When waters rise: Climate change, regional risk and infrastructure investment

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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.

We are an autonomous Crown entity, listed under the Crown Entities Act 2004, with an independent board. We were established by the New Zealand Infrastructure Commission/Te Waihanga Act 2019 on 25 September 2019.

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Cover image: Flooding of the river in Edgecumbe on April 6, 2017. Photo courtesy of NZFloodPics.

We need to know the flood risks we face

Flooding, which includes both inland and coastal flooding, is already one of New Zealand's most costly natural hazards, and the costs are rising. Climate change is increasing flood frequency and severity, sea levels are rising, and communities and infrastructure networks that were designed for yesterday's conditions will face greater pressure in the decades ahead. How New Zealand responds to this challenge will shape the resilience of its infrastructure system for generations.

But investment in resilience and flood protection competes with other pressing infrastructure demands: renewing ageing assets, meeting population growth, and the need to decarbonise our economy. Central government, local government and other infrastructure providers face real constraints on what they can spend.

This means choices have to be made: the scale of the response needs to be proportionate to the scale of the problem. Making those choices well requires evidence on the size of the risks we face, where it is concentrated, and how it will change over time, so that limited resources can be directed where they are needed most.

A new 2026 report, produced by Earth Sciences New Zealand and commissioned by Te Waihanga, helps to provide that evidence. Identifying cost-effective flood risk infrastructure is recognised as a priority for the next decade in New Zealand's National Infrastructure Plan, and doing it well requires the kind of quantitative foundation found in this research.

Why we commissioned this research

Te Waihanga has been building an evidence base for future resilience investment needs

Before quantifying what future resilience needs, Te Waihanga started with a framework for determining what optimal infrastructure approaches look like. Our 2025 Research Insights report, *Invest or Insure? Preparing infrastructure for natural hazards*,[1] set out a framework for thinking about how infrastructure owners can assess their options for managing natural hazard risk.

In short, that framework identified three broad approaches to respond to natural hazard risk: reducing physical risk, transferring financial risk or accepting the risk and either repairing after the fact or choosing not to rebuild.

[1] New Zealand Infrastructure Commission (February 2025). *Invest or insure? Preparing infrastructure for natural hazards.*

Figure 1: Alternative approaches to manage risk to infrastructure and communities

Source: New Zealand Infrastructure Commission (February 2025). *Invest or insure? Preparing infrastructure for natural hazards.*

Understanding the cost of natural hazard risk (the cost of inaction) is the essential first step in deciding how to respond. Without a quantified measure of the size of this problem, investment decisions risk being either too cautious or too costly relative to the actual risk.

Average annual loss is a useful measure for understanding the size of the problem

Average annual loss (AAL) is one such measure. AAL is the expected financial cost of damage from natural hazards each year, averaged over many years. It is estimated by modelling the full range of possible events (from small, frequent events to large, rare ones) and averaging each by how likely it is to occur in any given year. AAL provides a consistent basis for comparing risk across hazards, sectors, and regions, and averages out annual losses which can be highly variable. For example, the 2023 North Island weather events caused an estimated $5 to $7.5 billion in physical infrastructure damage, representing over a decade of average annual losses in a single event.[2]

For existing infrastructure and property, AAL provides a benchmark or threshold against which to compare options for reducing physical and financial risk, such as annual insurance premiums, or the annual cost of maintaining and renewing resilience investments. Where the cost of an option is lower than AAL, it likely represents value for money. Where the costs are higher than AAL, it may be more efficient to accept the risk and prepare to respond after an event has occurred, or take a different approach.

However, these AAL estimates do not capture indirect costs such as service disruption to consumers and reduced productivity for businesses. These are discussed in a later section.

[2] New Zealand Treasury (27 April 2023). *Impacts from the North Island weather events.*

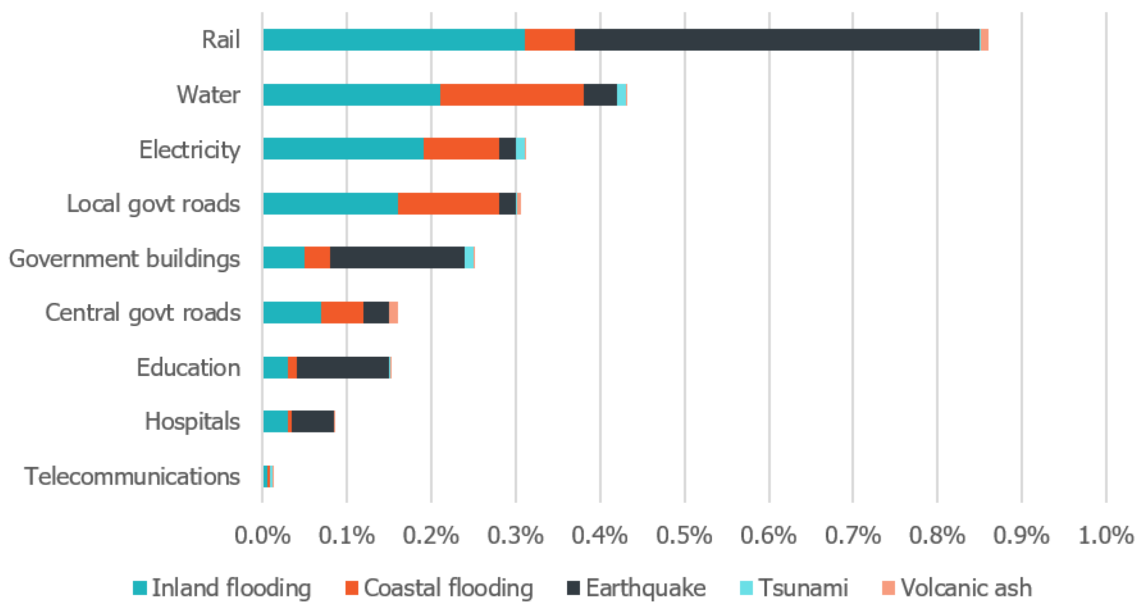
Earlier research gave us an understanding of losses across hazards and infrastructure sectors

In 2025, Te Waihanga commissioned GNS Science, predecessor to Earth Sciences New Zealand (ESNZ), to estimate national-scale losses to New Zealand's infrastructure from natural hazards.[3] That research (Phase 1) used AAL and AAL as a share of asset value (AALpc) as its two primary metrics. AALpc adjusts for asset value, allowing comparisons across sectors of different size. The AALs estimated for Phase 1 were based upon the risks as they existed in 2025, not considering growing future risk from climate change.

Figure 2 shows AALpc for each infrastructure sector, with losses broken down by hazard type. Rail faces the highest losses as a share of asset value,[4] driven largely by earthquake risk. Horizontal infrastructure (water, electricity and local roads) faces meaningful exposure to both inland and coastal flooding. Vertical infrastructure, such as hospitals and schools, has lower overall losses, with earthquakes again the dominant hazard. Totalling across all infrastructure types, almost half (45%) of losses are from inland flooding, around a quarter each from earthquakes (27%) and coastal flooding (26%), and very small shares from tsunami (1%) and volcanic ash (1%).

Flood-induced landslide risk was not included in this modelling, because the models to understand this risk at a national scale do not currently exist.

Figure 2: Average annual losses as a share of asset book value in 2025, broken down by infrastructure sector and natural hazard type



Source: Horspool, N. et al. (2025), *Estimating national-scale losses to infrastructure from natural hazards*, GNS Science (predecessor to Earth Sciences New Zealand). Prepared for the New Zealand Infrastructure Commission.

These estimates formed a key input into the Commission's Forward Guidance, our forecast for the level of investment required to meet needs in an affordable and sustainable way over the next 30

[3] Horspool, N. et al. (2025). *Estimating national-scale losses to infrastructure from natural hazards*, Earth Sciences New Zealand. Prepared for the New Zealand Infrastructure Commission.

[4] For these asset values, the book value is used.

years.[5] The AAL figures by sector were used to derive an annual resilience investment requirement for each infrastructure sector.

This new research was designed to answer some additional questions

The Phase 1 research gave us a clearer picture of what natural hazards cost New Zealand's infrastructure system today. But it raised three further questions that are important for infrastructure planning, and that the Phase 2 research was designed to answer.

First: a national average loss figure for all natural hazards is not particularly useful for infrastructure owners making decisions about how to protect against specific risks to specific networks in specific places. Risk is local, and investment decisions need to reflect that. How does natural hazard risk vary across regions?

Second: flood risk and severity are expected to increase over time as the climate warms and sea levels rise. Infrastructure assets are long-lived and understanding how hazard risk will change over the lifetime of those assets is essential for making good investment decisions now. How much will climate change increase the cost of flood damage to infrastructure, and does that vary by climate scenario?

Third: infrastructure is not only damaged by flooding, but also used to protect people and property from flooding. Stopbanks, natural waterway management, and catchment-level interventions can all reduce the risk faced by communities and private buildings. How much of this infrastructure we need depends on the scale of the problem it is solving. What is the expected annual cost of flooding to New Zealand's private building stock, and how does that change under future climate scenarios?

This modelling used several key assumptions

Book values, the original capital cost of an asset less accumulated depreciation, are used rather than replacement costs to better capture the additional loss caused by flooding.

To illustrate the difference, imagine two classrooms. These two classrooms might cost the same to replace, but a flood destroying a nearly new classroom represents a larger loss than one near end-of-life, and book value captures this difference. For private buildings, estimated replacement values are used rather than book values, due to limited available data.

Future flood losses are projected under three internationally recognised Shared Socioeconomic Pathways (SSPs): a medium greenhouse gas emissions scenario (SSP2-4.5), a high greenhouse gas emissions scenario (SSP3-7.0), and a very high greenhouse gas emissions scenario (SSP5-8.5).[6]

Modelling of future years assume that assets remain where they are in 2025 and does not account for new investments or increases in asset value. Decisions about where we build are a key tool for managing future flood exposure, and these results can be thought of as losses before that tool is applied.

Six network infrastructure sectors (water, electricity, telecommunications, local roads, central government roads, and rail) and three vertical infrastructure sectors (government buildings, hospitals

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[5] New Zealand Infrastructure Commission (2026). *Forward Guidance: Results and Modelling Technical Report*.

[6] These are the scenarios considered in the IPCC's sixth assessment report. Research on global climate scenarios since this assessment report has noted that an updated high emission scenario is likely to result in less warming than SSP5-8.5, in part due to lower emission trends since the assessment report. The SSP5-8.5 results can still provide a useful downside scenario, given there are a range of uncertainties in this modelling beyond global average temperature. See Van Vuuren, D.P., O'Neill, B.C., Tebaldi, C. et al., *The Scenario Model Intercomparison Project for CMIP7 (ScenarioMIP-CMIP7)*, *Geoscientific Model Development*, Vol 19 (2026).

and education) are modelled. Some sectors, including gas networks, ports, and airports, are not included, meaning the modelling gives a partial picture of total infrastructure losses.

Like Phase 1, risk and damage from flood-induced landslides are not included, as the models to assess this risk do not exist at a national level.

The ESNZ report provides a full description of the assumptions used which should be reviewed before using these results for investment and planning decisions.

Which climate scenarios are modelled?

ESNZ modelled three different Shared Socioeconomic Pathways (SSPs).

The Shared Socioeconomic Pathways (SSPs) were developed by the international climate research community and underpin the projections in the United Nation's Intergovernmental Panel on Climate Change's Sixth Assessment Report (IPCC AR6).

These scenarios can be thought of as a narrative describing how global society, demographics, and economies might evolve over the next 75 years. Each of these societies produce certain levels of greenhouse gases. These narratives are translated into quantitative projections of energy use, land use, and emissions, which are then used as inputs to global climate models to simulate the resulting changes in temperature, rainfall, sea level, and other climate variables.

The scenarios are not predictions and are not given specific probabilities. Rather, they describe a plausible range of futures that allows the consequences of different global development and emissions paths to be compared. These pathway narratives are discussed more thoroughly in O'Neill et al (2017).[1]

The **SSP2-4.5 scenario** represents a "middle of the road" future in which social, economic, and technological trends continue broadly in line with historical patterns and progress on emissions reduction is slower. Greenhouse gas emissions remain around current levels before beginning to decline after mid-century, but they do not fall fast enough to meet the goals of the Paris Agreement. Under this scenario, global average temperatures rise by approximately 2.7°C above pre-industrial levels by 2100.

The **SSP3-7.0 scenario** (high greenhouse gas emissions) represents a future where limited additional climate policy is implemented and global development is slow and uneven. Greenhouse gas emissions continue to rise steadily, roughly doubling from current levels by 2100. Under this scenario, global average temperatures rise by approximately 3.6°C above pre-industrial levels by 2100.

The **SSP5-8.5 scenario** (very high greenhouse gas emissions) represents a future of rapid, energy-intensive economic growth driven predominantly by fossil fuels, driving emissions to roughly triple current levels by 2075. Research on global climate scenarios since this assessment report has noted that an updated high emission scenario is likely to result in less warming than SSP5-8.5, in part due to lower emission trends since the assessment report. The SSP5-8.5 results can still provide a useful downside scenario, given there are a range of uncertainties in this modelling beyond global average temperature. Under this scenario, global average temperatures rise by approximately 4.4°C above pre-industrial levels by 2100.

These scenarios were current as of the publication of this report. The IPCC will continue updating them as new evidence becomes available. We present results across this report for all three SSPs.

[1] O'Neill, B. C. et al. (2017). The roads ahead: Narratives for shared socioeconomic pathways describing world futures in the 21st century, *Global Environmental Change* 42: 169-180.

Key findings from this research

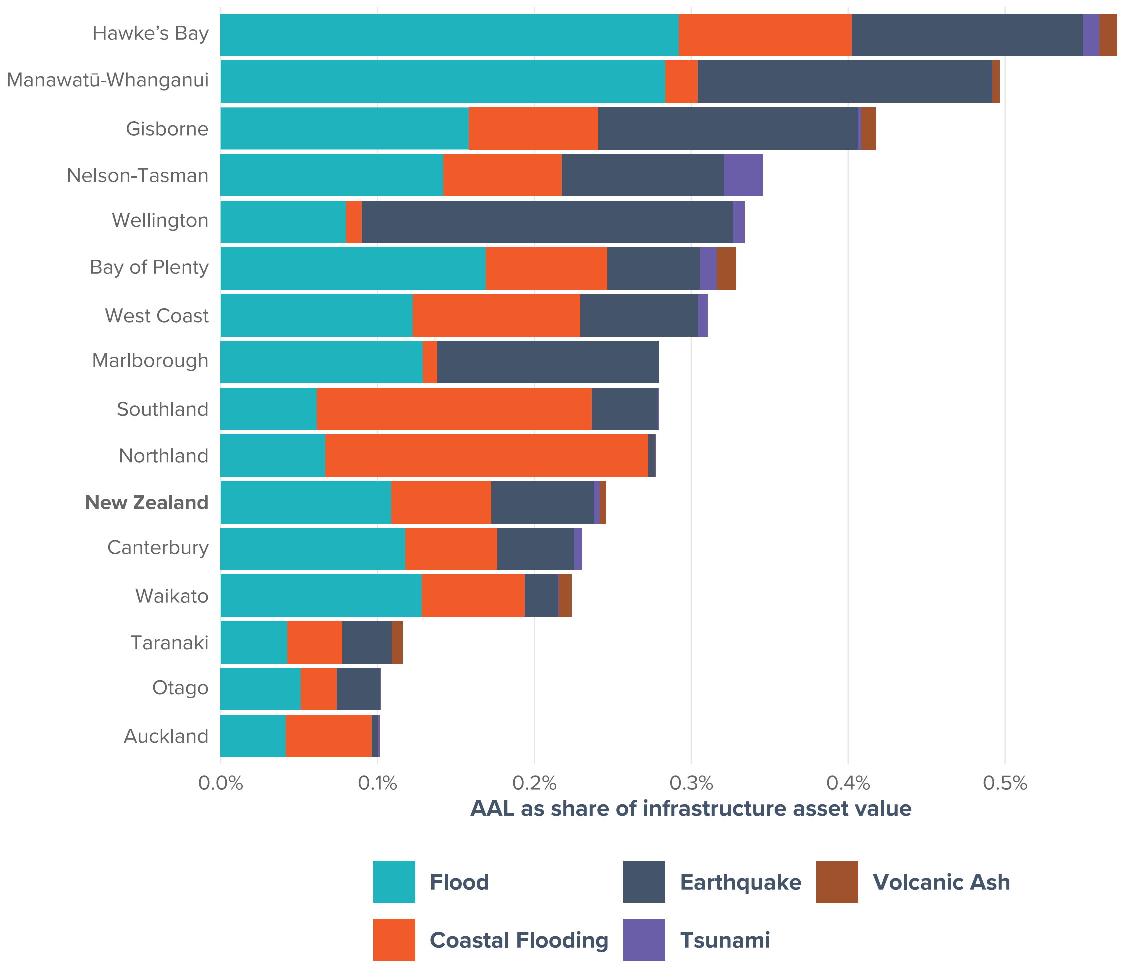
Infrastructure losses from natural hazards are highly uneven across the country

Before exploring how climate change affects flood losses, Figure 3 shows AAL as a share of asset value, broken down by region and by hazard.

Expected infrastructure losses vary significantly across New Zealand's regions. Hawke's Bay faces the highest losses as a share of infrastructure asset value, over double the national average. By contrast, regions with the largest urban centres (Auckland, Canterbury and Wellington) tend to face lower losses from flooding, with Wellington facing significant earthquake losses.

For most regions, expected losses from flooding are greater than any other natural hazard. Some regions, notably Northland and Southland, face a higher share of losses from coastal flooding than inland flooding, which matters for how risk evolves under climate change.

Figure 3: AAL as a share of infrastructure asset value by regional council area in 2025



Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling.

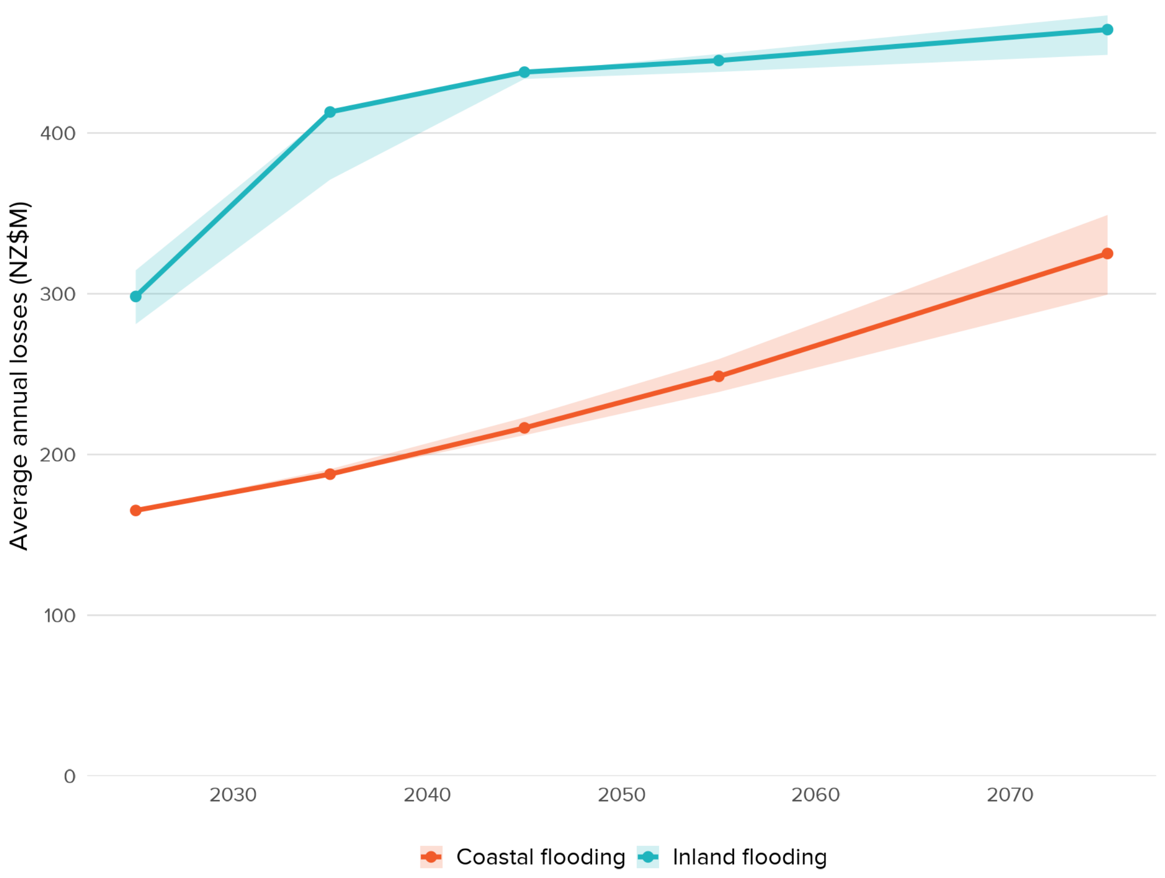
Note: Regional losses are estimated by aggregating Territorial Authorities within each region. Where a Territorial Authority crosses regional boundaries, it is allocated to the region containing the largest share of its land area. Territorial Authority-level results are in the accompanying databook.

Flooding losses to infrastructure are expected to increase in the coming decades

In 2025 and at a national level, AAL from coastal flooding is estimated at around $165 million and from inland flooding at around $300 million. Coastal flooding losses are modelled to almost double between 2025 and 2075. Over the same timeframe, inland flooding losses are projected to increase by around 50%.

Notably, the variation between different climate scenarios is not too significant, as shown in the shaded bands in Figure 4. This increase in losses is driven purely by changes in climate, as the modelling assumes the asset base size and location does not change in future. Increases in asset value will tend to increase losses, while changes to where we choose to build assets has the potential to reduce losses.

Figure 4: Average annual losses to infrastructure over time, broken down by hazard type



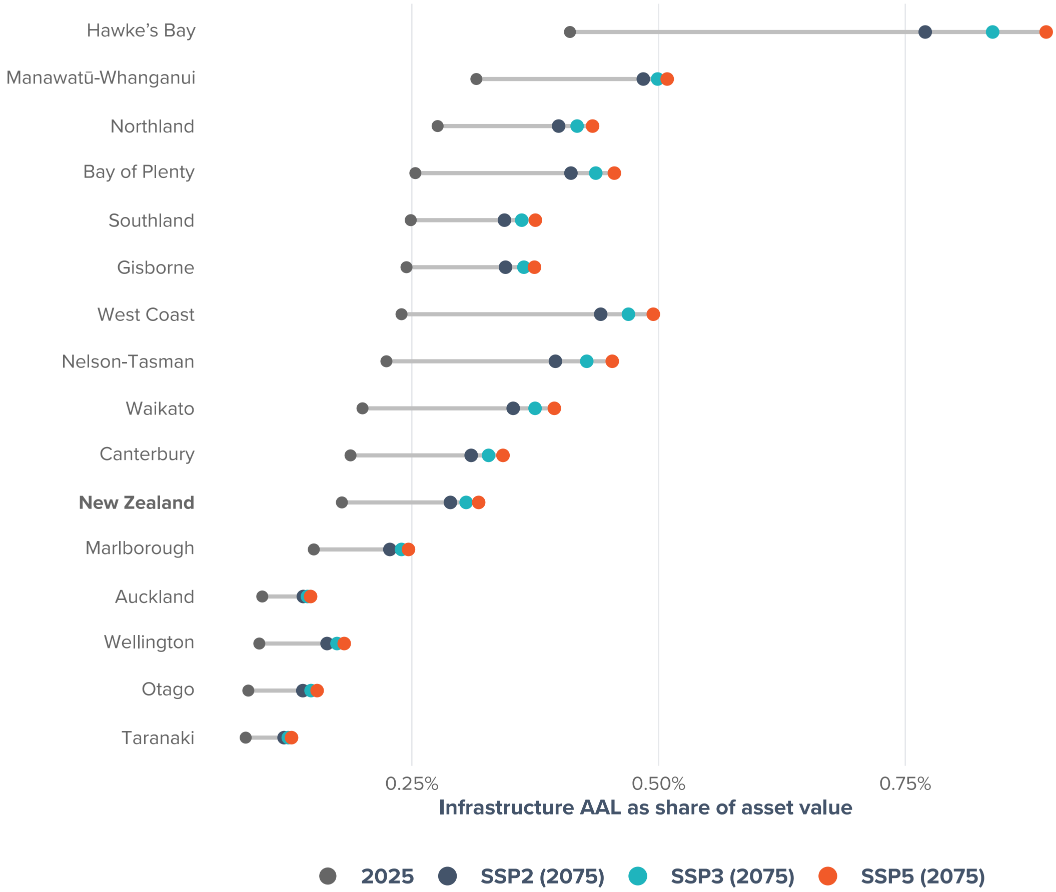
Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling.

Note: Line shows SSP3-7.0 (high emissions scenario). Shaded ribbon shows the range across all three climate scenarios (SSP2-4.5 to SSP5-8.5), with the upper bound set to the highest projected value in each year across scenarios.

The trajectories of the two hazards differ in an important way. Inland flooding losses increase relatively rapidly in the near term, with the majority of the increase occurring by 2045. This increase is driven by higher temperatures resulting in more frequent and more severe flood events. Coastal flooding losses, by contrast, increase gradually but at an accelerating rate. This is driven by higher sea levels, which increase more gradually over the next 50 years. This means the urgency of the response differs by hazard type: for inland flooding, the investment case is strongest now; for coastal flooding, the case grows stronger over time.

Losses vary significantly by region. Regions that already face the highest expected losses as a share of infrastructure value also tend to see the largest absolute increases in expected losses over time, particularly Hawke's Bay. Regions that currently face lower losses, such as Auckland, Wellington, Otago and Taranaki, see smaller increases over time.

Figure 5: Increase in AAL as a share of asset value between 2025 and 2075, inland flooding and coastal flooding combined



Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling.

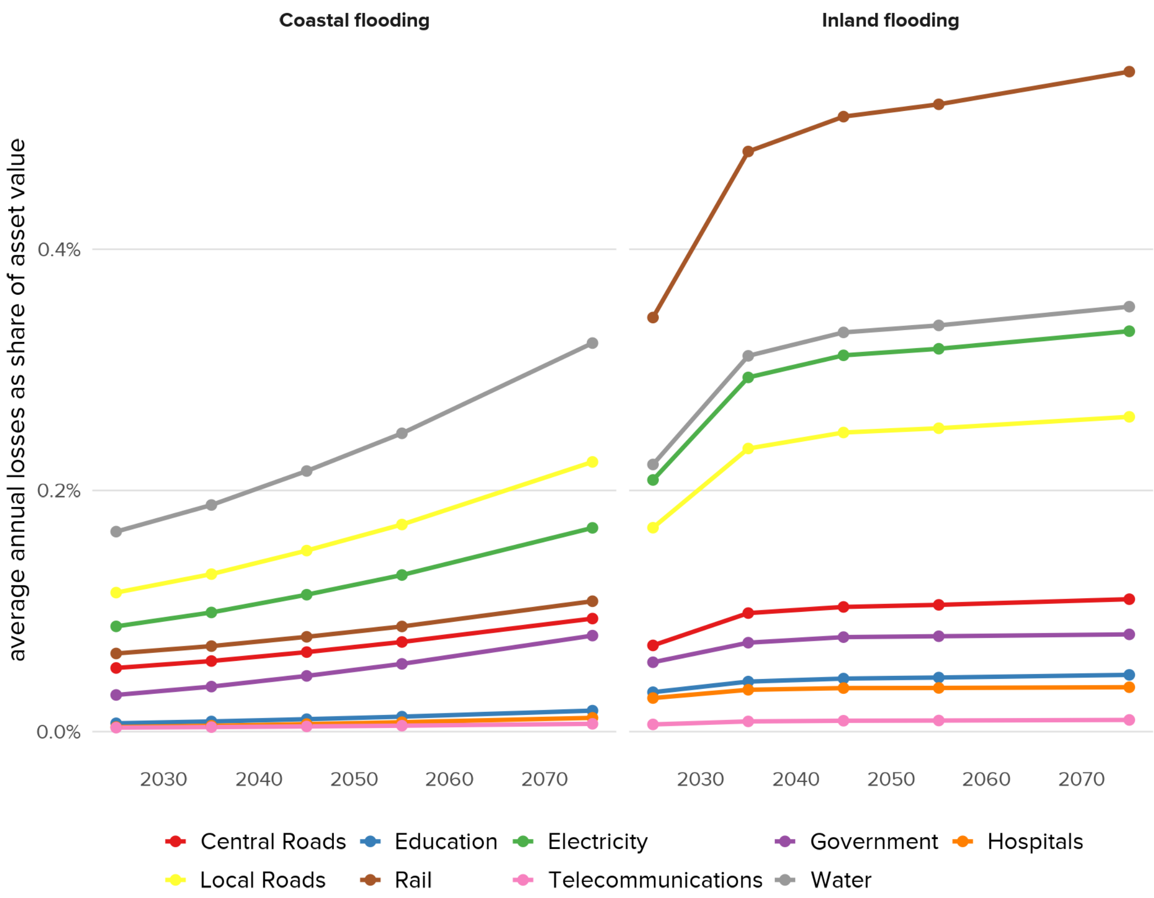
Note: Regional losses are estimated by aggregating Territorial Authorities within each region. Where a Territorial Authority crosses regional boundaries, it is allocated to the region containing the largest share of its land area. Territorial Authority-level results are in the accompanying databook.

Some infrastructure types are more exposed to current and future flooding than others

Coastal and inland flooding losses are not felt equally across infrastructure sectors. As a share of asset value, network infrastructure tends to see higher losses: most notably rail, which sees significant losses from inland floods. Vertical infrastructure (hospitals, schools and government buildings) face lower inland and coastal flood losses.

This potentially reflects the location (and therefore exposure) of these assets. Vertical infrastructure tends to be concentrated near where people live but horizontal infrastructure needs to connect across built and non-built areas. It may also reflect inherent differences in vulnerability between asset types. While the level of losses differs across sectors, the pattern over time is broadly consistent: all sectors see increases over time, with a significant increase in inland flooding losses between now and 2045.

Figure 6: Change in AAL as a share of asset value over time, broken down by infrastructure type



Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling.

Note: Climate scenario SSP3-7.0 shown, but trends are broadly similar for other climate scenarios.

The expected losses to private buildings are significant, but not as high as infrastructure

Total losses to private buildings from flooding are less than that for infrastructure. Total AAL for private buildings from inland and coastal flooding combined is around $270 million in 2025, compared to $450 million for all infrastructure sectors combined. Note that these losses reflect the loss to current buildings and infrastructure, not including any expected growth. As such, we would expect total AAL to rise for both infrastructure and private buildings over time, and percentage losses might be lower if new construction is generally in lower hazard areas than the existing stock.

Private buildings have a total asset value of around $1.5 trillion, much higher than the value of all infrastructure assets analysed by ESNZ of around $260 billion, though this is partially due to private buildings being valued at replacement value and infrastructure assets being valued at book value. As with infrastructure assets, this increase in losses is driven purely by changes in climate, as the modelling assumes the private building asset base size and location does not change in future.

Similar to vertical infrastructure, proportionately lower losses for private buildings may reflect the location of these assets. Private buildings may be located in lower risk areas, due to a combination of land-use regulations, targeted resilience investment and decisions by developers. As noted earlier, flood-induced landslide risk is not included in this modelling, nor is damage to the land underlying private buildings. Finally, infrastructure assets are valued at book value, whereas private buildings are valued at replacement cost, which makes comparisons as a share of asset value difficult. As a point of comparison, ESNZ have compared their modelling estimates for this work against insurance-industry reporting and found that modelled estimates are similar in magnitude, albeit slightly lower than reported estimates.[7]

Figure 7: Increase in average annual losses, broken down by infrastructure and private buildings

Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling.

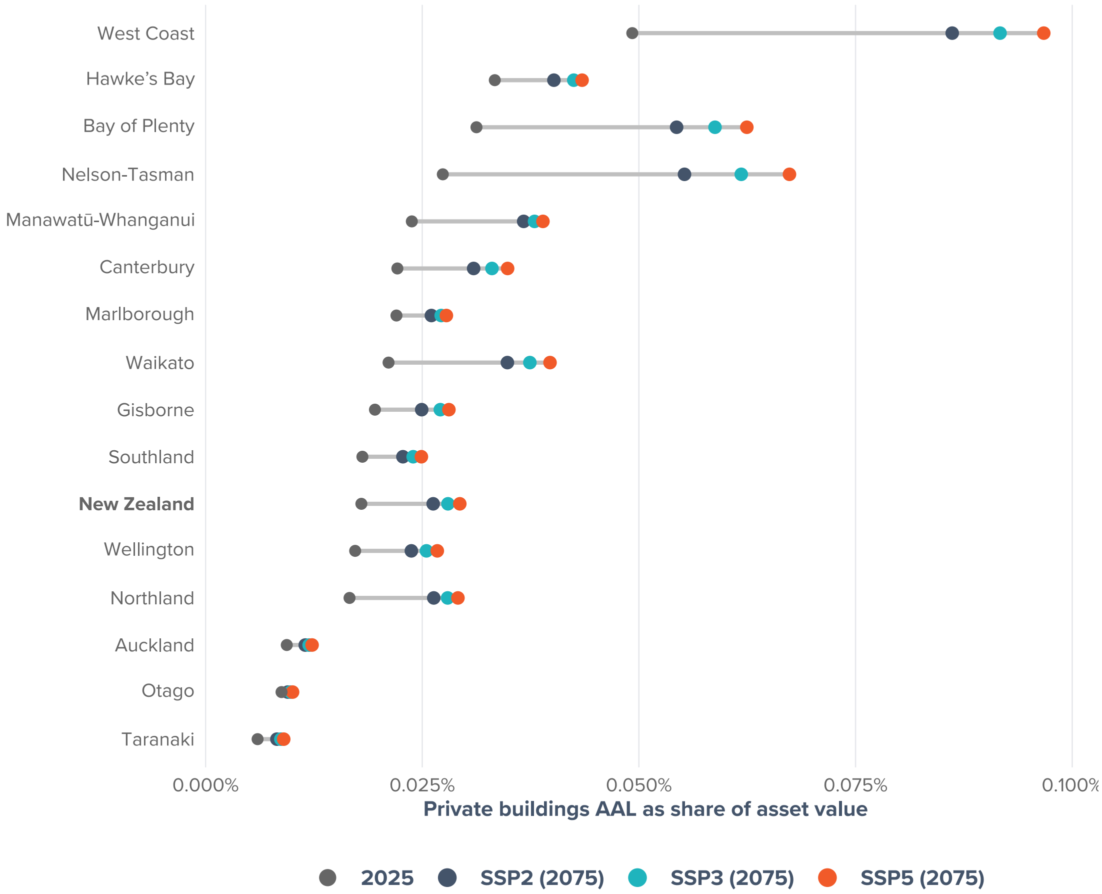
Note: Line shows SSP3-7.0 (high emissions scenario). Shaded ribbon shows the range across all three climate scenarios (SSP2-4.5 to SSP5-8.5), with the upper bound set to the highest projected value in each year across scenarios. AAL for private buildings uses estimated replacement values rather than book values.

Expected losses to private buildings are highly variable across regions. Regions with higher infrastructure expected losses also tend to, on average, have higher private building losses, with West Coast having the highest losses as a share of asset value.

[7] For a fuller discussion, see page 25 of Horspool, N. and Griffiths, N. et al. (2026). *Estimating national-scale losses to infrastructure from natural hazards: Phase 2 – Future climate scenarios, regional disaggregation and flooding impacts on buildings*, Earth Sciences New Zealand Consultancy Report 2026/07. Prepared for the New Zealand Infrastructure Commission.

The expected effect of climate change will impact different regions to varying degrees. Some see relatively small increases in expected losses (Auckland, Otago and Taranaki), most regions experiencing moderating increases and some regions experiencing relatively large increases (West Coast, Bay of Plenty and Nelson-Tasman).

Figure 8: Increase in AAL as a share of asset value between 2025 and 2075, for private buildings



Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling.

Implications for the infrastructure system

This research is useful not just to understand the scale of potential damage to our infrastructure networks from natural hazard, but it also could be used to inform approaches to making resilience investments.

As noted earlier, resilience investment competes for funding against other infrastructure needs so sizing up the problem is the first step to understanding its relative priority. But these needs are not the same everywhere, so the priority resilience is given will vary by region.

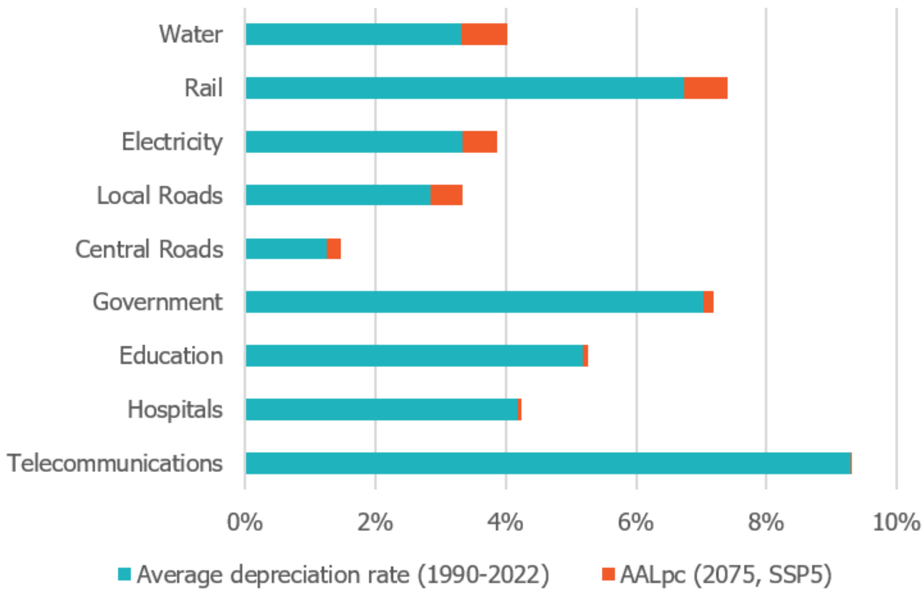
The most damaging natural hazard is… time

This modelling shows that flood losses to infrastructure are real and growing. Flood losses can also be difficult to predict, with some actual losses in some years significantly exceeding average annual losses. But when thinking about how much to invest in managing natural hazard risk, it helps to put those losses in context.

The figure below shows average depreciation rates (blue) and AAL as a share of asset value in 2075 under the very high climate scenario (orange) for each sector. Assets wear out over time. Part of that is normal wear and tear, proxied by depreciation, and the other is because of natural hazard damage, proxied by AAL.

Depreciation significantly exceeds AAL by at least a factor of five across all sectors. Therefore, the most damaging natural hazard facing infrastructure owners is not inland flooding or coastal inundation. It is time.

Figure 9: Depreciation rates and AAL as a share of asset value, by infrastructure sector



Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling. Depreciation rates are taken from New Zealand Infrastructure Commission, *Build or maintain? New Zealand's infrastructure asset value, investment, and depreciation, 1990–2022* (February 2024).

Note: Depreciation rate for the electricity sector is taken from the combined 'Electricity and Gas Services' industry.

The implication is not that resilience spending is unimportant. The results do, however, help us understand the relative amounts we should be spending on resilience and assist in prioritising funding. It is easy to conflate renewing an asset with replacing it because it was damaged by a natural hazard. Often, when a natural hazard occurs and damages infrastructure, it brings into relief the significant renewal needs on our networks.

This highlights that natural hazard risk should be considered as part of asset management rather than treated as a separate planning problem. The Commission's Asset Management and Investment Planning Guidance recommends agencies incorporate climate change and natural hazard resilience into their strategic planning and asset management practices, including reporting expected annual loss from natural hazards as a performance metric.[8]

The AAL estimates in this paper give agencies a quantitative benchmark to work with, both at the sectoral and regional level. Incorporating natural hazard resilience into asset management practices

[8] New Zealand Infrastructure Commission (2025). ***Asset Management and Investment Planning Guidance for agencies covered under Cabinet Office circular CO (23) 9***.

can also identify where resilience can be incorporated into renewal programmes (replacing assets that have reached end-of-life), which can be more cost effective than decommissioning assets prematurely.

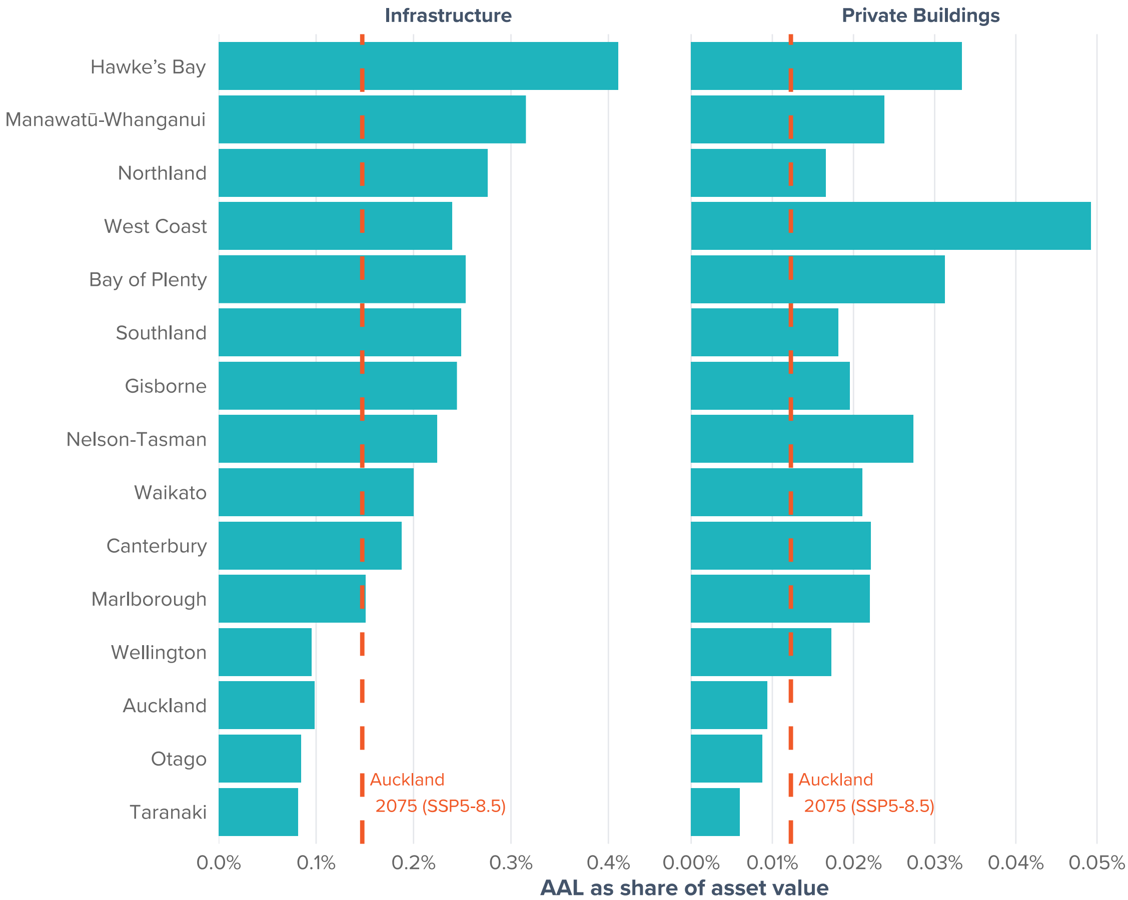
Resilience investment requires a localised approach

An important finding of this work for infrastructure owners is not just the scale of the losses, but where they are concentrated: some regions and sectors are expected to face significantly more losses than other areas.

To illustrate this, the chart below compares the relative expected losses of New Zealand regions to those in Auckland, New Zealand's largest city, and one of its fastest growing areas. It shows the AAL as a share of asset value by region in 2025 for both infrastructure and private buildings.

The dashed orange lines show the AAL as a share of asset value for the Auckland region in 2075, under the very high climate scenario. What this chart demonstrates is that most regions in New Zealand face higher proportional losses today than our largest city is expected to in 50 years' time, even under the very high climate scenario.

Figure 10: AAL as a share of asset value by region, compared with Auckland AAL as a share of asset value in 2075 under very high climate scenario



Source: New Zealand Infrastructure Commission analysis of Earth Sciences New Zealand modelling.

This research has highlighted the response to flood losses and the investment in resilience is likely to, and should, look quite different across regions. In regions and sectors where AALpc is already high and growing fastest, the financial case for resilience investment is likely to be strongest. For owners of nationwide infrastructure assets, this may mean carefully prioritising which parts of their network require resilience investment. Infrastructure asset owners will need to scale their resilience investment to the local risk they face, which could have funding implications for communities and infrastructure users.

The regional picture for private building losses tells a similar story. Where insurance is unavailable or unaffordable, this makes the decision about the level of resilience investment more challenging. The appropriate mix will depend on local circumstances: the scale of losses, whether protection is best provided at a community or property level, and community preferences. The regional variation in private building losses that this research provides gives communities and local decision-makers a quantitative starting point for those conversations.

This variation in risk also has important implications for spatial planning and growth decisions. Natural hazard risk will be a key consideration when planning decisions are made through regional spatial plans and district land use plans. This analysis suggests that risk assessments used in planning decisions could benefit from nationally consistent data. For example, a potential development area thought of as low risk in Hawke's Bay may face higher absolute losses than a development area thought of as high risk in Auckland. Given that natural hazard risk also varies significantly with regions and territorial authorities, these nationally consistent estimates should be complemented with more detailed local assessments of risk.

Conclusion: the way forward

The opening of this paper set out the challenge: flood risk is growing, resources are constrained, and making good choices requires evidence on the scale, distribution, and trajectory of losses. This research provides that evidence.

However, these estimates capture direct asset losses only. But when infrastructure fails, the economic consequences can extend well beyond the repair bill. These wider indirect costs can include service disruption costs to infrastructure users, loss of life, business interruptions and reduced productivity. While quantifying the size of these costs is outside the scope of this research, this is potentially an area where further work is needed.

The size of these benefits will be directly related to the substitutes available for their service. Where there are very limited substitutes, such as the undersea transmission cables that connect electricity networks in the North and South Islands, will tend to have very high indirect costs and therefore justify greater resilience investment.

However, resilience investment can be provided in multiple ways, and physical investment by infrastructure owners may not be the lowest cost option. Building infrastructure involves significant capital. The risk is that we build resilience infrastructure assets that limits the loss of those indirect benefits, but also whose costs exceed them.

A more targeted and localised approach may be better in some cases. As an example, investments in distributed energy systems like rooftop solar and batteries in individual homes could improve reliability more cost-effectively than greater resilience investment in the distribution network.

These factors highlight the importance of quantifying users' willingness to pay for resilience investment. Transpower's Value of Lost Load study and Vector's 2026 climate resilience work both illustrate how infrastructure providers can estimate the cost of disruption to their customers and use this to calibrate investment decisions.[9] Relatedly, this willingness to pay will have important implications for how we price infrastructure resilience and potential funding models.

For its part, Te Waihanga will continue work on this important area. This includes guidance the Commission is developing under National Adaptation Plan Action 3.8, to be published in 2027. The guidance will support business case authors to assess climate adaptation options in the face of uncertainty, including estimating the magnitude of financial risk that a project faces, which can be informed by this research.

[9] Transpower (November 2018). ***Value of Lost Load Study***; Jayathissa, P. (Vector), **Vector's approach to climate resilience**, presented at National Lifeline Utilities Forum (17 October 2025).