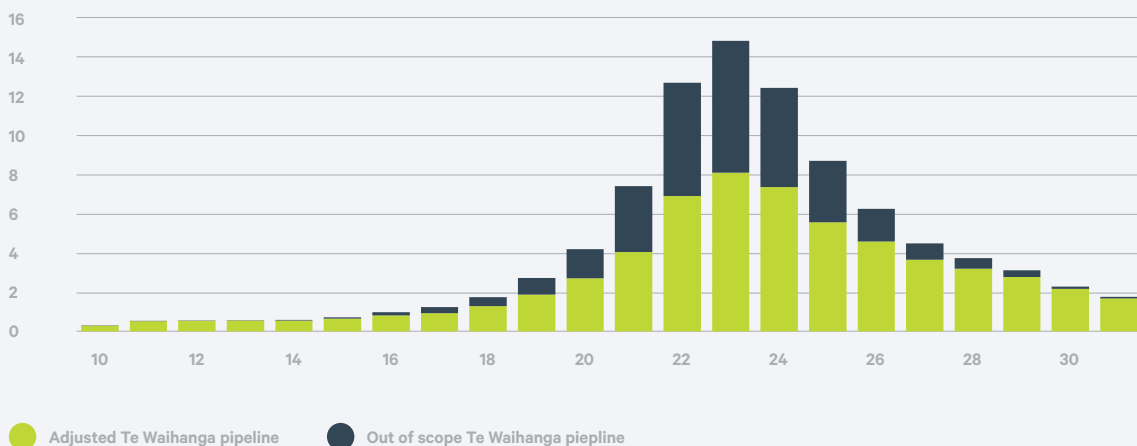
As Graph 1 shows, over the comparison period 2010-2031, around 66% of the total Te Waihanga Infrastructure Pipeline is network infrastructure comparable in definition to the IPP.

The remaining third is predominantly housing, education buildings (schools), and health investment (hospitals).

Graph 1

Network infra covers 66% of pipeline

Annual infrastructure investment, June years, \$b



4 Te Waihanga states that “Project information is provided directly from government agencies, councils, and private sector entities involved in providing infrastructure services across New Zealand.” – see <https://tewaihanga.govt.nz/the-pipeline/about-the-pipeline>

The completeness of Te Waihanga’s pipeline

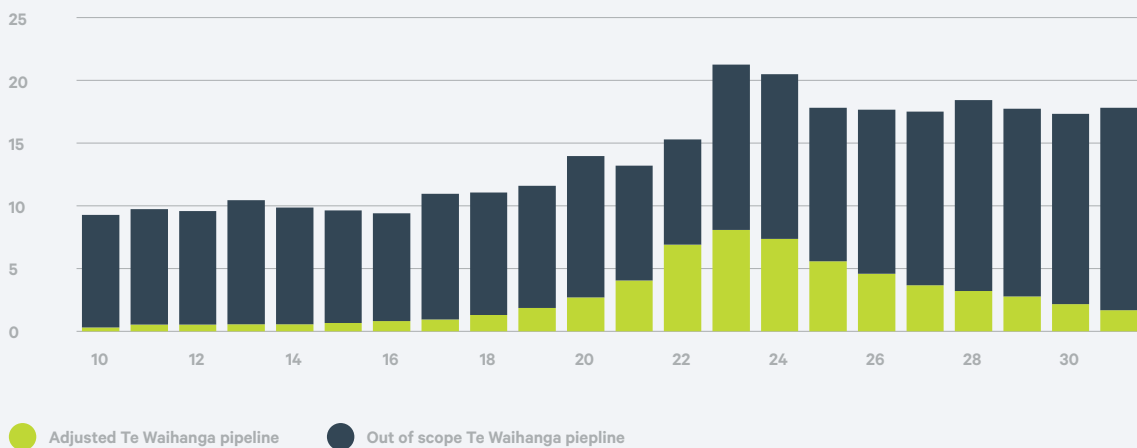
When the value of infrastructure investment in the adjusted Te Waihanga Infrastructure Pipeline is compared to the value of infrastructure investment in the IPP, two key trends become clear, as shown in Graph 2.

1. The adjusted Te Waihanga Infrastructure Pipeline represents a decent amount of the total expected volume of network infrastructure investment expected but doesn’t yet provide overwhelming coverage.
2. The adjusted Te Waihanga Infrastructure Pipeline represents a greater proportion of investment in the short term, with less coverage of expected investment over the longer term.

Graph 2

Pipeline certainly falls away quickly

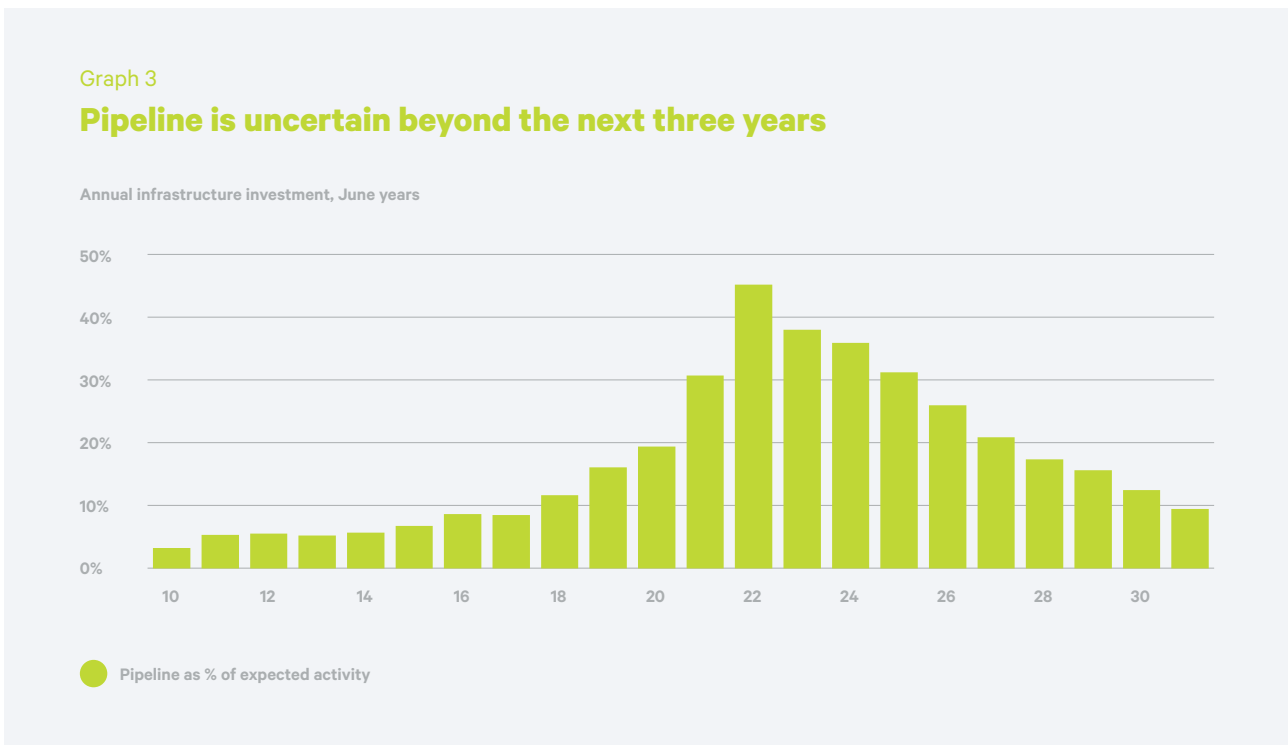
Annual infrastructure investment, June years, \$b



Graph 2 shows that there is a total of \$39b in network infrastructure investments currently known about and listed in the adjusted Te Waihanga Infrastructure Pipeline over the 9 years to 2031 – 24% of the overall total. The remaining \$127b over the 9 year period (76%) is expected to be invested, but isn’t currently covered by the adjusted Te Waihanga Infrastructure Pipeline.

The adjusted Te Waihanga Infrastructure Pipeline contains nearly half of expected infrastructure investment in the short-term. Our analysis indicates that the pipeline contains 45% of last year’s infrastructure investment, 38% for the 2023, and 36% for 2024.

Graph 3 demonstrates that the certainty of the pipeline drops away quickly, to below 30% after 2025, heading below 20% by 2028, and falls to 9.5% of expected investment in 2031.



Pipeline completeness varies across infrastructure type

Different types of infrastructure are better accounted for in the adjusted Te Waihangā Infrastructure Pipeline. This following analysis examines detailed investments for transport, energy, communications, and water, waste, and environment infrastructure.

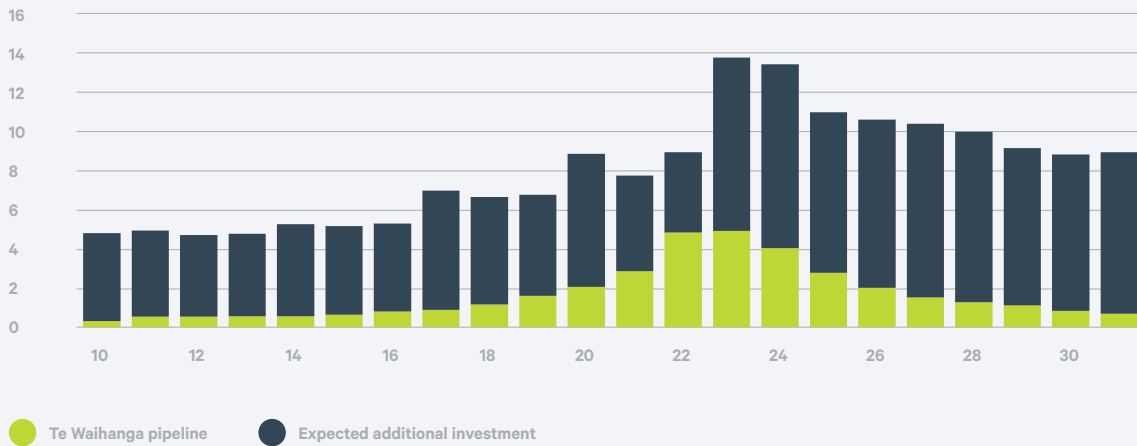
The pipeline for investment in transport infrastructure is the largest of all infrastructure types in the adjusted Te Waihangā Infrastructure Pipeline, totalling just over \$19b between 2023 and 2031. However, the pipeline for transport infrastructure is relatively uncertain, even in the short term.

Between 2023 and 2025, the transport pipeline comprises 31% of expected investment in transport infrastructure, which then falls to 15% between 2026 and 2028. Graph 4 compares the pipeline for transport infrastructure with the expected level of investment in transport infrastructure.

Graph 4

Transport infrastructure has a substantial pipeline

Annual infrastructure investment, June years, \$b



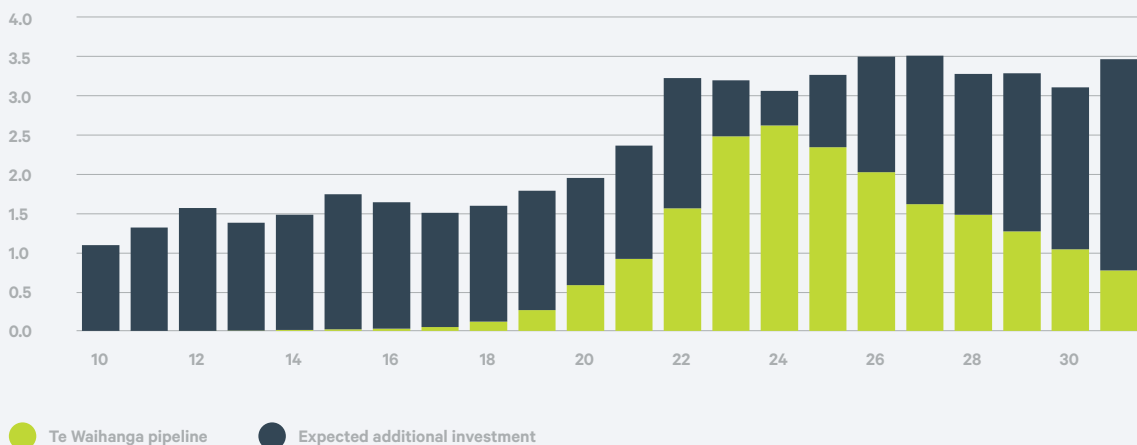
The pipeline for investment in water, waste and environment infrastructure is the most certain of the four types considered, with the pipeline comprising 78% of expected investment from 2023 to 2025, and 50% of

investment from 2026 to 2028. Graph 5 compares the pipeline for water, waste, and environment infrastructure with the expected level of investment, highlighting the completeness of the pipeline.

Graph 5

The water, waste and environment pipeline is robust

Annual infrastructure investment, June years, \$b



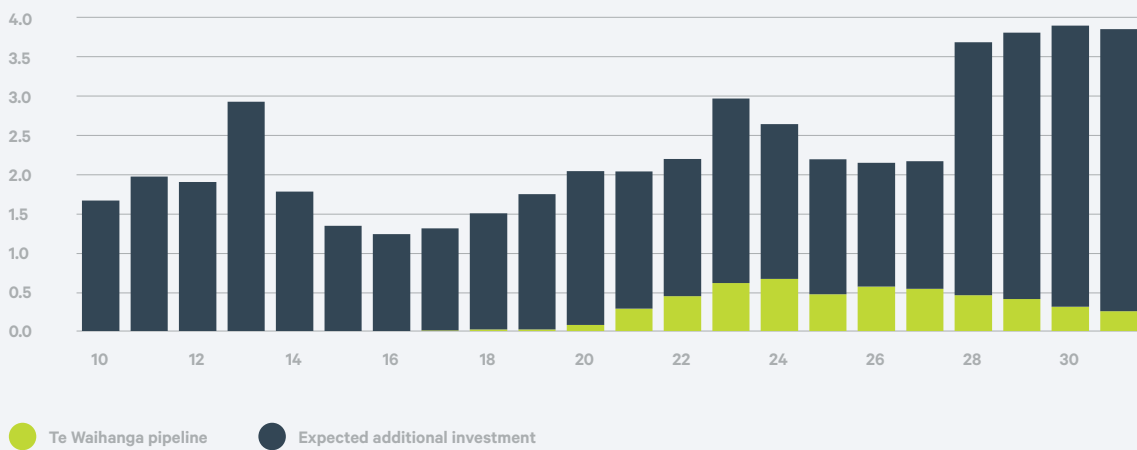
Compared to the pipeline for transport and water, waste and environment infrastructure, the pipeline for energy infrastructure is smaller and more uncertain. However, the completeness of the energy pipeline does not fall as swiftly as other infrastructure types. The energy pipeline accounts

for 22% of expected investment in energy infrastructure between 2023 and 2025, which falls only two percentage points (to 20%) between 2026 and 2028. Graph 6 compares the pipeline for energy infrastructure with the expected level of investment in energy infrastructure.

Graph 6

The energy pipeline is highly uncertain

Annual infrastructure investment, June years, \$b



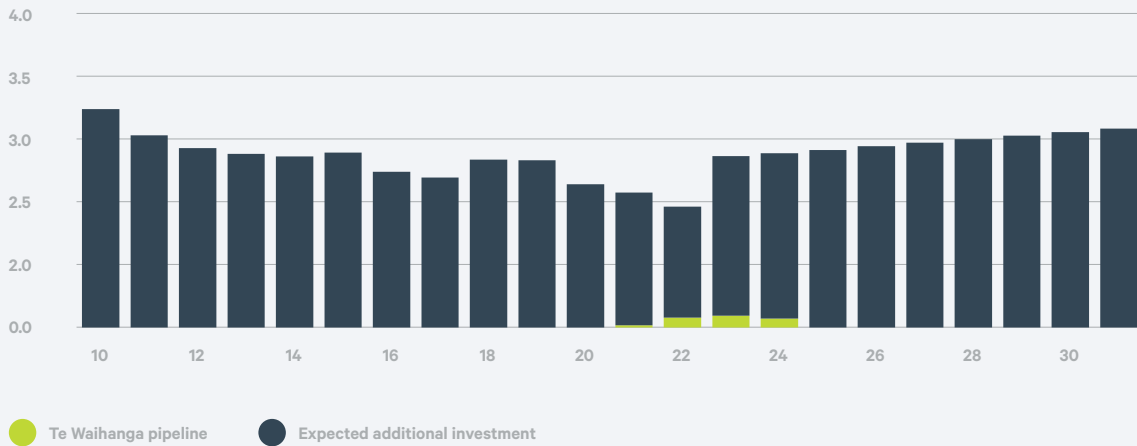
Graph 7 shows the expected level of investment in communications infrastructure in the Te Waihangā Infrastructure Pipeline and demonstrates the lack of anticipated communications infrastructure investment.

This very low level of expected investment into communications infrastructure might be due to communications spending generally being a private sector investment. A subsequent update to the Pipeline after the completion of our data analysis did incorporate expected investments for a Mobile Tower Build programme over the next decade, although this investment was still limited compared to anticipated investment over the period.

Graph 7

Pipeline for communication is almost non-existent

Annual infrastructure investment, June years, \$b



The pipeline for investment in communications infrastructure is almost non-existent, totalling \$165m between 2023 and 2025, falling to \$0pa from 2026. This communications pipeline represents 4.0% of expected investment in communications infrastructure from 2023 to 2025 (and obviously 0% thereafter).

International literature on costs of an uncertain pipeline

Infometrics has attempted to review relevant international literature to determine the costs of an uncertain infrastructure pipeline, and therefore the possible benefits of a more certain pipeline.

Although there are copious number of publications on infrastructure, infrastructure pipelines, ways to enhance infrastructure delivery, and more, few discuss or detail the certainty of the pipeline.

Where pipeline certainty is discussed, it appears to be discussed in a more binary format – either a pipeline is certain or not, without analysis to determine the potential benefits of more certainty.

Often the clearest causal link in publications to pipeline certainty surrounds the ability to plan better, invest more strategically in plant and equipment, and determine and support a required workforce with the right skills for upcoming work. Together, these common factors are seen as ways to deliver either more infrastructure or the same amount of infrastructure at a lower price or with fewer resources. All outcomes are seen as implicitly, or explicitly, productivity enhancing.

The importance of certainty

As has long been highlighted, political and policy developments are drivers of fluctuations in economic uncertainty. High policy uncertainty harms macroeconomic performance.⁵ A similar view can be extrapolated to infrastructure policy and planning – greater policy uncertainty limits infrastructure outcomes.

A 2010 World Economic Forum report, *Positive Infrastructure: A framework for revitalizing the global economy*, constructed a framework to

“provide the enabling environment for ensuring that infrastructure projects undertaken as part of stimulus programmes are economically, socially and environmentally sustainable”,⁶

designed by an expert group. This framework explicitly noted the importance of pipelines to aid planning and better economic outcomes, with section 1.6 of the Framework denoting

“1.6.i. Public sector that has the ability to create high-value, competitiveness generating projects, which can be bid, adjudicated and managed to commissioning, and then overseen through the life cycle

1.6.ii. Robust pipeline of projects that are ready to be financed”

A 2012 World Economic Forum report, *Strategic Infrastructure – Steps to Prioritize and Deliver Infrastructure Effectively and Efficiently*, outlined the benefits of preparing an Economic Infrastructure Plan, which included efficiencies and confidence to invest, reduced investment delays, lower cost of infrastructure delivery, and more.⁷

5 Davis, Steven J. Rising policy uncertainty. No. w26243. National Bureau of Economic Research, 2019.

6 World Economic Forum (2010). Positive Infrastructure: A framework for revitalizing the global economy. World Economic Forum. Retrieved from <https://web.archive.org/web/20140210233524/http://www.weforum.org/pdf/ip/ec/Positive-Infrastructure-Report.pdf> (accessed 25 August 2023).

7 World Economic Forum (2012). Strategic Infrastructure – Steps to Prioritize and Deliver Infrastructure Effectively and Efficiently. World Economic Forum. Retrieved from https://www3.weforum.org/docs/WEF_IU_StrategicInfrastructure_Report_2012.pdf (accessed 25 August 2023).



Te Ara a Toa Bridge, Transmission Gully
Wellington

A further 2014 World Economic Forum report, *Accelerating Infrastructure Delivery: New Evidence from International Financial Institutions*, drew on earlier reports the G20 that recommended an^{8,9}

“increase in the supply of bankable projects in recognition of the fact that the pipeline of projects must be made broader to achieve higher levels of investment in the sector.”^{8,9}

The 2019 report by the Business Council of Australia, *Australia’s Infrastructure System: Policy settings to improve the lives of all Australians*, saw pipeline certainty as one of five ways to enhance the functioning of the wider infrastructure system, specifically

*“long-term planning and more certain project pipeline – long-term and stable funding commitments that give greater certainty to the infrastructure pipeline and ensure that businesses are ready and equipped to deliver infrastructure.”*¹⁰

The 2022 *Infrastructure Market Capacity* report, published in 2023 by Infrastructure Australia, said

*“having a stable pipeline will also facilitate the transformation of industry productivity through the adoption of production and manufacturing approaches to reduce cost volatility, lower overall prices and create a more sustainable industry.”*¹¹

8 World Economic Forum (2014). *Accelerating Infrastructure Delivery: New Evidence from International Financial Institutions*. World Economic Forum. Retrieved from https://www3.weforum.org/docs/WEF_AcceleratingInfrastructureDelivery_2014.pdf (accessed 25 August 2023).

9 High Level Panel on Infrastructure. (2011). *Recommendations to G20 Final Report*. Hosted by the Ministry of Foreign Affairs of Japan. Retrieved from https://www.mofa.go.jp/policy/economy/g20_summit/2011/pdfs/annex09.pdf (accessed 25 August 2023).

10 Business Council of Australia. (2019). *Australia’s Infrastructure System: Policy settings to improve the lives of all Australians*. Business Council of Australia. Retrieved from https://www.bca.com.au/australia_s_infrastructure_system_policy_settings_to_improve_the_lives_of_all_australians (accessed 25 August 2023).

11 Infrastructure Australia. (2023). *2022 Infrastructure Market Capacity*. Infrastructure Australia. Retrieved from https://www.infrastructureaustralia.gov.au/sites/default/files/2023-04/2022_IA_Market-Capacity-Report_2.0_HR.pdf (accessed 25 August 2023).

Certainty and private capital

A 2015 OECD report highlighted the importance of have a stable pipeline to support private capital investment, with a

“sufficient pipeline of projects ... over the long-term”

needed to enable institutional investors.¹²

Pipeline development and certainty can also enhance private sector participation and increase the leveraging of private sector capital in the infrastructure space. The World Bank Public Private Infrastructure Advisory Facility’s *PPP Institutions Building Program* has supported identification of additional projects to be added to the pipeline of work in developing countries. For example, in Kenya

“a strong PPP pipeline expected to mobilize \$1.25 billion in private capital in the transport, energy, education, and agriculture sectors.”¹³

More directly, the Program has also noted that “the private sector often reports a lack of quality projects in the pipeline as a constraint to invest in infrastructure”.¹⁴

Further work by the World Bank has also highlighted the ability for greater infrastructure pipeline certainty to both identify more opportunities for utilising private investment, but also improves

“project bankability”

that private capital can be more confident about investing into.¹⁵ The not-for-profit business advocacy group *BusinessLDN* (formerly *London First*) highlighted that uncertain pipelines are not as

“investable by investors...”¹⁶

They cited a 2017 report from the UK’s Infrastructure Forum that found that only 8% of projects in the UK-equivalent infrastructure pipeline were

“sufficiently certain for contractors to prepare to deliver them”.¹⁷

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- 12 Dahou & Biau. (2015). *Fostering Investment in Infrastructure*. OECD. Retrieved from <https://www.oecd.org/daf/inv/investment-policy/Fostering-Investment-in-Infrastructure.pdf> (accessed 6 October 2023).
 - 13 World Bank. (2023). *Building Stronger Institutions to Mobilize Private Capital in Infrastructure*. World Bank. Retrieved from <https://www.worldbank.org/en/results/2023/04/20/building-stronger-institutions-to-mobilize-private-capital-in-infrastructure> (accessed 6 October 2023).
 - 14 International Bank for Reconstruction and Development. (2018). *Procuring Infrastructure Public-Private Partnerships Report*. World Bank. Retrieved from <https://thedocs.worldbank.org/en/doc/256451522692645967-0050022018/original/PIP32018.pdf> (accessed 6 October 2023).
 - 15 Marcelo, Darwin, Cledan Mandri-Perrott, Schuyler House, and Jordan Z. Schwartz. (2016). *An alternative approach to project selection: the infrastructure prioritization framework*. World Bank. Retrieved from <https://thedocs.worldbank.org/en/doc/844631461874662700-0100022016/original/160423InfrastructurePrioritizationFrameworkFinalVersion.pdf> (accessed 6 October 2023).
 - 16 Infrastructure Funding and Financing Working Group. (2019). *The role of private capital in securing London’s future infrastructure*. BusinessLDN. Retrieved from <https://www.businessldn.co.uk/sites/default/files/documents/2019-09/InfraFinancing.pdf> (accessed 6 October 2023).
 - 17 The Infrastructure Forum. (2017). *Sustainable Procurement: A Vision for UK Infrastructure*. The Infrastructure Forum. Retrieved from https://www.infrastructure.cc/_files/ugd/d9a995_5bc1017abd7b424289ba2e4514ecbaa9.pdf (accessed 6 October 2023).

NZ's interest in a more certain pipeline

A key goal of the New Zealand Construction Accord Transformation Plan was to

“provide visibility of a more comprehensive and certain pipeline of construction work that includes both government and private sector projects.”¹⁸

AECOM's Sentiment infrastructure and buildings construction survey, conducted annually, has increasingly noted a need for a more certain pipeline.

The 2018 edition submitted that

“key drivers of the decline in [infrastructure sector] sentiment over the past 12 months are the market's desire for improved confidence in the pipeline of projects coming to market and transparency around funding.”¹⁹

The 2019 edition outlined that

“one of the other key themes that emerged from this year's survey was the need for a clearer understanding of the future pipeline of work to give industry participants more certainty around planning for upcoming work and to allow them to build the right capacity to deliver essential infrastructure. The government's announcement on 9 May [2019] about an infrastructure pipeline is a welcome step in this direction.”²⁰

The 2021 report went the furthest, outlining that

“without the skilled workforce to deliver these infrastructure projects, and without the certainty of robust delivery models or pipeline visibility, the positive impacts of additional infrastructure investment may not be realised.”²¹

The 2022 edition echoed all these themes, including the need for a more certain pipeline to

“allow organisations to build the capacity to deliver essential infrastructure sustainably.”²²

The importance of a more certain pipeline also reoccurred throughout Deloitte's 2021 report, *A better way forward: Building the road to recovery together*, for Te Waihangā.²³

18 Construction Sector Accord. (2020). Construction Accord Transformation Plan. MBIE. Retrieved from <https://www.constructionaccord.nz/assets/Construction-Accord/files/construction-accord-transformation-plan.pdf> (accessed 25 August 2023).

19 AECOM. (2018). Sentiment infrastructure and buildings construction survey. AECOM. Retrieved from <https://aecom.com/wp-content/uploads/documents/brochures/Sentiment-NZ2018-WEB.pdf> (accessed 25 August 2023).

20 AECOM. (2019). Sentiment infrastructure and buildings construction survey. AECOM. Retrieved from <https://www.aecom.com/nz/wp-content/uploads/2019/06/Sentiment-NZ2019-WEB.pdf> (accessed 25 August 2023).

21 AECOM. (2021). Sentiment infrastructure and buildings construction survey. AECOM. Retrieved from <https://aecom.com/wp-content/uploads/documents/brochures/Sentiment-NZ2021-WEB.pdf> (accessed 25 August 2023).

22 AECOM. (2022). Sentiment infrastructure and buildings construction survey. AECOM. Retrieved from https://cms.withoutlimit.net/nz-sentiment/uploads/Sentiment_NZ_2022_5dfd533d47.pdf (accessed 25 August 2023).

23 Deloitte (2021). *A better way forward: Building the road to recovery together*. Deloitte. Retrieved from <https://www2.deloitte.com/content/dam/Deloitte/nz/Documents/icp/Deloitte%20Construction%20Sector%20C19%20Recovery%20Study.pdf> (accessed 25 August 2023).

A lack of concrete estimates on the impact of pipeline certainty

Even of the more limited literature that directly discusses certainty of pipelines, or the importance and value of more certainty, there is usually little quantitative analysis of this certainty. Only two sets of analysis engaged in a useful quantitative assessment of a more certain pipeline and are set out below.

First, a 2014 report by the Australian B20 Infrastructure & Investment Taskforce estimated that 10% of the potential shortfall in infrastructure investment needed globally by 2030 could be achieved by better project selection.²⁴ This analysis was repeated in the previously referenced 2014 World Economic Forum report.²⁵

The Taskforce also assessed that 60-65% of the shortfall could be enabled through better project preparation, structuring and delivery (i.e. procurement), 10-15% through improved enabling environments (cross border investments), and 15% through better long-term financing.

Using the \$210b infrastructure deficit estimate contained in the Treasury's 2022 Investment Statement,²⁶ and the above 10% estimate, and \$21b in infrastructure could be estimated to be enabled by a stronger pipeline.

Second, a 2013 report by McKinsey & Company is the most instructive piece of analysis we reviewed.²⁷

It calculates the possible infrastructure savings from streamlining delivery of infrastructure projects, with a mid-point average of 26.5% possible savings available for new projects, and a 13.5% possible savings on renewal projects. These savings are driven by three components:

- Value engineering: 7% midpoint average
- Effective procurement processes: 8% midpoint average
- Less costly construction techniques: 11.5% midpoint average.

The estimates of savings are based on results from 40 McKinsey & Company cases on the optimization of infrastructure project delivery.

These estimates have been used as the basis for further analysis in the next section of this report, to examine the potential uplift in infrastructure investment with a more certain pipeline.

24 B20 Infrastructure & Investment Taskforce. (2014). B20 Infrastructure & Investment Taskforce Policy Summary. Files hosted by the University of Toronto. Retrieved from <http://www.g20.utoronto.ca/b20/B20-2014-infrastructure-recs.pdf> (accessed 25 August 2023).

25 World Economic Forum (2014)

26 Treasury. (2022). He Puna Hao Pātiki: 2022 Investment Statement. New Zealand Government. Retrieved from <https://www.treasury.govt.nz/sites/default/files/2022-03/is22-hphp-v2.pdf> (accessed 25 August 2023).

27 Dobbs et. al. (2013). Infrastructure productivity: How to save \$1 trillion a year. McKinsey & Company. Retrieved from https://www.mckinsey.com/~/media/mckinsey/business%20functions/operations/our%20insights/infrastructure%20productivity/mgi%20infrastructure_full%20report_jan%202013.pdf (accessed 25 August 2023).



Estimates of a more certain pipeline

Our analysis of the current infrastructure pipeline in New Zealand and various reports and literature internationally provides a basis from which we can begin to assess the potential uplift in investment that could be enabled by a more certain infrastructure pipeline.

A 13.5% infrastructure investment uplift possible

Our analysis of estimates put forward in some international literature provides a basis to estimate the potential infrastructure investment uplift that might be possible from a more certain pipeline. Although other estimates might also exist, they are of such a high potential uplift that is, in our view, unfeasible.

We believe that the following infrastructure investment uplift estimates, given a more certain pipeline, are more moderate and feasible:

- A 13.5% uplift, based on the infrastructure savings estimates produced by McKinsey & Company on the savings possible on renewal projects.
- A 26.5% uplift, based on the infrastructure savings estimates produced by McKinsey & Company on the savings possible on new projects.

As Table 1 shows, achieving a 13.5-26.5% uplift in infrastructure investment through a more certain infrastructure pipeline could see between \$2.4 and \$4.7b more a year on average being delivered, over the period 2025-31.

Table 1

Achieving a possible infrastructure uplift

Annual infrastructure expectations, \$b

	Additional investment, annual average	Additional investment, 2025-31
McKinsey & Company - New Projects Savings Estimate	\$4.71	\$32.94
McKinsey & Company - Renewal Projects Savings Estimate	\$2.40	\$16.78

Source: Infometrics estimates

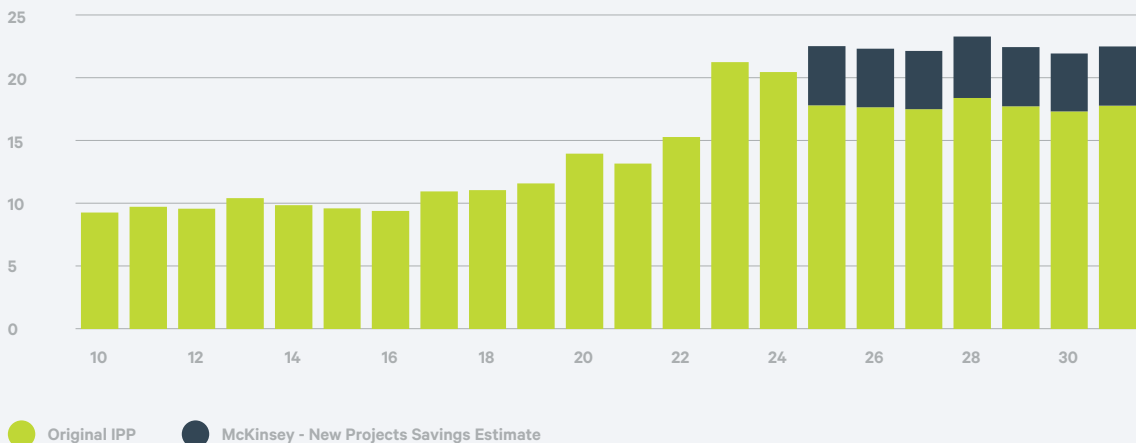
Cumulatively, a more certain pipeline under the three above scenarios could generate additional infrastructure investment of \$16-\$33b over the 7 years to 2031, compared to our existing baseline expectation.

Graph 8 and Graph 9 below outline the expected infrastructure investment under each estimate outcome.

Graph 8

Pushing investment to around \$20b pa – new projects

Annual infrastructure investment, June years, \$b





Waitangirua Interchange
Porirua

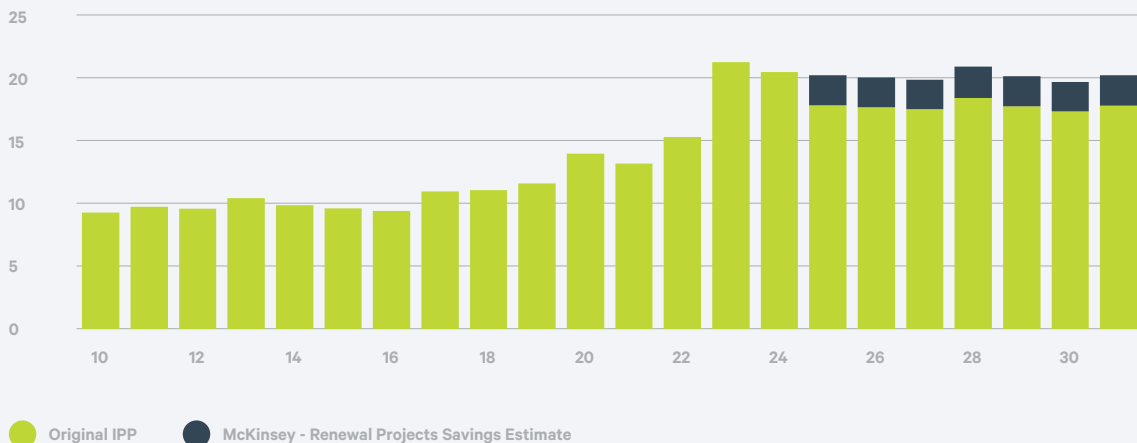
Under the new project savings estimate from McKinsey & Company, the additional \$4.7b average investment uplift each year would see infrastructure investment average nearly \$22.5b a year from 2025-2031.

Under the renewal project savings estimate from McKinsey & Company, the additional \$2.4b average investment uplift each year would see infrastructure investment average nearly \$20.2b a year from 2025-2031.

Graph 9

Pushing investment to around \$20b pa - renewal projects

Annual infrastructure investment, June years, \$b



Skills development also required

Although not a central focus of this analysis, Infometrics also undertook some qualitative short interviews with a small number of key infrastructure leaders in New Zealand to add qualitative support to the quantitative results.

Although these qualitative assessments confirmed much of the views around a need for a more certain pipeline, they also raised a greater than expected focus on workforce and skills development being enabled by a more certain pipeline.

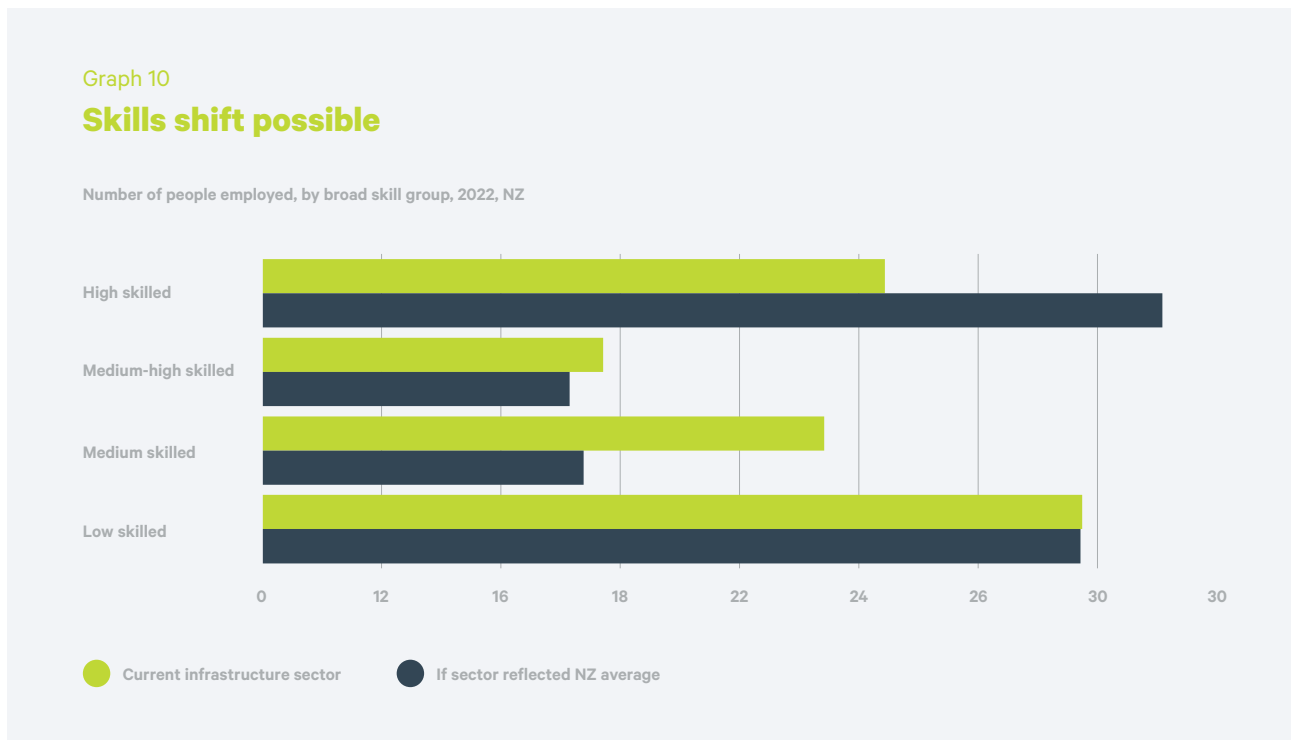
Alongside the other literature reviewed earlier, greater infrastructure pipeline certainty was also implicitly supported in a 2016 World Economic Forum report, *Shaping the Future of Construction: A Breakthrough in Mindset and Technology*. The report recommended taking

*“a long-term view of workforce demand, by simulating the future project pipeline... it should consider, for example, future skills requirements”.*²⁸

To take the longer-term view of workforce demand, having a more certain pipeline is required.

The focus on workforce development through a more certain infrastructure pipeline, noted in our qualitative conversations, highlighted that infrastructure leaders were increasingly of the view that a more certain pipeline would allow infrastructure firms to enable better succession planning and development for rising leaders in the sector, recruit ahead of time for skills, retain more staff rather than have volatile employment based on available/underway contracts, and ultimately upskill their current workforce to be more efficient and effective.

Infometrics analysis shows that the infrastructure workforce is of a generally lower average skill level than the national average. Graph 10 shows the current skill level of infrastructure sector employees, and how the skills mix would look like if the sector was aligned to the national average.



28 World Economic Forum (2016). *Shaping the Future of Construction: A Breakthrough in Mindset and Technology*. World Economic Forum. Retrieved from https://www3.weforum.org/docs/WEF_Shaping_the_Future_of_Construction_full_report_.pdf (accessed 25 August 2023).



In 2022, around 14,000 workers (35% of the workforce) were low-skilled in the infrastructure sector (proxied by the heavy and civil construction industry), broadly the same as the national average (35%).

But medium skilled workers in the infrastructure sector accounted for a much larger share of total employment than the national average, with 9,400 (24%) in infrastructure compared to just below 14% across all industries.

Medium-high skilled workers were broadly similar, with 5,700 (14.5%) of the infrastructure sector employment, and 13% of national employment.

High skilled workers in the infrastructure sector represented around 10,400, or 26.5% of total employment. This share was considerably lower than the 38.4% national average.

Around 4,600 workers would need to shift up across low, medium, and medium-high skilled groups into the high skilled group.

To see the infrastructure workforce skills mix increase to meet the national average, around 12% of the workforce would need to be upskilled.

Assessing the financial outcomes of pipeline uncertainty

This section provides a case study on the heavy and civil engineering construction industry, as a proxy for the wider infrastructure sector, and the lower financial returns generated by the sector. Lower financial returns are an outcome driven by a broad set of economic, policy, and institutional settings, which will include the certainty of the infrastructure pipeline.

A more certain pipeline, as outlined earlier, would enable cost savings as well as increase efficiency and enable productivity gains. To better understand the current state of industry-level financial returns Infometrics has utilised data from the Annual Enterprise Survey (AES), produced by Stats NZ. We have examined a selected number of financial indicators for infrastructure-related businesses and compared these results with the broader construction sector. The purpose of providing these comparisons is to illustrate the financial performance of the infrastructure construction sector in the context of the wider construction sector in New Zealand.

In this analysis, the infrastructure sector is represented by the “heavy and civil engineering construction” sub-industry,²⁹ within the wider construction industry, given the majority focus that this industry has on infrastructure.

We have examined three key financial outcomes:

- return on equity
- return on total assets
- surplus per employee (effectively, a return on employee measure).



29 The “Heavy and Civil Engineering Construction” subindustry is a Group-level industry within the Australian and New Zealand Standard Industrial Classification (ANZSIC). It is made up of “Road and Bridge Construction” (3101) and “Other Heavy and Civil Engineering Construction” (3109) which covers a range of generally horizontal infrastructure works including railways, dams, water systems, pipelines, etc. Full details can be found here: <https://www.abs.gov.au/statistics/classifications/australian-and-new-zealand-standard-industrial-classification-anzsic/2006-revision-2-0/detailed-classification/e/31/310>

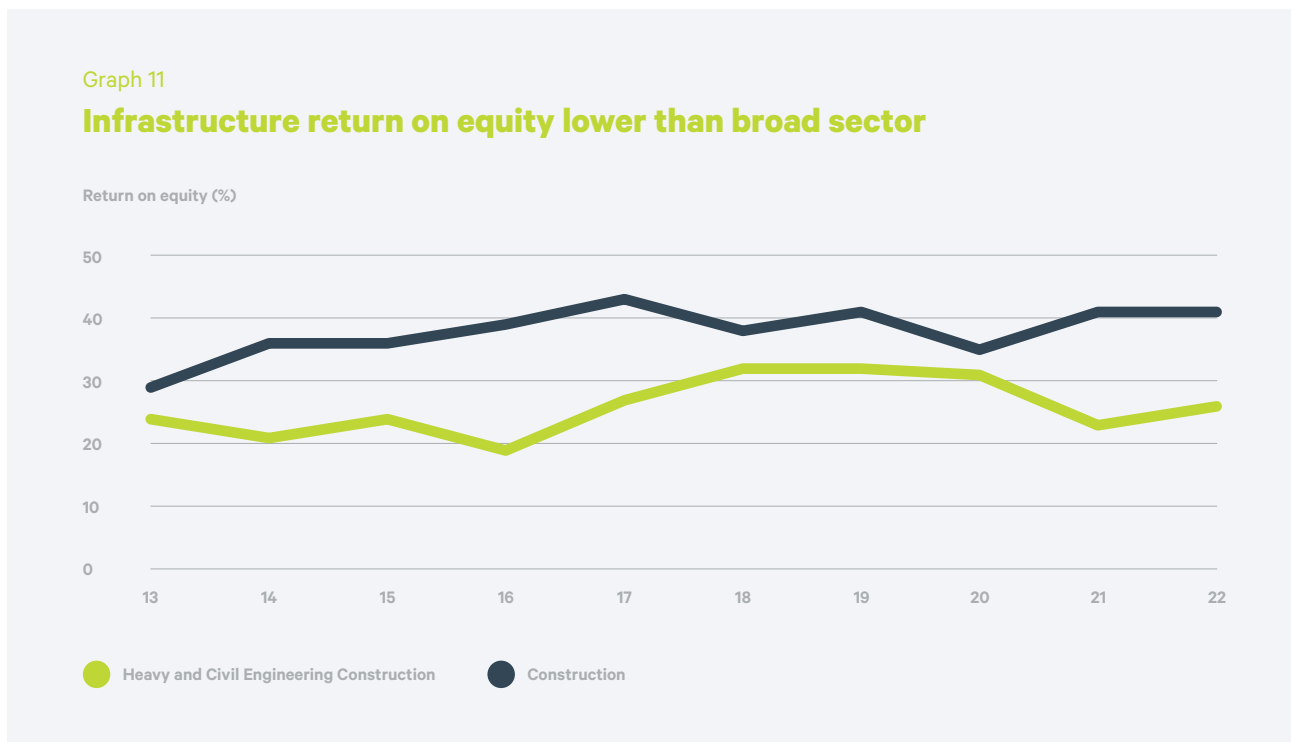
The “Heavy and Civil Engineering Construction” subindustry is the only industry that is almost fully focused on infrastructure, as for other parts of the broader infrastructure sector (including legal, project management, and financing work), there is no simple breakdown of infrastructure vs non-infrastructure focused elements of these other industries. The “Heavy and Civil Engineering Construction” subindustry, then, provides the clearest representation on how infrastructure sector-focused outcomes likely trend.

Current infrastructure industry financial returns

Return on equity

Return on equity is calculated as the total annual taxable profit divided by total proprietor or shareholder funds. This measure represents the rate of return earned on the owner's equity and investment, measuring the business's efficiency at turning equity (assets less liabilities) into profit. The higher the return on equity, the more efficiently the business has used the owner's investment.

Graph 11 highlights that the infrastructure sector, proxied by the heavy and civil engineering construction sub-industry, had a lower return on equity than the wider construction sector. On average over the 2013 to 2022 period, the infrastructure sector reported an average 26% return on equity, below that of overall construction, which had a return on equity of 38%. To achieve the same return on equity as the wider construction sector, the infrastructure sector would need a 46% gain in productivity.

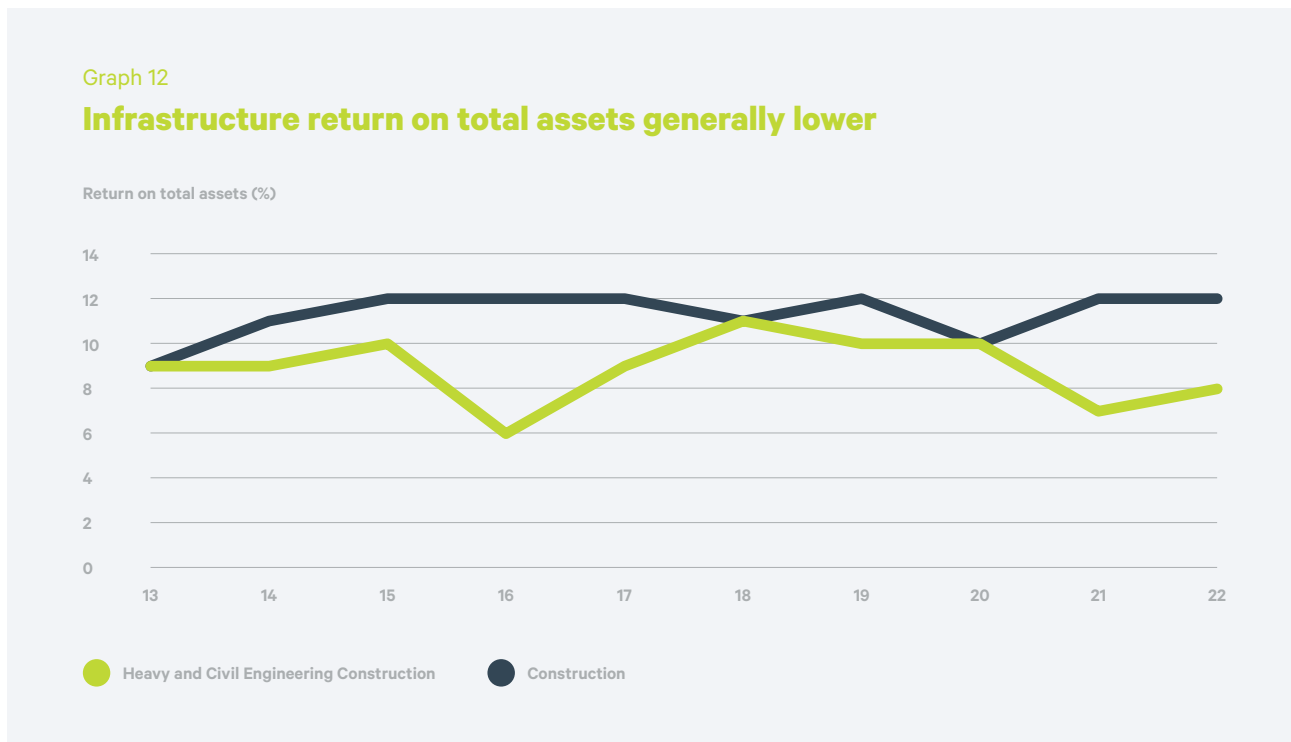


Final data for 2021 (with 2022 data still provisional), showed that residential construction had the highest return on equity (at 64%), followed by non-residential (26%) and then heavy and civil engineering construction (23%).

Return on total assets

Return on total assets is calculated as the total annual taxable profit divided by total assets. Return on total assets tests the efficiency of investment in assets and is a measure of how efficiently a business turns assets into net income. The higher the return on total assets, the more efficiently the business has used its assets.

Graph 12 demonstrates that the infrastructure sector, proxied by the heavy and civil engineering construction sub-industry, had a lower return on total assets than the total construction sector. On average over the 2013 to 2022 period, the infrastructure sector reported an 8.9% return on total assets, lower than the 11.3% average for the total construction sector over the same period. To achieve the same return on total assets as the wider construction sector, the infrastructure sector would need a 27% gain in productivity.

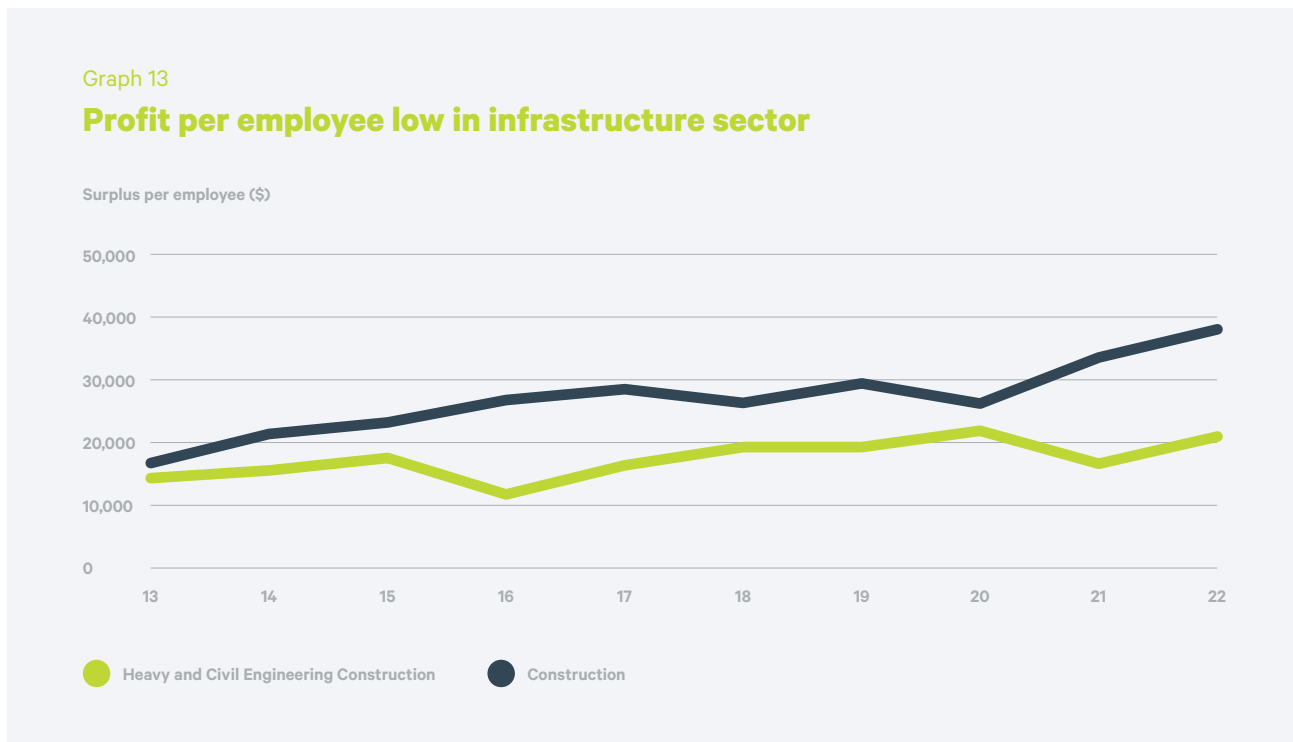


In 2021, residential construction again had the highest return on total assets (at 13%), followed by non-residential (8.0%) and then heavy and civil engineering construction (7.0%).

Surplus per employee

Surplus per employee is calculated as the total annual taxable profit divided by the total employee count. Surplus per employee tests the efficiency of investment in employees and is a measure of how efficiently a business uses its workforce. The higher the surplus per employee, the more efficiently the business has used its workforce.

Graph 13 indicates that the infrastructure sector, proxied by the heavy and civil engineering construction sub-industry, had a sustained lower surplus per employee than the total construction sectors. On average over the 2013 to 2022 period, the infrastructure sector reported a surplus of \$17,500 per employee, lower than the total construction sector, which had an average surplus per employee of \$27,110.



In 2021, residential construction also had the highest surplus per employee (at \$46,400), followed by non-residential (\$38,300) and then heavy and civil construction (\$16,800).

Conclusions

Our analysis has shown that the infrastructure pipeline in New Zealand remains uncertain, with considerable amounts of expected work not easily profiled. In particular, pipeline certainty falls away early (just a few years ahead), which limits the ability for the sector to have the confidence of secure work levels to invest in people and equipment, which in of itself limits further increases in productivity and the ability to undertake more infrastructure investment over the same period at lower cost.

International literature supports the importance of infrastructure pipeline certainty, and provides some estimates to assess the potential uplift in investment possible with a more certain pipeline.

Unclear how “certain” a pipeline needs to be

Although international literature and domestic reporting continues to highlight the importance of more certain pipeline, and our report attempts to estimate the potential uplift in investment that could be achieved through more certainty, not all questions have been answered. One key unanswered question is **how** certain a pipeline might need to be, and over what forecast horizon, to achieve the outcomes sought and modelled in this analysis.

There has been little analysis generally on quantifying the benefits of more certainty in infrastructure pipelines. Therefore, research around the degree of certainty required to yield significant benefits is particularly limited so far in literature.

More certainty clearly needed for infrastructure

Despite this lack of detailed analysis on certainty, our analysis builds a stronger evidence base around the need for a more certain infrastructure pipeline. Further, a more certain pipeline and other changes to industry settings would help enable more efficient and productivity delivery of the infrastructure pipeline, over time.

Increasing the certainty of the current infrastructure pipeline would better enable infrastructure stakeholders across the spectrum (from funders, to regulatory agencies, to contracted agencies, and more) to plan better and integrate infrastructure investments for better scale. Most importantly, more pipeline certainty would enable better confidence for strategic investment in plant and equipment, which would boost productivity in the sector.

Better long-term investment in talent and skills would also be possible with a more certain pipeline, helping increase the skill level across the infrastructure sector closer to the industrywide average. That workforce would also be more efficient, having the right skills that can better move from project to project with more certainty that there is a next project to move to.



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