New Zealand Infrastructure Resilience Index

Produced by

NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Downer

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Foreword from **Murray Robertson, Downer**

Downer's purpose is to enable communities to thrive. That commitment extends beyond infrastructure delivery. It's about ensuring the systems that support daily life in Aotearoa New Zealand are reliable, resilient, and future-ready.

In recent years, extreme weather events such as Cyclone Gabrielle have exposed vulnerabilities in our critical networks. Power outages in Northland, road closures in Gisborne, and telecommunications disruptions in Hawke's Bay have shown how infrastructure failures can have a ripple effect, and can isolate communities, delay recovery, and impact lives and livelihoods. These events cost millions of dollars for both central and local government, particularly where investment in maintenance has been neglected.

That's why we partnered with NZIER to create the Infrastructure Resilience Index (IRI). It provides a clear snapshot of where infrastructure is most vulnerable and where investment will have the greatest impact, and in turn, support better social, environmental, and economic outcomes across our communities.

This work complements the recently released draft 30-year National Infrastructure Plan, which highlights pressing needs in health, electricity generation, and resilience-building, with annual capital investment expected to rise from $20 billion to over $30 billion by the 2050s.

The Index offers empirical resilience scores and interdependency insights to guide regional decision-making. It reveals that resilience across much of the country is insufficient, especially in regions already experiencing high deprivation. It is a forward-looking tool that supports the shift from reactive investment to proactive maintenance and from isolated projects to coordinated, system-wide planning. Downer is committed to updating the Index annually to track progress and guide where investment can best strengthen Aotearoa, New Zealand's infrastructure resilience.

Resilience isn't built overnight. It requires collaboration across central and local government, iwi, industry, and communities, and should be the result of contributions from all sides of the political spectrum. We are proud to support this work and help deliver infrastructure that protects lives, sustains economies, and enables all communities to thrive.

Ngā mihi nui,

Murray Robertson

Managing Director – New Zealand

Foreword from Christina Leung, NZIER

The New Zealand Institute of Economic Research (NZIER) is an independent economic consultancy and forecasting organisation that has been informing and encouraging debate on policy and economic issues affecting Aotearoa, New Zealand for over 65 years. Our purpose is to help our clients and members make better business and policy decisions and to provide valuable insights and leadership on important public issues affecting our future.

This development of an Infrastructure Resilience Index (IRI) highlights where the key vulnerabilities are for regions when assessing how well each can cope with significant shocks such as a natural disaster. Infrastructure resilience matters because we need essential services and systems to be able to continue to operate and recover quickly should such events occur. We have identified in our analysis where investments should be focused to address these vulnerabilities to ensure communities and businesses can continue to go about their lives and function effectively with minimal disruptions.

We are pleased to partner with Downer on this analysis and to support its work in bolstering the resilience of infrastructure across New Zealand. By supporting the enablers which bolster resilience in the New Zealand infrastructure system, we can support the economic development of all the regions in New Zealand to ensure continuity of activity and community wellbeing even as unexpected events occur.

On this project with Downer, we have used data to understand where the key vulnerabilities for regions are when it comes to the key infrastructure sectors: electricity, roading, telecommunications and water. There is a wealth of existing research on different parts of infrastructure needs. Where this adds to the work already done, is that it quantifies infrastructure resilience and puts a framework around the key infrastructure sectors. Our definition of resilience goes beyond climate change shocks, and also covers the day-to-day stresses in the system.

Our work puts the available data into a consistent framework to assess resilience performance and vulnerabilities across the sectors and regions, as a way to focus on where New Zealand should allocate resources to bolster infrastructure resilience. Our development of the IRI builds on the interdependency matrix created by the Lifelines Council, which provides a valuable foundation for understanding how infrastructure systems rely on one another in the face of hazard events.

We extend this foundation by developing a structured, quantitative index that enables comparative assessment across infrastructure sectors and regions. Whereas the Lifelines Assessment Report mapped dependencies qualitatively, our index translates those relationships into measurable indicators using real inputs, empirical data, and metrics relevant to each resilience dimension. This allows for consistent application wherever data is available, helping to identify critical vulnerabilities and highlight priority areas for investment and intervention. Hence our findings should provide useful guidance for policy makers in where investments should be focused in future to improve infrastructure resilience in New Zealand.

We show how critical the security of electricity supply is to the functioning of other infrastructure across the regions. New Zealand's topography also means national networks are extended and regional networks are deeply intertwined with the national networks. Hence even local disruptions can have wide-reaching impacts.

By having a clear understanding of the key vulnerabilities in the New Zealand infrastructure system, we can address them and use this infrastructure resilience index to measure progress in the future. We look forward to continuing to support Downer in bolstering the resilience of New Zealand infrastructure so our communities and businesses can thrive in the coming years.

Ngā mihi nui,

Christina Leung

Deputy Chief Executive (Auckland) & Principal Economist

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Section I – Executive Summary

New Zealand Institute of Economic Research (NZIER) worked with Downer to develop the Infrastructure Resilience Index (IRI) to show **how resilient infrastructure is across key infrastructure sectors in New Zealand regions.** Infrastructure resilience shapes both the systems we rely on and the daily lives of individuals and families. Communities depend on it for essential services like water, electricity, and transport, as well as access to employment, healthcare, education and social connection. Infrastructure resilience matters because we need **essential services and systems to operate and recover quickly** after shocks and outages occur.

The IRI allows us to see where the biggest vulnerabilities are, to guide us in where investment should be prioritised to ensure the infrastructure system can continue to function with minimal disruptions in the event of a shock.

Disruptions come in two forms: shocks, such as extreme weather or cyberattacks, and stresses, like ageing assets or climate change, which quietly undermine resilience over time.

The Index reflects both stress factors and vulnerability to shocks:

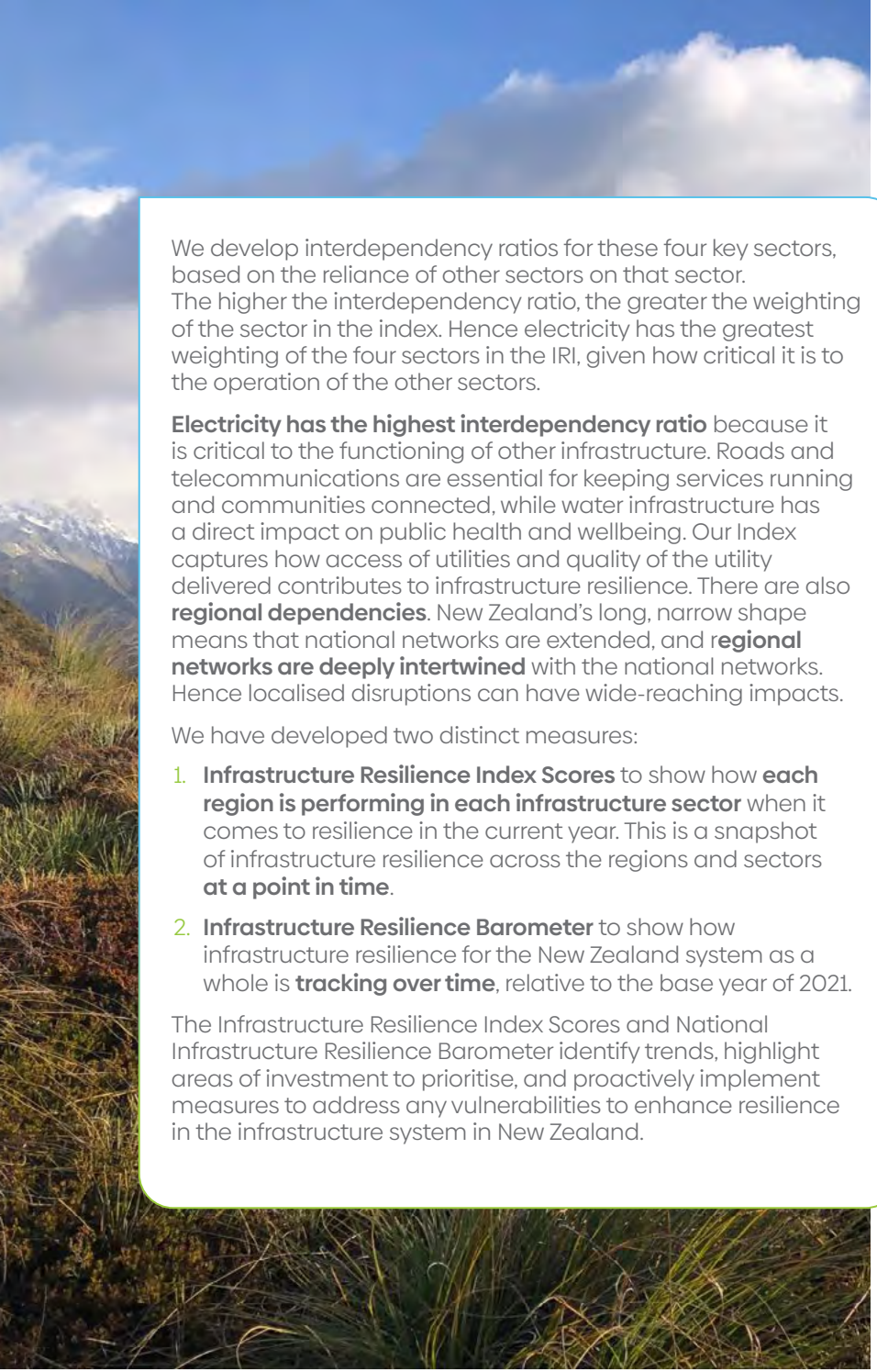
- Shocks: Sudden, damaging events like extreme weather, earthquakes, pandemics, or cyberattacks.
- Stresses: Long-term pressures like ageing assets, climate change, or underinvestment, which quietly undermine resilience over time.

I**t also shows the state of infrastructure resilience since 2021**, so that we can see whether the resilience of the infrastructure system in New Zealand has improved or deteriorated. Having an annual **measure of progress** will allow us to see **whether investments have been effective in improving infrastructure resilience**.

This research draws on the work of the Infrastructure Commission, government agencies such as New Zealand Transport Agency, Waka Kotahi, the Insurance Council and the Lifelines Council/National Emergency Management Agency (NEMA) for data and information to understand the issues. The research builds on the work done to date as it provides an assessment of infrastructure resilience that shows comparison across regions and infrastructure, where as Insurance Council research on infrastructure focuses on risk management. Hence the development of the IRI and Barometer is a new approach to resilience assessment, in assessing infrastructure resilience which captures and goes beyond analysis on dependency, current quantity of infrastructure and pipeline of future investments, natural hazard risks and puts this into a quantitative framework which allows assessment between regions and sectors, and over time which is specific to New Zealand.

Based on the NZ Lifelines Council analysis on the dependence of infrastructure sectors on each other, we focus on these four key infrastructure sectors in our development of the Index:

- **Electricity:** Powers homes, businesses and all other critical services
- **Roads:** Keeps roading networks and communities connected, ensuring supply chains are uninterrupted
- **Telecommunications:** Enables emergency response, business continuity, and national connectivity
- **Water:** Essential for public health, environmental protection, and community resilience.



We develop interdependency ratios for these four key sectors, based on the reliance of other sectors on that sector. The higher the interdependency ratio, the greater the weighting of the sector in the index. Hence electricity has the greatest weighting of the four sectors in the IRI, given how critical it is to the operation of the other sectors.

Electricity has the highest interdependency ratio because it is critical to the functioning of other infrastructure. Roads and telecommunications are essential for keeping services running and communities connected, while water infrastructure has a direct impact on public health and wellbeing. Our Index captures how access of utilities and quality of the utility delivered contributes to infrastructure resilience. There are also **regional dependencies**. New Zealand's long, narrow shape means that national networks are extended, and r**egional networks are deeply intertwined** with the national networks. Hence localised disruptions can have wide-reaching impacts.

We have developed two distinct measures:

1. **Infrastructure Resilience Index Scores** to show how **each region is performing in each infrastructure sector** when it comes to resilience in the current year. This is a snapshot of infrastructure resilience across the regions and sectors **at a point in time**.
2. **Infrastructure Resilience Barometer** to show how infrastructure resilience for the New Zealand system as a whole is **tracking over time**, relative to the base year of 2021.

The Infrastructure Resilience Index Scores and National Infrastructure Resilience Barometer identify trends, highlight areas of investment to prioritise, and proactively implement measures to address any vulnerabilities to enhance resilience in the infrastructure system in New Zealand.

The Infrastructure Resilience Index

The Infrastructure Resilience Index shows how resilient infrastructure is in each region and sector (Electricity, Roading, Telecommunications, Water) at a point in time. It takes the available data that we have deemed as appropriate measures of infrastructure resilience, standardised the measures to a common unit in order to enable comparisons across the regions and sectors, then assessed the performance of each relative to the other regions and sectors at a point in time. These comparisons provide guidance on where investments should be targeted in order to reduce disruptions to essential services in the event of a shock.

The scores range from 0 to 100, with 0 indicating a high likelihood of severe disruptions in the event of a shock, and 100 indicating minimal disruptions in the event of a shock. A high score for that region and sector means that the performance of that particular infrastructure sector is more positive relative to that of other regions and sectors, in that the infrastructure is likely to operate with minimal disruptions after a shock. Conversely, a low score would suggest vulnerabilities for that region and infrastructure in the event of a shock, and investments should be targeted there to reduce the likelihood of disruptions if shocks were to occur.

0-33	33-66	66-100
Urgent action is required to address the vulnerabilities for the infrastructure sector in that region.	Vulnerabilities for the infrastructure sector that should be addressed within the next five years to mitigate a failure in the infrastructure system in the event of a shock.	Low priority when considering where investment should be targeted.

How New Zealand's regions scored across our four sectors

	Infrastructure Resilience Index	Electricity	Roading	Telecommunications	Water*
Southland	66	55	89	56	70
Waikato	77	52	58	46	69
Tasman	62	45	46	73	84
Nelson	58	50	46	37	72
Bay of Plenty	58	47	77	44	73
Taranaki	56	54	52	45	83
Marlborough	56	47	46	59	83
Canterbury	54	42	42	67	76
Hawke's By	52	40	73	42	61
West Coast	52	48	62	42	60
Otago	52	40	45	71	57
Gisbourne	51	46	40	43	88
Manawatū-Whanganui	50	33	59	51	68
Wellington	49	38	32	64	73
Northland	42	23	52	40	66
Auckland	36	0	38	67	84

*Includes stormwater and drinking water only

Scores show Auckland and Northland as the most vulnerable regions when it comes to infrastructure resilience. This means that there is a **high likelihood of severe disruptions in the event of a shock** in these regions.

The low scores for **Auckland and Northland** reflect the **high vulnerability of the energy supply**. Given how critical electricity is to the functioning of other infrastructure, **investments should be prioritised to address these vulnerabilities** in these regions to ensure the continued functioning of the infrastructure system in the event of a shock.

In contrast, regions such as **Waikato and Southland show stronger resilience**, supported by more stable infrastructure performance across the four key infrastructure sectors.

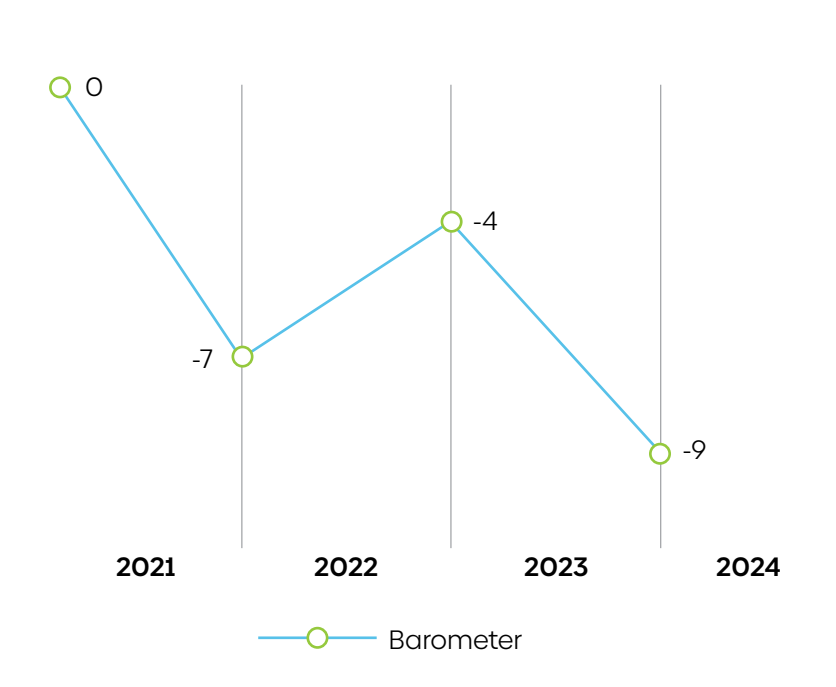
New Zealand's roading network shows greater resilience than the electricity sector. But **Auckland, Gisborne, Wellington, and parts of the South Island** have areas where road networks are more exposed to disruption, often due to limited route options or vulnerability to weather events and seismic risk.

Given available data for the water sector only covers stormwater systems and the quality of drinking water, **we recommend that consistent collection of data on the state of water infrastructure across all the local councils** will enable a more representative picture of the state of water infrastructure in the regions. Nonetheless, stormwater resilience provides a valuable insight into how water systems are coping, especially in urban areas facing growth and climate-related pressures.

You can read more about this and see the regional breakdown on page 14.

The National Infrastructure **Resilience Barometer**

The Infrastructure Resilience Barometer tracks how resilient in the New Zealand infrastructure system is **over time**, as referenced to the base year of 2021. A positive value means an improvement in infrastructure resilience since 2021, while a negative value means a deterioration in infrastructure resilience since 2021.



The decline over this period highlights **emerging constraints in electricity generation and distribution capacities, as well as growing vulnerabilities in the physical condition of the road network**. Such infrastructure weaknesses can lead to cascading effects, adversely impacting community wellbeing, economic productivity, and emergency responsiveness.

The aim is for continuous improvement in resilience in the New Zealand infrastructure system, reflected in a rise in the Barometer over time. Having a measure to track how infrastructure resilience is performing in New Zealand will enable the effectiveness of investments to address resilience to be assessed in the future.

You can read more about this on page 24.

Infrastructure resilience and **community outcomes**

The IRI score shows that regions with lower infrastructure resilience often face other, compounding challenges. When we overlay resilience data with the 2023 New Zealand Socioeconomic Deprivation Index, a pattern emerges: regions with higher levels of socioeconomic deprivation have lower levels of infrastructure resilience.
Given the interdependence of infrastructure resilience with community resilience, improved infrastructure resilience could help improve socioeconomic deprivation outcomes in these regions.

Gisborne has the highest deprivation score. Its resilience is reduced by exposure to weather events (cyclones) and its geographic isolation. It scores low on electricity, roading and telecommunications. Northland, a region that also has a high deprivation score, has experienced several infrastructure outages, including electricity transmission and distribution outages, issues around roading access and poorer telecommunications access given the rural/semi-rural connectivity divide.

Telecommunications access issues are a key driver for regions with high deprivation issues, which highlights the need for improving rural connectivity in order to improve wellbeing for these communities.

More detail is provided on page 22.

Enablers and recommendations

Across our sectors we can summarise the recommendations as follows:

Electricity

- Increase generation capacity closer to demand centres, particularly in Auckland and Northland.
- Prioritise maintaining and strengthening existing transmission and distribution infrastructure to minimise the risk of future outages.

Roading

- Proactively manage assets, including monitoring of roads, pavements, and bridges, applying climate-resilient design standards, and prioritising maintenance based on route usage and hazard exposure.
- Strengthen key bridges and high-traffic arterials against seismic and flood risks.
- Introduce resilient pavement in areas prone to frost or heat.

Telecommunications

- Invest to keep pace with evolving technology and user needs.
- Strengthen emergency planning, particularly in light of lessons from Cyclone Gabrielle.
- Address the persistent urban–rural divide, where rural communities remain more vulnerable to outages.

Water

- Upgrade existing Three Waters infrastructure, especially in rural communities.
- Strengthen regional governance and developing sustainable funding mechanisms to ensure communities can invest in long-term water resilience.
- Build on the progress made in new housing developments, where local stormwater solutions have helped increase resilience.

To strengthen New Zealand's infrastructure resilience, targeted actions (with associated investment) are required across the electricity, roading, telecommunications, and water sectors. Across all sectors, maintenance is the most important enabler of resilience, reducing stress and strengthening the system's ability to handle shocks.

We also found that in order to strategically invest in Aotearoa New Zealand's infrastructure resilience, consistent data and reporting across regions is required to inform decision making.

Margin of error

The IRI relies on the best available data; however, gaps in coverage and consistency of the data available inevitably introduce a degree of uncertainty. We acknowledge that due to data limitations, there are areas where the strength of the IRI is constrained. For example, in some regions energy data is missing, and in the water sector there is no consistent data across regions that capture the condition of aging pipelines. Where appropriate, assumptions or proxies have been applied to maintain consistency across the Index.

We have highlighted these data gaps to be clear about the IRI's limitations and the areas where further data collection would improve resilience assessment in providing a more comprehensive view. Over time, as data quality and availability improve, the robustness of the Index will increase, which should narrow the margin of uncertainty.

Section 2 – Overview of New Zealand's infrastructure resilience

Infrastructure resilience means more than just designing for natural disasters like storms, floods, or earthquakes. It's also about investing in maintaining and renewing the systems we rely on, to ensure that they recover quickly when disruptions occur.

The IRI brings together a national and regional picture of resilience, helping us see where New Zealand's infrastructure performs strongly, where we are exposed, and where improvements are most needed.

For communities, resilience protects safety and wellbeing. For businesses, it safeguards continuity and reliability. For central and local government councils, it shields economies. Strong, connected infrastructure underpins New Zealand's future.

Electricity

Powers homes, businesses and all other critical services.

Roads

Keeps roading networks and communities connected, ensuring supply chains are uninterrupted.

Telecommunications

Enables emergency response, business continuity, and national connectivity.

Water

Essential for public health, environmental protection , and community resilience.

Understanding infrastructure **interdependencies**

No infrastructure system stands alone. Electricity powers water pumps and cell towers; roads enable fuel delivery to keep services moving; telecommunications connect people and coordinate responses. When one system fails, there is a ripple effect disrupting homes, communities, and businesses across entire regions.

Within each of our four focus sectors, resilience depends on how well different players work together. For example, electricity relies on coordination between generators, grid operators, and local distributors. But when we look across sectors, interdependency runs even deeper: electricity is needed for water, telecommunications, and fuel; roads are essential to deliver repair crews and supplies; telecommunications underpin emergency coordination.

The interwoven nature of these systems became clear during Cyclone Gabrielle in the Hawke's Bay in February 2023. Power outages didn't just leave households in the dark – they halted water supply, communications, gas networks, fuel distribution, and disrupted payment services.

In 2011, Christchurch's earthquakes damaged roads, pipes, and powerlines, slowing recovery across sectors. Auckland's Anniversary Weekend floods in January 2023 overwhelmed stormwater systems, causing widespread road closures and localised power outages.

The infrastructure priorities that matter most can also change after a major shock. In normal times, electricity is the backbone holding everything together. But during and after a disaster, fuel supply and road access become just as critical – they are the lifelines that enable movement, emergency response, and delivery of essential goods, and support the recovery phase.

Mapping sector importance and regional connections

Some parts of our infrastructure have a larger influence on overall resilience. Electricity is a foundation that supports everything from homes to businesses; while roads, telecommunications, and water play critical roles as connectors and enablers of daily life. But resilience isn't just determined by individual sectors – it's shaped by how systems interact and depend on one another across regions.

The Infrastructure Resilience Index uses interdependency ratios for four key sectors, drawing on work by the NZ Lifelines Council, to measure connections between the sectors. Electricity scores highest because it underpins so many services. Roads and telecommunications are essential for keeping services running and communities connected, while water infrastructure has a direct impact on public health and wellbeing.

New Zealand's topography adds another layer of complexity. Our long, narrow shape means r**egional networks are deeply intertwined**. A substation failure in Auckland can create knock-on effects in Northland, showing how even local disruptions can have wide-reaching impacts.

Together, these interdependency insights help us better understand the **strengths and vulnerabilities across New Zealand's infrastructure**.

Supplier / Receiver	Electricity	Roads	Telecommunications	Water
Electricity		2	3	3
Roads	2		2	2
Telecommunications	2	2		2
Water	1	1	2	

Source: New Zealand Lifelines Council, NZIER

Legend

3: Required for service to function

2: Important but can partially function and/or has full backup

1: Minimal requirement for service to function

The Infrastructure Resilience Index - resilience by region in New Zealand

The Infrastructure Resilience Index provides a national view of resilience across four of New Zealand's core infrastructure sectors – electricity, roading, telecommunications, and water – while also highlighting how resilience varies by region.

Looking at resilience at a regional level is important because New Zealand's infrastructure is not evenly distributed, and neither are our vulnerabilities. Each region has unique characteristics: differences in topography, population, economic activity and local infrastructure all shape how resilient New Zealand is to everyday pressures and disruptions.

By providing a picture of regional infrastructure resilience, we can better understand where improvements are most needed. This regional view also helps identify opportunities for targeted investment and collaboration, recognising that strengthening infrastructure in one part of the country can have flow-on benefits elsewhere, due to the interconnected nature of our systems. The IRI assesses network resilience in response to shocks. It does not measure the efficiency of the network.

	Infrastructure Resilience Index	Electricity	Roading	Telecommunications	Water*
Southland	66	55	89	56	70
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Northland	42	23	52	40	66
Auckland	36	0	38	67	84

**Includes stormwater and drinking water only*

Infrastructure resilience scores, by sector and regions

We developed a score for each infrastructure sector and region based on how that sector in that region has performed when it comes to infrastructure resilience, compared to other infrastructure sectors and regions.

This provides a snapshot of how in the current year, a region is performing based on its performance in each infrastructure sector, relative to other regions.

The scores range from 0 to 100, with 0 indicating a high likelihood of severe disruptions in the event of a shock, and 100 indicating minimal disruptions in the event of a shock.

In interpreting what the scores mean, we consider a score of 0-33 as urgent action is required to address the vulnerabilities for the infrastructure sector in that region, 33-66 as vulnerabilities for the infrastructure sector that should be addressed within the next five years to mitigate a failure in the infrastructure system in the event of a shock, and 66-100 as low priority when considering where investment should be targeted. Note this Index assesses infrastructure resilience, rather than network efficiency.

Source: NZIER

Infrastructure resilience **by the regions**

Auckland Electricity is the weakest link, with limited local generation and frequent connection faults the key vulnerabilities, and road condition remains only moderate.

Northland Electricity generation and internet access across all sectors are the key vulnerabilities, which drives the region's low resilience score.

Wellington Roads and electricity are the key vulnerabilities which drive down the resilience score for the region.

Manawatū-Whanganui Moderate scores across all sectors suggest no single vulnerability for the region.

Gisborne The deterioration in road conditions and limited telecommunications accessibility weighs on the region's resilience score.

Otago Electricity generation capacity remains constrained, and road conditions are suboptimal.

West Coast Mid-range scores are across all infrastructure sectors.

Hawke's Bay The region has vulnerabilities in electricity and telecommunications, where rural lines and towers need reinforcement against extreme weather.

Canterbury The comparatively low electricity and road condition scores are the main factors dragging down the overall resilience of the region.

Marlborough Mid-range electricity and road condition scores weigh on the overall resilience index.

Taranaki A relatively low telecommunications score is a vulnerability for the region.

Bay of Plenty Telecommunication connection faults and constraints in electricity generation are the vulnerabilities that needs to be addressed to improve the region's resilience score.

Nelson Moderate scores for road condition and electricity hold back the region's resilience.

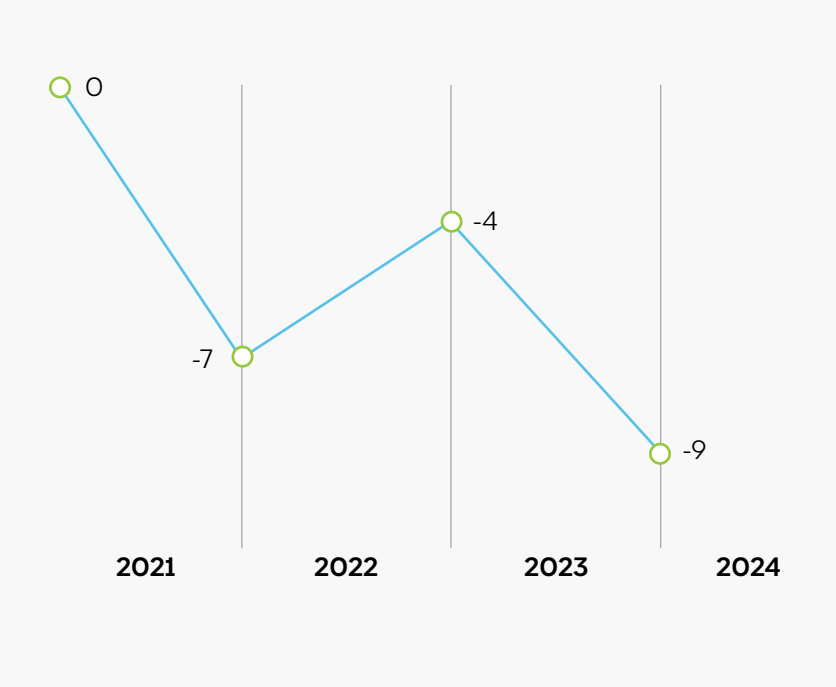
Tasman Subpar electricity and road condition scores hinder the region's resilience.

Waikato Although Waikato benefits from robust electricity generation, its high telecommunications fault rate per connection undermines the region's overall resilience.

Southland Its relatively high road conditions score support resilience in the region.

Infrastructure resilience **in recent years**

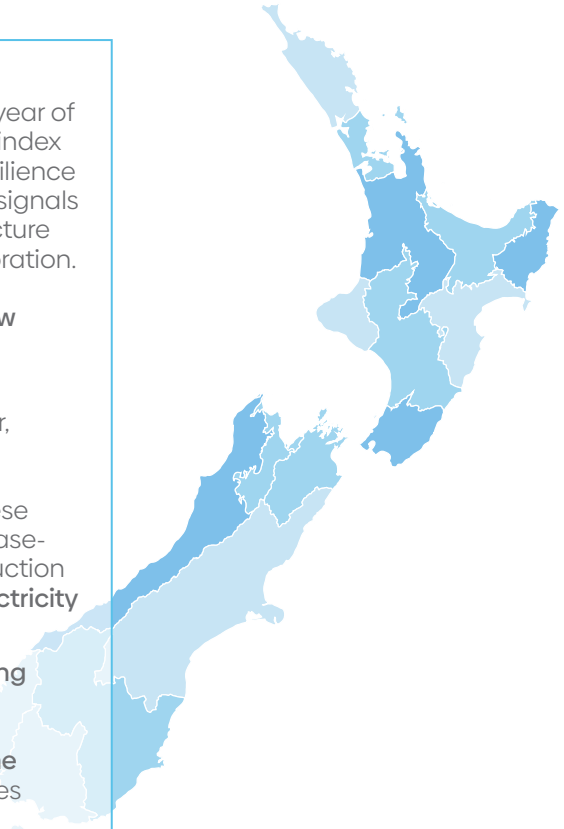
The Infrastructure Resilience Barometer tracks changes in New Zealand's infrastructure resilience over time, using data from the IRI. Unlike the Index, which provides a snapshot of sector performance by region, the Barometer shows whether resilience is improving or declining.



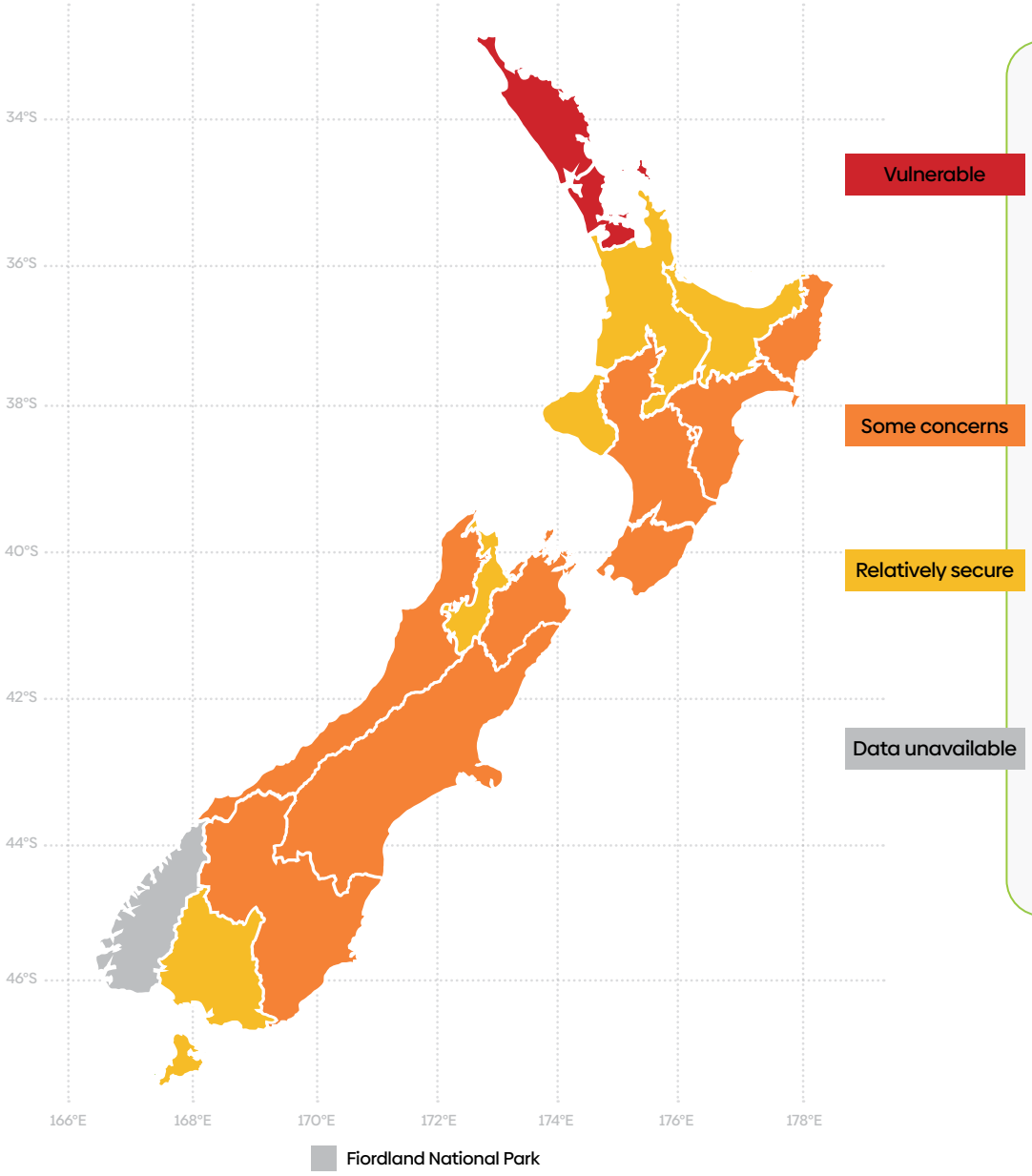
The Barometer captures the performance in infrastructure resilience relative to the base year of 2021, which is set to 0. We can compare this index value over time to see how infrastructure resilience is performing: an increase in the Barometer signals greater resilience in New Zealand's infrastructure system, while a decrease indicates a deterioration. **The Barometer value of -9 for the 2024 year indicates that infrastructure resilience in New Zealand has deteriorated since 2021**.

The Barometer integrates four critical infrastructure sectors: Electricity, Road, Water, and Telecommunications. However, due to limited data points available for Water and Telecommunications, we have assumed these two sectors remain unchanged from their base-year levels. Consequently, the observed reduction primarily **reflects the deterioration in the Electricity and Road sectors between 2021 and 2024**.

The decrease in the index highlights **emerging constraints in electricity generation and distribution capacities, as well as growing vulnerabilities in the physical condition of the road network**. Such infrastructure weaknesses can lead to cascading effects, adversely impacting community wellbeing, economic productivity, and emergency responsiveness.



A national picture of infrastructure resilience – overview



The IRI scores brings together the resilience ratings for each region across the four infrastructure sectors, weighting them by their level of interdependency. Electricity carries the highest weight, reflecting its foundational role, while water infrastructure carries the lowest.

This combined view gives us a snapshot of how regions perform overall when it comes to infrastructure resilience, and importantly, where there are opportunities to strengthen resilience.

The results **highlight Auckland and Northland as the most vulnerable regions** in the country when it comes to infrastructure resilience. This largely reflects their vulnerabilities when it comes to resilience in energy supply. Both face compounded risks, including dependence on critical transmission points and exposure to severe weather events. Given the reliance of other infrastructure sectors on electricity, the vulnerability of the Auckland and Northland electricity networks suggest there would be **significant flow-on disruptions across the infrastructure system in the event of a shock**.

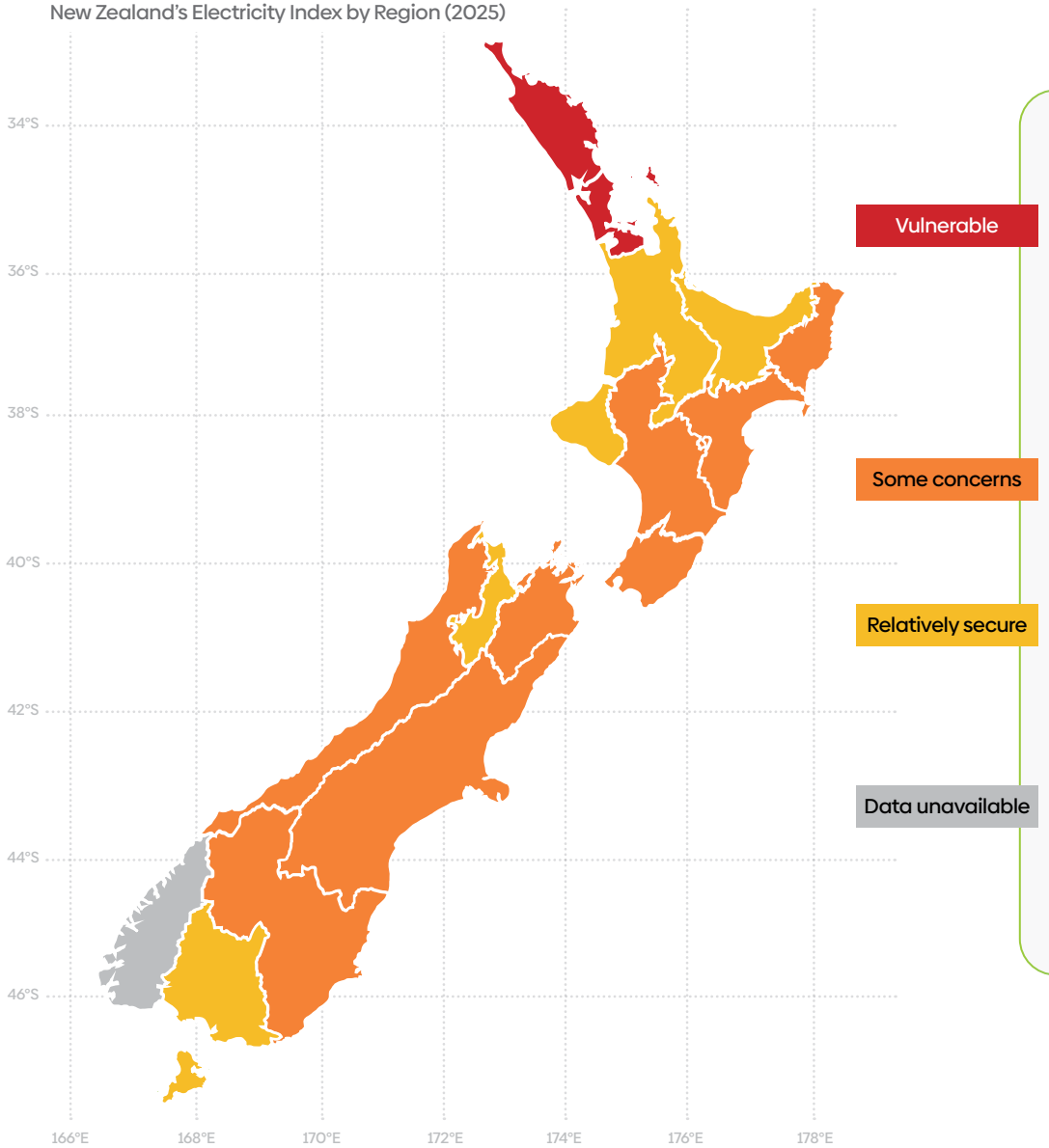
In contrast, regions such as **Waikato and Southland show stronger resilience**, supported by more stable infrastructure performance across the four key infrastructure sectors.

The national picture highlights an important reality: **much of New Zealand's infrastructure remains vulnerable to disruption**, a reflection of long-term underinvestment and the growing pressures of climate change, population growth, and ageing assets, all of which will shape future resilience needs.

Aotearoa New Zealand's infrastructure **across the four sectors**

Electricity : The backbone of resilience

New Zealand's Electricity Index by Region (2025)



Electricity is the most interconnected of the four sectors measured, with other critical services – from and telecommunications to fuel distribution – relying on a stable and secure power supply.

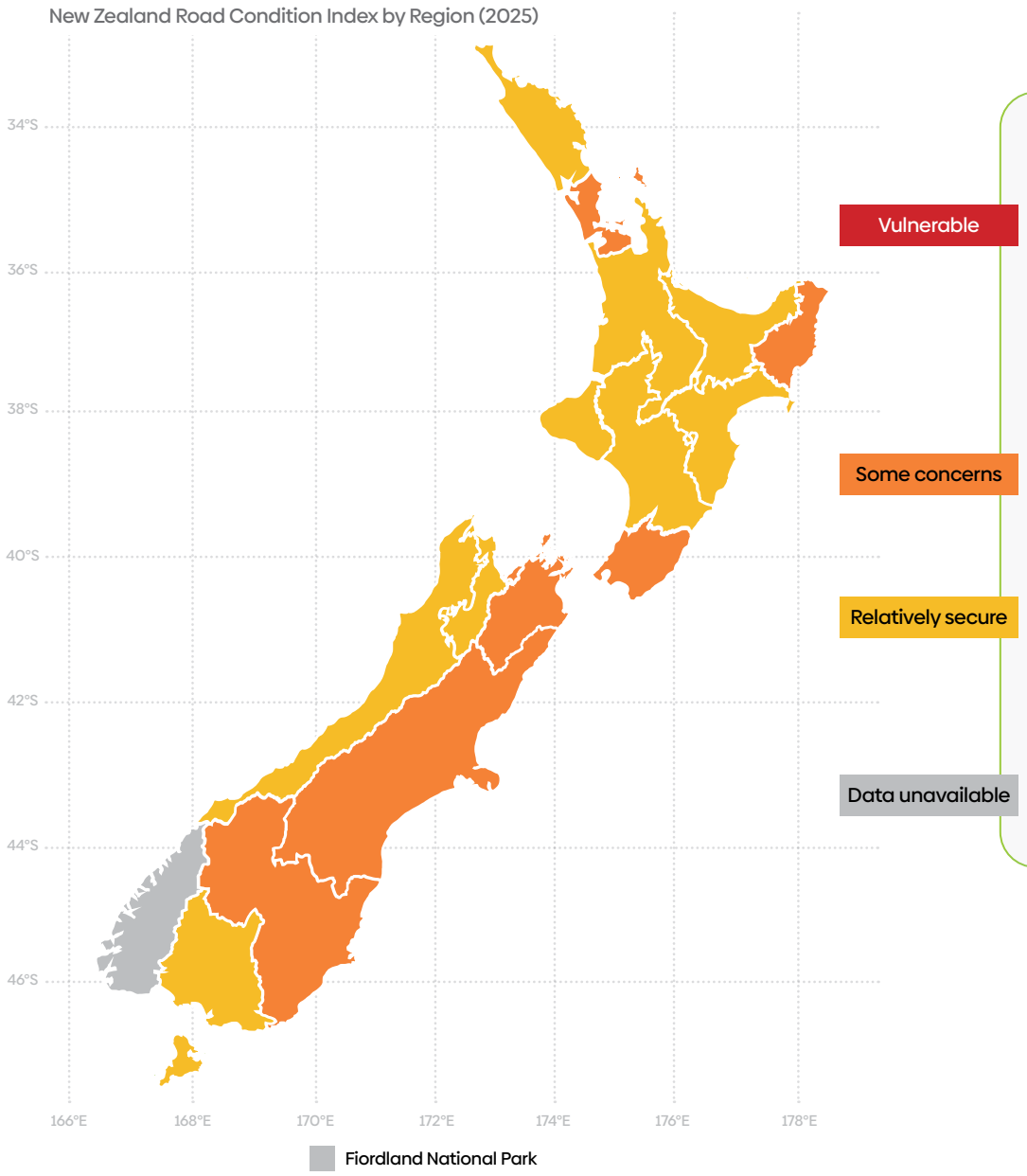
Electricity resilience depends on several factors, including generation capacity, the security of winter energy supply, and the strength of transmission and distribution networks. New Zealand's electricity system is unique in that much of our power is generated in the South Island, but the highest volume is consumed in the North Island where almost three quarters of the population lives, making transmission lines vital to our national resilience.

Regions without local generation capacity are more exposed to shocks that disrupt transmission. **Auckland is highly vulnerable** to disruptions to energy supply in the event of a shock, given it is the country's largest consumer of electricity, and lacks significant local generation. Auckland relies on energy supply that has to pass through a distribution network that has experienced multiple disruptions in recent years. This vulnerability is a key contributor to Auckland's low score when it comes to overall infrastructure resilience.

Northland, in turn, relies on electricity flowing through Auckland, creating a **dependency point** that heightens its exposure to shocks.

Recent severe weather events, including Cyclone Gabrielle and transmission outages in Northland, have further tested the resilience of the electricity sector. These events highlight the importance of investing in infrastructure that can withstand both local disruptions and wider system shocks, to safeguard communities, businesses and essential services.

Roading: Connecting communities and economies



Roading plays a vital role in supporting New Zealand's economy and communities, providing the connections that link people to services, goods to businesses, and regions to one another.

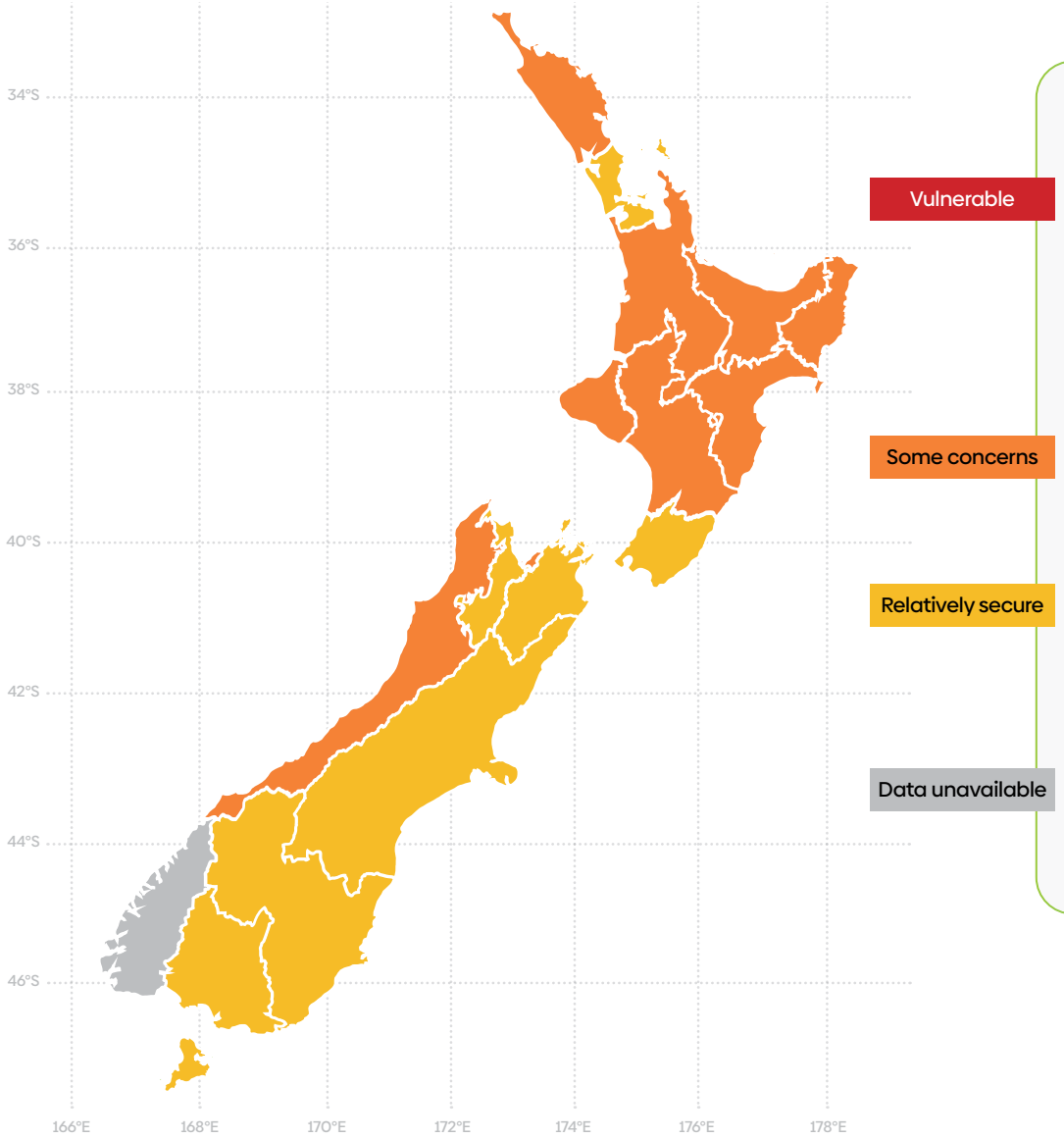
Resilience in this sector is shaped by the quality and coverage of road infrastructure, including the availability of alternative routes when disruptions occur. While overall, New Zealand's roading network shows greater resilience than the electricity sector, some regions face unique challenges. Auckland, Gisborne, Wellington, and parts of the South Island have areas where road networks are more exposed to disruption, often due to limited route options or vulnerability to weather events.

In Wellington, the combination of steep terrain, constrained transport corridors, and a reliance on key routes like State Highway 1 and State Highway 2 increases the region's exposure to road closures and disruptions, particularly during severe weather or seismic events. This accounts for **Wellington's low score when it comes to resilience in roading** and contributes to the region's relatively low infrastructure resilience overall.

Recent severe weather events, such as Cyclone Gabrielle (which affected Coromandel, Gisborne, and Hawke's Bay) and major slips on the Brynderwyn Hills in Northland, have tested the resilience of road networks. Since 2021, these events have contributed to a decline in roading resilience across much of the country, though regions like Otago and Southland have remained relatively stable.

Telecommunications: Connecting people and services across sectors

New Zealand Telecom Access & Quality Index by region (2025)



Telecommunications play a critical role in New Zealand's resilience, enabling everything from day-to-day communication to business continuity, health services, and emergency response.

Resilience in this sector includes not only access to reliable telephone and internet services, but also the ability to maintain connectivity during disruptive events. The importance of digital connections has grown sharply in recent years, particularly during the COVID-19 pandemic, which accelerated the shift to online services across health, education and commerce.

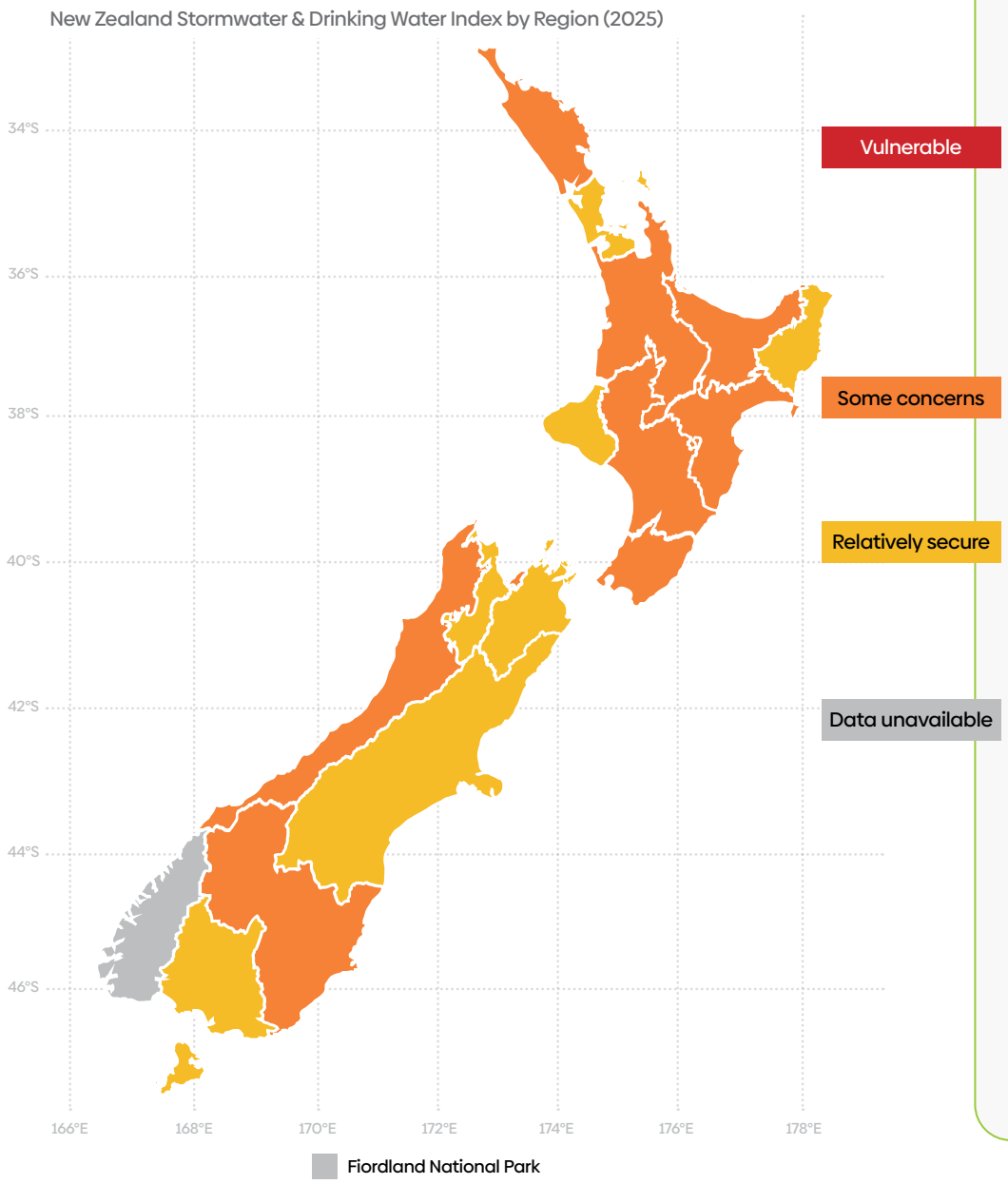
While the telecommunications network has generally met the needs of households and businesses, gaps remain. **Rural and remote areas** – and some under served urban pockets – continue to face **challenges accessing consistent and reliable connectivity**. These gaps can leave communities more exposed during disruptions, at a time when access to information and services is most critical.

Telecommunications also underpin other essential systems. During Cyclone Gabrielle, power outages led to the failure of telecommunications networks, which in turn disrupted online payment systems and emergency communications.

Regions with larger urban centres tend to score higher on telecommunications resilience, reflecting both better infrastructure investment and economies of scale.

Strengthening connectivity in more isolated or disadvantaged regions is a key opportunity to build resilience more evenly across the country.

Water: Protecting communities and the environment



Water infrastructure – including freshwater supply, wastewater, and stormwater systems – plays a fundamental role in supporting the health, wellbeing and resilience of communities across Aotearoa.

Resilience in this sector is shaped by the condition and performance of water systems, as well as their ability to handle shocks like severe weather events. While water carries a lower interdependency score compared to sectors like electricity or roading, its local importance cannot be overstated. Access to clean water, effective wastewater management and reliable stormwater systems are essential to public health and environmental protection.

The **availability of data currently limits the Index's water resilience measure to stormwater infrastructure**, which means the results do not capture households or communities not connected to a formal water supplier or alternative management system. Data on water infrastructure is based on **Water New Zealand surveys of councils that choose to respond**. The most recent survey was completed in 2022 and does not include data from Watercare (Auckland) on freshwater and wastewater system, and no data for Gisborne. The Infrastructure Commission has a dashboard of the Water New Zealand data, but this only captures information for the regions that have supplied data [1]

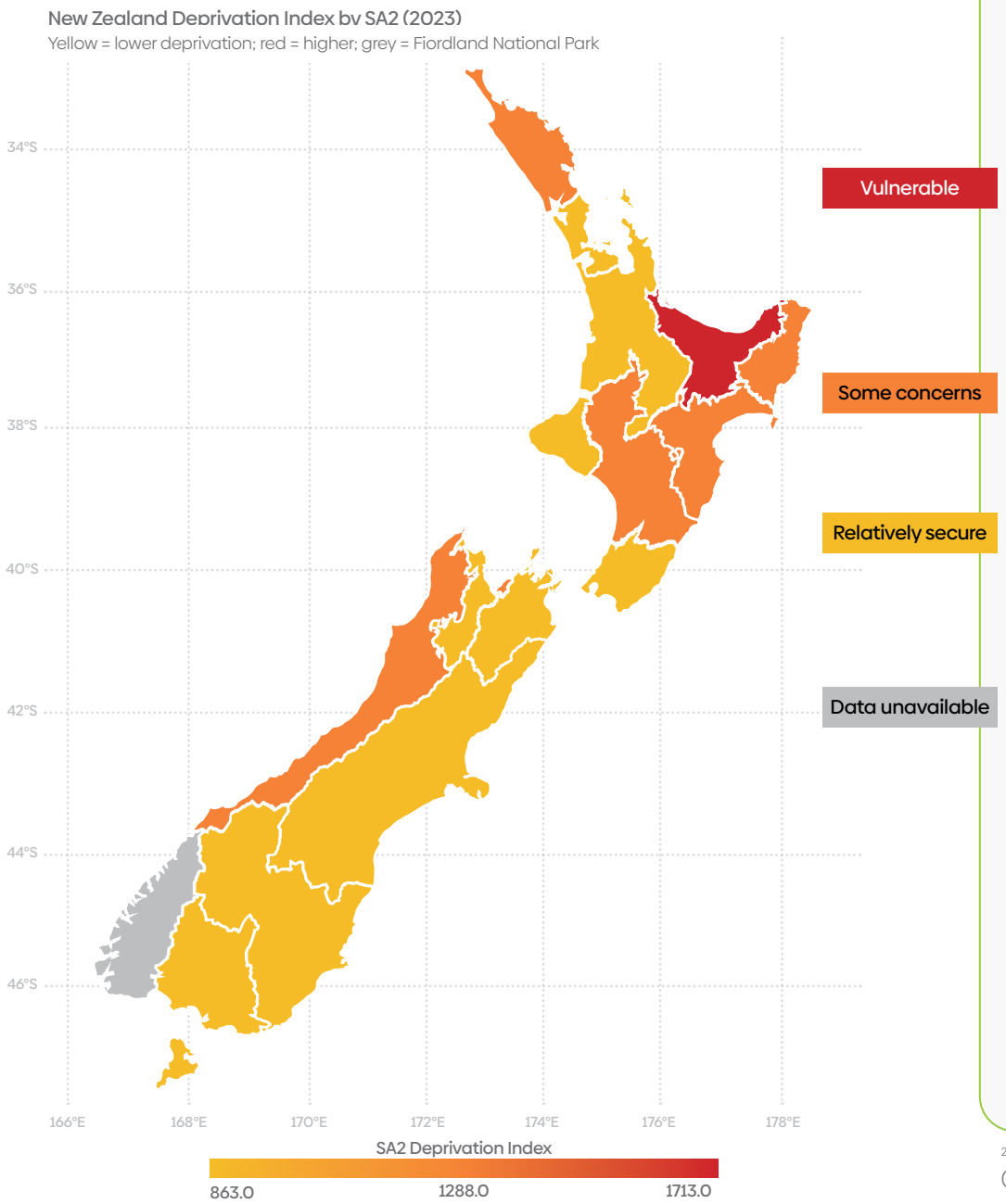
It also **excludes consumers / regions that are not on reticulated water supply**, for example on bores etc. Hence, we have used the stormwater data as a proxy for the state of the infrastructure. Drinking water quality in the reticulated system is relatively good. And the stormwater system is probably not as closely monitored unless it gets compromised by wastewater or floods. In Wellington the pipes are visibly failing but elsewhere it may not be so obvious, although there is an awareness that the infrastructure is ageing and needs replacement. While there have been recent developments which show disruptions in water supply, the data available is focused on stormwater infrastructure. It is also important to note this data is collected on an annual basis, which means more recent events will not be captured in the Index.

Our analysis highlights **a clear need for consistent data on water infrastructure to be collected** across all New Zealand regions, in order to obtain an accurate picture of the resilience in water infrastructure in New Zealand.

Nonetheless, stormwater resilience provides a valuable insight into how water systems are coping, especially in urban areas facing growth and climate-related pressures. Although New Zealand's water infrastructure is widely acknowledged to be ageing and in need of investment, the Index shows relatively stable performance in this sector. This may reflect the positive impact of recent investments in new infrastructure – particularly in areas of new housing development – as well as ongoing efforts to upgrade stormwater systems to cope with increasing demand.

[1] https://tewaihanga.govt.nz/our-work/performance-monitoring/water-sector-performance

Infrastructure resilience and community outcomes



The IRI scores shows that regions with lower infrastructure resilience often face other, compounding challenges. When we overlay our resilience data with the 2023 New Zealand Socioeconomic Deprivation Index, a pattern emerges: regions with higher levels of socioeconomic deprivation have lower levels of infrastructure resilience.

Communities in regions with higher deprivation are often more vulnerable to infrastructure shocks, such as severe weather events, and have fewer resources to respond and recover. When infrastructure fails, it can take longer to restore essential services in these areas, deepening hardship and slowing recovery.

Gisborne has the highest deprivation score, that is the highest percent of its population that in the lowest deciles. Its resilience is also reduced by exposure to weather events (cyclones) and its geographic isolation. It scores low on electricity, roading and telecommunications. The relatively benign water score is suggesting better outcomes than is the case for Gisborne, because there is only data on drinking water quality, when half the region is likely not on reticulated water supply. Its low population means that the cost benefit analysis of investing in infrastructure in Gisborne often does not justify investment when decisions are made by Government about where to allocate funding, further reducing the resilience of its infrastructure.

Northland, a region that also has a high deprivation score, has experienced several infrastructure outages, including electricity transmission and distribution outages, issues around roading access and poorer telecommunications access given the rural/semi-rural connectivity divide. Its proximity to Auckland also reduces its resilience because Auckland acts as a choke point for transmission of electricity and roading access.

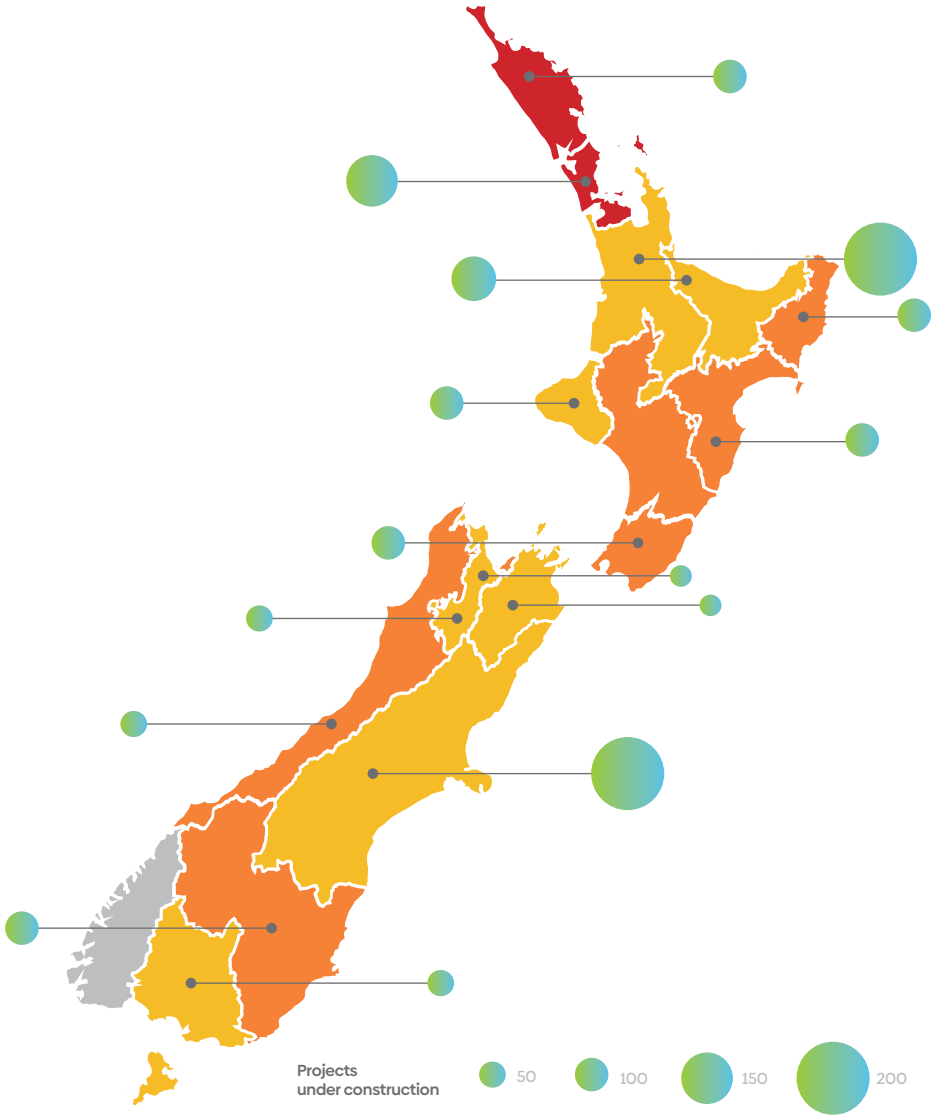
Telecommunications access issues are a key driver for regions with high deprivation issues, which highlights the need for improving rural connectivity in order to improve wellbeing for these communities [2].

Investment criteria often prioritises population centres, meaning infrastructure in some regions is not seen as a priority – creating resilience gaps that directly impact community wellbeing and exacerbate the resilience gap from one community or region in New Zealand to another. Improving infrastructure resilience in these communities is not just about protecting systems – it's about enabling better access to the opportunities and services that support wellbeing, reduce inequity, and strengthen social and economic resilience.

[2] June Atkinson et al., NZDep2023 Index of Socioeconomic Deprivation: User's Manual (University of Otago, 2024).

Current state of infrastructure investment

Infrastructure Resilience Index Scores (with Pipeline bubbles)



Bubble size = total projects under construction

Fiordland National Park

To understand how New Zealand is investing in future resilience, we looked at the Infrastructure Commission's National Infrastructure Pipeline. This provides a snapshot of major projects currently underway or in procurement, across water, transport, energy, and telecommunications.

The size of the bubbles on the maps indicates the number of projects in the region.

While the volume of projects is encouraging, their long-term impact on resilience will depend on how well they address both current vulnerabilities and future risks. In the pipeline, most activity is concentrated in Auckland, Waikato, and Canterbury, reflecting both population demands and regional investment priorities.

- **Water:** The largest number of projects, reflecting urgent needs in the Three Waters space
- **Transport (Roading):** A significant share, although utilisation data suggests maintenance should be the priority
- **Energy and Telecommunications:** Fewer projects, particularly in telecommunications, where no projects are currently listed in procurement.

The Infrastructure Commission's National Infrastructure Pipeline shows there is already some investment underway to address the infrastructure gaps in the regions.

In Auckland, where energy is the least resilient there are six energy projects, one on the distribution network and one on the transmission network. There are three solar generation projects.

In Gisborne there are 16 roading projects under construction. However, there are no projects in energy or telecommunications and few in water.

Northland projects underway include roading investments, three water treatment facility projects and some flood protection. However, there are no telecommunications projects or substantial energy projects.

Meanwhile, Wellington has no telecommunications or energy projects, 18 local and state roading projects, and 8eight water-related projects.

A national picture of infrastructure resilience – Taking Action

We have identified the following key enablers and recommendations to enhance the resilience of the four sectors covered in this report:

Electricity

Enablers

- Increase electricity generation capacity closer to urban centres, especially Auckland and in Northland, to increase the resilience score in the electricity sector.

Recommendations

- Decentralise renewable electricity generation.
- Generate capacity closer to end consumers. The extended transmission and distribution lines network is vulnerable to shocks. This is unlikely to improve unless generation capacity is closer to the end consumers.
- Maintain transmission and distribution networks, to reduce the impact of shocks.

Roading

Enablers

- Asset management system: maintain a centralised database of road, pavement and bridge condition.
- Real-time road condition monitoring (as we have with traffic monitoring).
- Climate-resilient design standards, including specification of materials.
- Design of drainage to account for topography and extreme weather.
- Prioritisation framework: rank routes by volume, criticality (freight vs. evacuation) and hazard exposure.

Recommendations

- Focus on regular maintenance to prevent disruptions, rather than only responding post-shock. Data from the Infrastructure Commission suggests that compared to similar countries[3], New Zealand's existing road network is not highly congested – meaning the focus may need to shift from new road construction to maintaining and strengthening the roads we already have.
- Strengthening key bridges and high-traffic arterials against seismic and flood risks.
- Introducing resilient pavement reducing the need for frequent repairs or replacement, including in areas prone to frost or heat.

Telecommunications

Enablers

- Delivering consistent quality and capacity of telecommunications services across New Zealand will increase resilience.

Recommendations

- Invest to keep pace with evolving technology and user needs.
- Strengthen emergency planning, particularly in light of lessons from Cyclone Gabrielle.
- Address the persistent urban-rural divide, where rural communities remain more vulnerable to outages.

Water

Enablers

- Support the work to strengthen how water services are governed and managed across regions and explore fair, sustainable funding options to help communities invest in resilient water systems.

Recommendations

- Upgrade ageing Three Waters infrastructure, particularly in rural areas.
- Build on the progress made in new housing developments, where local stormwater solutions have helped increase resilience.
- Consistent and timely collection of data on the age and quality of water infrastructure across all local councils to allow for a more accurate assessment of resilience in this sector across the regions.
- Utilisation of common asset management technology systems used across New Zealand to enable shared learning, competency development, data standards and reduce the costs of technology implementation.

Across all sectors, maintenance is the most important enabler of resilience, reducing stress and strengthening the system's ability to handle shocks. New Zealand Infrastructure Commission Te Waihanga reports that 60% of new infrastructure spending is required just to sustain existing assets. Yet in practice, many sectors are not allocated sufficient renewal funding, meaning long-term infrastructure condition continues to deteriorate.

This highlights finance as another critical enabler across all sectors. While challenges in financing large-scale projects are well known in New Zealand, asset maintenance is often compromised when depreciation funds are diverted to other spending. Despite spending more than most OECD countries relative to GDP, New Zealand ranks in the bottom 10% of high-income countries for return on its infrastructure investment. [4]

Collaboration to build resilience across integrated transport, water, and energy networks will make a key contribution to improving the resilience of the New Zealand infrastructure system.

Finally, in order to strategically invest in our infrastructure resilience, consistent data and reporting is required to inform decision making.

[3] New Zealand Infrastructure Commission, 'National Infrastructure Plan Infrastructure Needs Analysis Summary of Results and Findings', June 2025, https://media.umbraco.io/te-waihanga-30-year-strategy/xwxn2h2y/infrastructure-needs-analysis-summary-results-and-findings.pdf.

Outlook for infrastructure resilience

The Government's commitment to infrastructure as a backbone for New Zealand's long-term economic success and the recent bipartisan cooperation to address infrastructure needs are promising foundations. However, these developments risk falling short if the focus remains predominantly on new projects without equal emphasis on maintaining and strengthening existing assets.

To strengthen resilience, we must also focus on maintaining our existing assets. Planned, well-funded maintenance is critical – not only is it more cost-effective than rebuilding after failure, but it also reduces the wider economic and social impacts of extended outages or closures.

If infrastructure maintenance continues to be underfunded and asset management remains fragmented with inconsistent and outdated data, New Zealand will face escalating risks of critical system failures. These failures could translate directly into:

- Costly and prolonged outages that disrupt households, businesses, healthcare, emergency services, and essential supply chains.
- Wider economic shocks as production halts, freight delays increase, and urban-rural divides worsen due to uneven service quality and infrastructure vulnerability.
- Increased social vulnerability, especially in rural and disadvantaged communities that rely heavily on resilient utilities for basic needs and emergency response. Inaction will only increase deprivation of already vulnerable communities.
- Scaling climate and hazard risks overwhelming aging infrastructure poorly prepared for extreme weather, floods, seismic events, and rising demand pressures.
- Missed opportunities to leverage innovation, data-driven decision-making, and community engagement to proactively reduce risks and costs.

The aim of developing the IRI is to provide a comprehensive view of resilience across the key infrastructure sectors and regions in New Zealand. What we found is that the data is not consistent across the sectors, and often not collected on a regular basis. In part, this depends on the needs of the agency collecting the data, as well as the frequency with which data is collected. Without a consistent, coordinated approach to collecting reliable data across all key infrastructure sectors, New Zealand will lack the insights needed to make informed investment and policy decisions that truly enhance resilience. This data gap inhibits the development of meaningful performance measures, making it impossible to identify vulnerabilities, monitor progress, or justify funding priorities transparently.

If New Zealand Inc. is to address its infrastructure resilience, we need consistent data across the sectors and regions, updated on at least an annual basis, so we can develop performance measures that is representative of the resilience of infrastructure in New Zealand. Delaying action on infrastructure resilience may increase the risk of damage to physical assets and potentially impact New Zealand's economic stability, social cohesion, and overall wellbeing, especially as challenges from more frequent and severe shocks continue to grow.

Costly and prolonged outages that disrupt households, businesses, healthcare, emergency services, and essential supply chains.

To mitigate these risks, New Zealand should:

- Establish **consistent, annual data collection** across all infrastructure sectors.
- **Fund maintenance** equally with new development.
- Implement **integrated, cross-sector resilience strategies** addressing climate adaptation, technology, and community needs.
- Give agencies **clear mandates and resources** to track and enhance infrastructure resilience.

By doing so, New Zealand can not only safeguard the infrastructure that underpins everyday life, but also build a foundation that supports prosperity and productivity for all New Zealanders.

Appendix

ASCE. A Comprehensive Assessment of America's Infrastructure. Report Card for America's Infrastructure. American Society of Civil Engineers, 2025.

Atkinson, June, Clare Salmond, Peter Crampton, Helen Viggers, and Kura Lacey. NZDep2023 Index of Socioeconomic Deprivation: User's Manual. University of Otago, 2024.

Infrastructure Australia. 'Resilience Principles - Infrastructure Australia's Approach to Resilience'. Australian Government, June 2022.

IPSOS. Global Infrastructure Index 2024. Global Infrastructure Investor Association, 2024.

Kay, Ellie, Joanne Stevenson, Chris Bowie, Vivienne Ivory, and John Vargo. The Resilience Warrant of Fitness Research Programme: Towards a Method for Applying the New Zealand Resilience Index in a Regional Context. 2019.

Mercier, Kali. Built to Last How Can We Take a More Strategic Approach to Infrastructure Asset Management in Aotearoa New Zealand? Helen Clark Foundation, 2025.

New Zealand Infrastructure Commission. 'Draft National Infrastructure Plan'. June 2025. https://media.umbraco.io/te-waihanga-30-year-strategy/y5fhk1ya/nip-draft-web.pdf.

New Zealand Infrastructure Commission. 'National Infrastructure Plan Infrastructure Needs Analysis Summary of Results and Findings'. June 2025. https://media.umbraco.io/te-waihanga-30-year-strategy/xwxn2h2y/infrastructure-needs-analysis-summary-results-and-findings.pdf.

New Zealand Infrastructure Commission. Paying It Forward: Understanding Our Long-Term Infrastructure Needs. Te Waihanga Research Insights. New Zealand Infrastructure Commission / Te Waihanga, 2024. https://media.umbraco.io/te-waihanga-30-year-strategy/43ikcme0/paying-it-forward-understanding-our-long-term-infrastructure-needs.pdf.

New Zealand Lifelines Council. Aotearoa New Zealand's Critical Infrastructure a National Vulnerability Assessment Part B: Main Report - Infrastructure Resilience in New Zealand. 2023.

OECD. Strengthening Regional Policy for Resilient Places: Key Issues and Policy Considerations. OECD Regional Development Papers. Organisation for Economic Co-Operation and Development (OECD), 2025. https://doi.org/10.1787/ea24eab5-en.

Sense Partners. New Zealand's Infrastructure Challenge Quantifying the Gap and Path to Close It. 2021.

UNDRR and CDRI. 'Global Methodology for Infrastructure Resilience Review'. United Nations Office for Disaster Risk Reduction (UNDRR) and Coalition for Disaster Resilient Infrastructure (CDRI), 2023. https://www.undrr.org/media/91939/download?startDownload=20250507.

Data Sources:

Pipeline

Infrastructure Commission, 2025: https://tewaihanga.govt.nz/the-pipeline downloaded 11 June 2025

Deprivation

Socioeconomic Deprivation Indexes: NZDep and NZiDep, Department of Public Health, University of Otago: https://www.otago.ac.nz/wellington/research/groups/research-groups-in-the-department-of-public-health/hirp/socioeconomic-deprivation-indexes-nzdep-and-nzidep-department-of-public-health

Interactive NZDep2023 maps, graphed by EHINZ (Environmental Health Indicators NZ): https://www.ehinz.ac.nz/indicators/population-vulnerability/socioeconomic-deprivation-profile/#nzdep-for-2023-nzdep2023

Roading

NZTA, 2010-2024: https://www.nzta.govt.nz/assets/userfiles/transport-data/RoadCondition.xls downloaded 3 June 2025

Electricity

Transpower, 2021-2025: https://www.transpower.co.nz/system-operator/planning-future/security-supply-assessment downloaded 30 May 2025

Electricity distribution, 2015-2024 - https://comcom.govt.nz/__data/assets/excel_doc/0033/367197/Performance-summaries-for-electricity-distributors-Year-to-31-March-2024.xlsx downloaded 3 June 2025

Water

Water NZ, 2022: https://public.tableau.com/app/profile/lesley.smith/viz/AssetsStory2022/Assets downloaded 3 June 2025

Water Services NZ Taumata Arowai, 2023: https://www.taumataarowai.govt.nz/assets/Uploads/Detailed-Data.xlsx downloaded 3 June 2025

Telecommunications

Telecommunications, 2022-2024 - https://comcom.govt.nz/regulated-industries/fibre/regulated-fibre-provider-performance-and-data/information-disclosed-by-fibre-providers

Stats NZ Census 2023-Access to telecommunication systems - https://explore.data.stats.govt.nz/ downloaded 4 June 2025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