GHD Advisory

August 2023

Department of the Prime Minister and Cabinet
NZ Critical Infrastructure Resilience Discussion Document

GHD Submission

Kia Ora

We appreciate the opportunity to share our views

As requested, we are providing our feedback on:

1. The definition of the problem provided in the Discussion Document,
2. What we perceive to be the current barriers to infrastructure resilience, and
3. Options for reform.

We have also provided at the end a selection of GHD teams' expertise that could support future evaluation and discussion.

The critical infrastructure resilience Discussion Document represents a great step forward in opening dialogue and defining accountabilities to achieve resilient infrastructure for Aotearoa New Zealand

Five Key Observations

① Funding and expert resources are needed

② Need to go beyond “tick-box” exercise

③ Improvements to operation and maintenance are critical to infrastructure resilience

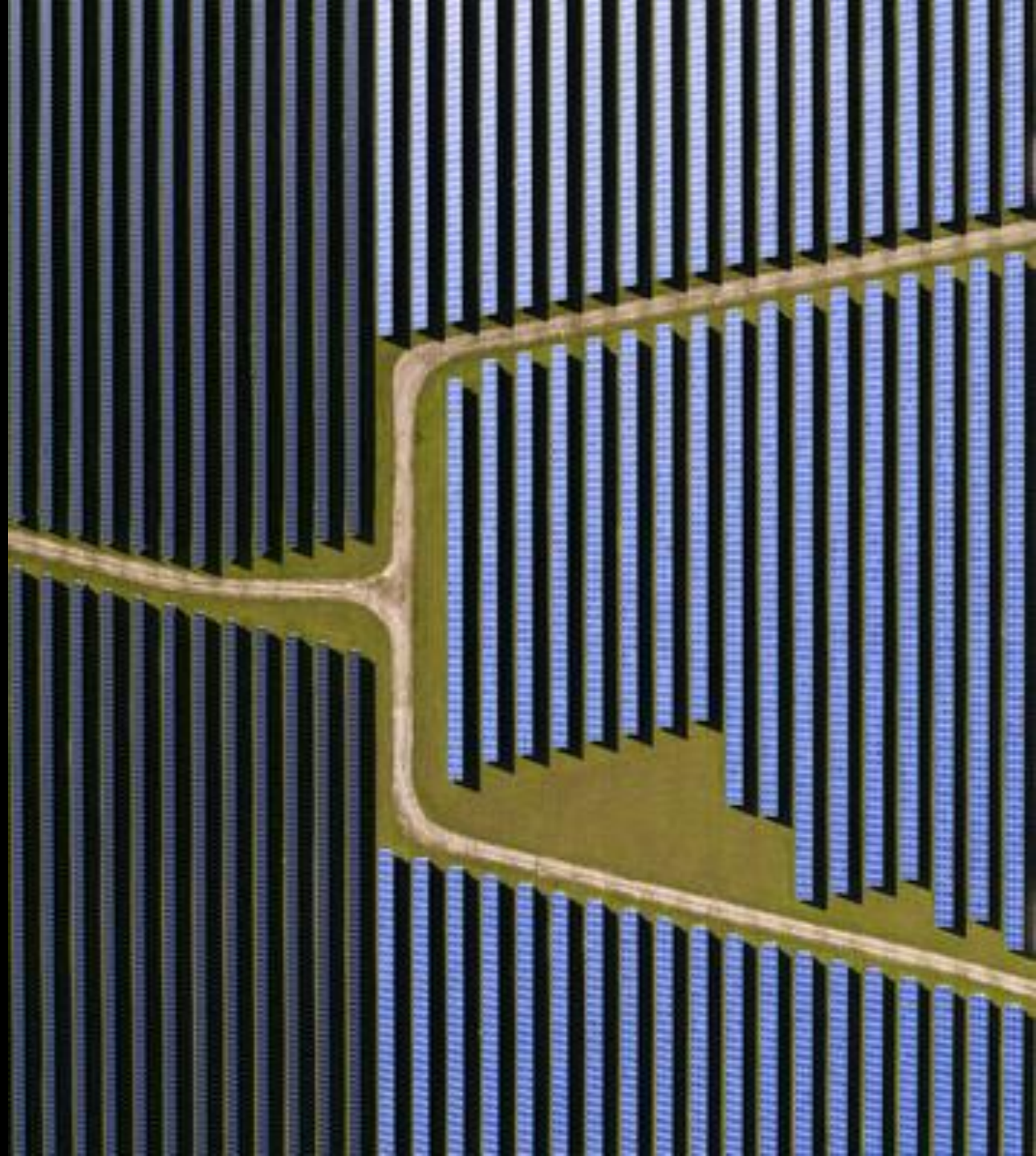
④ Reliable infrastructure has immense value to society

⑤ Currently regulated sectors have room for improvement; don’t lose those opportunities as we “raise the floor”

GHD Advisory

1. Defining the Issue

→ Inconsistent resilience of C.I.



Expanding the Definition of “Critical Infrastructure”

As noted, new and emerging sectors have proved critical to overall system resilience

Expanding the definition of critical infrastructure is prudent. Many relevant sectors are not subject to regulation that considers their significance as “infrastructure.” Furthermore, traditional lifeline utilities rely increasingly on emerging and underregulated technology platforms.

However, existing standards and resources are insufficient for Lifeline Utilities

When “lifting the resilience floor,” we must not lose sight of the need to increase resilience for traditional lifeline infrastructure, such as water, power, roading and communications.

- Chronic under-investment has resulted in fragile networks in many regions of NZ
- Current requirements place too much emphasis on planning for “post-event” recovery. More proactive planning and investment is needed to harden or adapt infrastructure networks such that fewer emergency repairs are required.

5 Resilience Domains

Physical, Cyber, Supply Chain and Procurement

These domains are well-defined in the discussion document and are consistent with best practice standards in other jurisdictions, such as Australia and the United States.

Each domain is necessary and should be considered by each asset owner.

Different sectors and enterprises will naturally need to focus their resources on the domains that apply most to their operational context, so a flexible resilience standard that accounts for this variability is needed.

Personnel Domain

While it is important to mitigate the risk of "bad actors" among trusted infrastructure personnel, through vetting of new recruits and other tools, the primary Personnel risk facing NZ infrastructure is a lack of personnel who are trained to operate and maintain critical infrastructure.

Resilience standards relating to Personnel must recognise the role that good, committed personnel play in making our infrastructure resilient. Supporting staff with training, competitive pay, and effective O&M tools and resources is essential to both day-to-day operations and emergency recovery capability.

GHD Advisory

2. Current Barriers

→ Resources and Expectations

Barriers One to Four are Well-defined

i. Information Sharing is Ad Hoc

Yes, government can be well-positioned to facilitate data collection and distribution. There is opportunity for data and expert insights regarding natural hazards and man-made threats to be shared with more infrastructure owners to inform and facilitate their asset management decisions. Likewise, expertise and insights must be shared across knowledge domains. (e.g. flood protection best practice as applied to power transmission systems)

A secure, central database would allow for risk mitigation resources to be targeted for optimum system-wide resilience benefits.

ii. No Enforceable Minimum Standards

Common, quantitative measures of Risk and Resilience are needed – Appendix B is a good start.

One opportunity for further development: the mechanics and nature of Consequences vary dramatically between infrastructure sectors, so more detailed and tailored measures are needed.

Australia's sector-specific Risk Assessment Advisory documents are a good step in this direction.

Barriers One to Four are Well-defined

iii. Limited National Security Tools

As a supplement to the tools and authorities described in the discussion paper, a range of other resources and tools can help protect infrastructure from security threats:

- Codify best practices and educate owners
- Establish minimum security requirements
- Create and support “mutual aid” networks among asset owners and operators to facilitate the quick deployment of emergency response resources.

iv. Unclear Accountabilities

As noted by DPMC, infrastructure vulnerabilities and risks in one sector impact the resilience of critical assets in other sectors.

While existing requirements can be expanded or strengthened to spur resilience improvements, there is perhaps a need to assign top-down accountability for the entire infrastructure system.

A balance must be found between creating accountability and managing the regulatory system’s complexity, as is well-acknowledged in the Discussion Document.

Additional Barriers to Resilience in NZ

Lack of Resources for Resilience Planning and Improvement

As noted in the discussion paper, many communities with significant resilience gaps cannot afford the necessary improvements.

– Funding and leadership are needed to identify these communities and quantify their resilience gaps

– All communities deserve reliable, resilient infrastructure. Existing investment gaps such as those identified for 3 Waters systems will be exacerbated by future threats. Conversely, supporting and requiring risk assessments will optimise the limited available funding.

Further, staffing resources and expertise are already limited in the infrastructure sector broadly.

– NZ needs additional programme support for education, training and development

– Effective, proactive maintenance and inspections also increase system resilience, but this too requires trained people and adequate funding

Resilience pays for itself, but only if we do pay for resilience.

Those savings are not retroactive – time is of the essence.

GHD Advisory

3. Options and Opportunities

→ Potential reforms

System-based Approach to Infrastructure

Interdependency is a critical and under-evaluated aspect of infrastructure resilience.

As DPMC noted, more comprehensive information-sharing (and related risk analysis) is needed.

– A secure, central, data repository would enable trusted professionals to evaluate which assets and systems are most critical across sectors.
  - Australia has established the Trusted Insider Security Network for this purpose

Supply-chain and procurement also require greater awareness.

As DPMC noted, these risk domains apply across sectors and are not all always present in emergency planning or risk assessments.

– GHD has recently provided supply resilience analysis to the infrastructure sector in Australia.

Existing Resilience Standards and Requirements

Other nations have implemented similar requirements.

The American Water Infrastructure Act (2018) recently required all community water systems to perform Risk and Resilience Assessments.

– The USEPA provided an abundance of tools and resources, many of them based on consultation with expert government agencies such as DHS or NOAA
  - Baseline Information on Malevolent Acts for Community Water Systems (threat likelihood)
  - Vulnerability Self-Assessment Tool: a free calculator that included location-specific threat likelihood values for a range of natural hazards
  - Online workshops and webinars to increase awareness of the new requirements

Australia's Security of Critical Infrastructure Act 2018 required all critical infrastructure owners comply with CIRMP Rules

– Expanded the definition of "critical infrastructure" to include many data and communication systems
– Response to increased cyber threat and increased reliance on centralised tech/finance services
– However, the threshold of "serving 100k+ homes" leaves out many communities (water/sewer)
– Published Risk Assessment Advisory papers with sector-specific guidance

Proposed Resilience Standards and Requirements

At a minimum, new requirements should outline:

- When the first resilience assessment is due, and how often it should be renewed
  - This could be managed through existing requirements such as LGA AMPs
- What framework or standard is required, or are considered best practice
  - Quantitative, evidence-based evaluation of likelihood and consequence is best
- Specific and attainable objectives for infrastructure owners' resilience

The 5 Resilience Domains are well-defined.

- Perhaps consider aggregating and disseminating best practices across each of these domains.
- Also ensure that the benefits of resilience are considered across a range of societal domains, as suggested in the discussion document (economic, environmental, social and cultural)

Existing Resilience Frameworks

Standards and tools exist within and beyond NZ.

GHD recently completed a review with a Government Agency to evaluate their Lifeline Infrastructure's resilience to various infrastructure service disruptions, incorporating:

- Categorical rating of vulnerability, likelihood and consequence of outage ("1-5")
- Identified "operational critical assets"
- Evidence-based, risk-based method applied to each distinct geographic context
- Engagement with external providers

The American Water Works Association's J100 Standard (updated 2021): Risk and Resilience Management of Water and Wastewater Systems sets requirements for an all-hazards risk and resilience analysis. It provides a robust methodology and ample supplemental reference material.

- The methodology presented by DPMC is well-aligned with this standard.
- A quantitative, evidence-based measure of resilience is needed when defining new requirements.
- While created for water systems, it is applicable to infrastructure systems more generally

Is a New Regulator Required?

As acknowledged by DPMC, infrastructure is already highly regulated, especially traditional Lifelines.

Adding Resilience measures and standards to existing regulatory pathways can be more efficient and effective. We suggest it would be useful to:

- Make use of existing relationships and organisational structures
- Apply needed resilience resources through existing approval paths
  - Resource requirements and optimal strategies will vary by sector
  - Use existing experts with relevant “domain” knowledge.

Ensuring the resilience of all NZ Infrastructure is perhaps too big a job for just one authority

Other Ongoing Reforms

RMA reforms could be used to enhance resilience.

Perhaps consider how the **Natural and Built Environment Bill** could be leveraged to apply requirements and provide accountability for built systems' resilience to natural and other hazards. Of particular relevance are System Outcomes 4 and 8, summarised here:

(4) Risks arising from natural hazards and climate change are reduced

(8) Infrastructure is provided to promote well-being

The **Climate Adaptation Act** could include provisions for community (and infrastructure) resilience, as well, though a draft of the document is not yet available to inform detailed discussion.

Also, ongoing **three waters reform** efforts could apply greater emphasis to future resilience, and so could future policies by Taumata Arowai.

Emphasise the Value of Infrastructure

“Wellbeing matters”

A reliable and resilient infrastructure system will demonstrate New Zealand’s commitment to community wellbeing. Pride of place and confidence in government are contingent on functioning infrastructure systems. “Keeping the lights on” has more value to society than the baseline cost of energy and transmission.

This higher value should be represented in the investments made by local and central government.

Emphasise the Value of Infrastructure

“Build back better”

When infrastructure is damaged by an event, or simply ages out (no longer fit for purpose), future resilience must be considered in design and siting.

Too-restrictive restraints on initial costs (design, construction) often get in the way of “common sense” asset optimisation. Relocation or redundancy costs extra initially, but saves more in the long run.

E.g.: Don’t replace “like-for-like,” upsize the culvert that was shown to be inadequate.

“Best value” instead of “lowest cost” procurement of planning, design, and construction makes for more reliable and resilient infrastructure.

Tiered approach based on asset criticality

Local Councils recovering from recent disasters in NZ have developed a tiered approach to characterise the criticality of infrastructure being rebuilt.

For infrastructure assets in a higher Tier, higher level of service or resilience provisions are made.

Additionally, local engineers and professionals are empowered to recommend improvements that will help prevent a future infrastructure failure.

The Tier framework facilitates an informed discussion and decision-making for “best value” outcomes.

Resilience at the Community Scale

A distributed system is a resilient system

Highly centralised infrastructure is more vulnerable to a single failure or hazard. It is also more vulnerable to localised outages in supporting infrastructure systems such as roads or power.

Furthermore, many infrastructure assets cannot be adequately protected in their current alignments.

A distributed approach presents certain opportunities for improvement on the current model:

- Energy: local renewable power generation
- 3 Waters: local treatment of water and wastewater, water reuse or desalination systems
- Promoting more local procurement or manufacturing of parts, supplies, fuel, and food

There is a nexus here between resilient infrastructure and opportunities for sustainability and local community economic benefit.

These local systems need not provide 100% of a community's needs to provide major resilience benefits during and following a disruption.

A Flexible Framework

Hazards and threats vary geographically and by sector

Certain communities and infrastructure systems are more exposed or more vulnerable to specific hazards or threats.

“Hard” infrastructure like pipes, power lines, and roads are more vulnerable to physical hazards, for instance. They are also generally more expensive and time-consuming to repair after an event.

Resilience efforts should consider local/system context

The impact of infrastructure failures is often local, and risk mitigation analysis and solutions should scale appropriately to the local context.

An infrastructure failure in a smaller town may never rate as a “5” on a one-size-fits-all consequence scale, but it has dramatic implications for every individual in the community.

Similarly, the availability and appropriateness of risk mitigation solutions will vary depending on the geographic context.

GHD's Experience Supporting Resilience in New Zealand

- Advisory and Asset Management
- Risk and Assurance
- Emergency Response Planning
- Climate and Sustainability
- Energy and Resources
- Infrastructure Design
- Geotechnical Assessment
- Digital Intelligence

Contact details:

Casey Claborn, Senior Advisor
Asset Management
casey.claborn@ghd.com
+64 3 363 0846

David Walker, Market Leader Advisory NZ
david.walker@ghd.com
+64 9 370 8280

90+ years **in operation**
135+ countries **served**
160+ offices **worldwide**
2.3Ⓑ AUD revenue **2022**
5 global markets
11Ⓚ people
45+ service **lines**

↳ **Providing engineering, environmental, advisory, architecture, digital and construction services**