



Water infrastructure failures from Cyclone Gabrielle show low resilience to climate change

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Summary

When Cyclone Gabrielle swept across large parts of Aotearoa New Zealand (NZ) in February this year, it displaced thousands of people as flooding caused landslides, ripped through homes, trapped people on roofs, ruined farmland and closed roads. Here we assess the reported damage to water infrastructure in this disaster and find evidence of a low level of resilience. It is clear that both central and local government need to invest far more in upgrading water infrastructure if it is to survive intensifying climate disruption.

In February this year, Cyclone Gabrielle left massive damage in its wake. It caused an estimated 1720 injuries,¹ 11 deaths,² with an economic cost estimated to be up to \$14.5 billion.³

In this *Briefing*, we focus on just one aspect of this disaster: water infrastructure damage. (See Appendix for note on stormwater.) Such infrastructure is critical for protecting public health, providing drinking water and treating waste. This infrastructure is vulnerable to the more frequent and extreme weather events associated with climate change.⁴

We take a preliminary view of the resilience our water infrastructure has in the face of climate change using media reports, local government websites and official data on boil water notices from Taumata Arowai (the country's new drinking water regulator established in 2021).

Damage to reticulated drinking water infrastructure

In Gisborne, the cyclone caused extensive damage to the water supply pipe into the city, breaking it in ten places. It took 45 days to repair and reconnect the pipeline which meant water restrictions for the population of nearly 40,000 people. About 100km of the 285km of the water pipe network was damaged⁵ (see Figure 1).

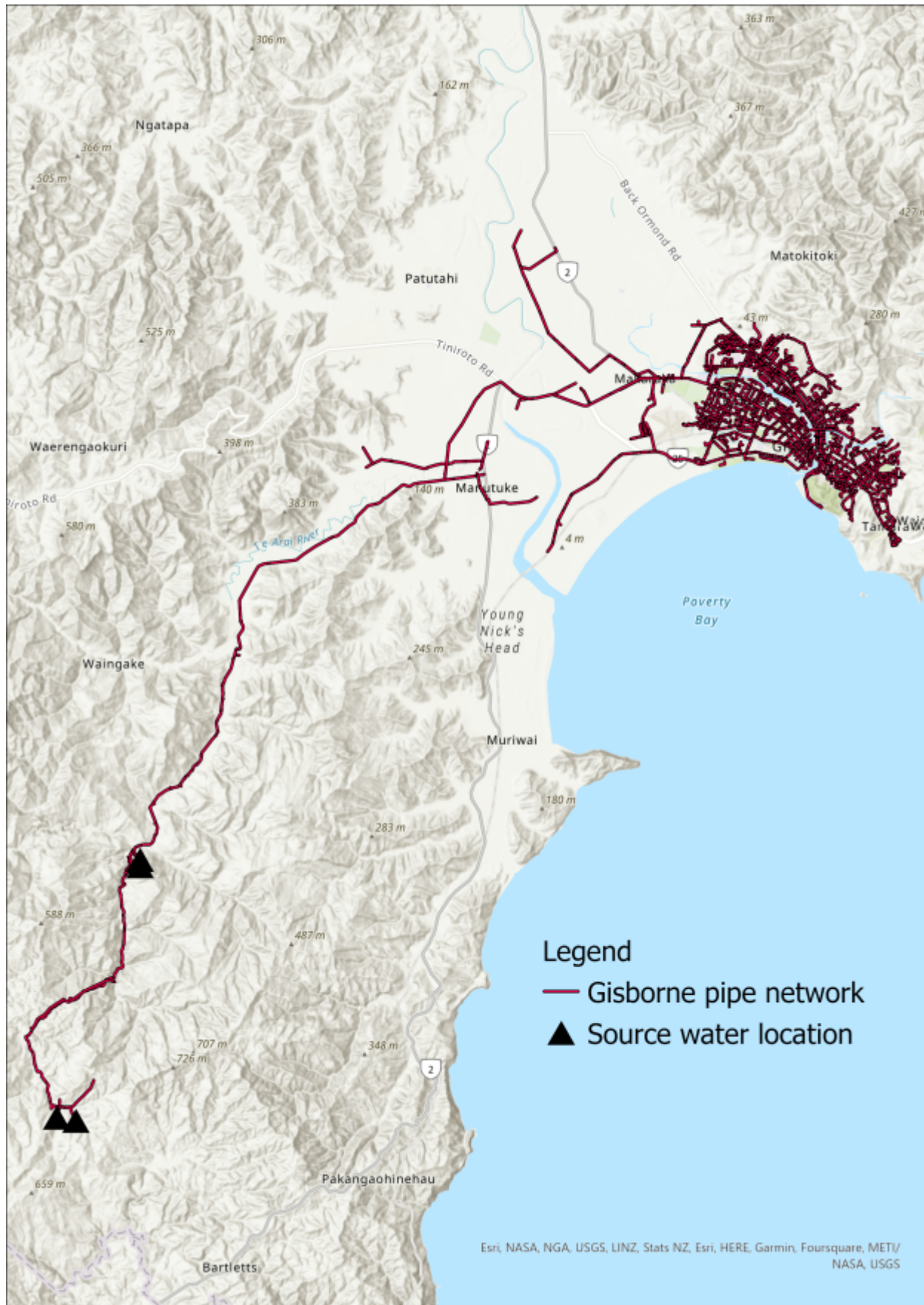


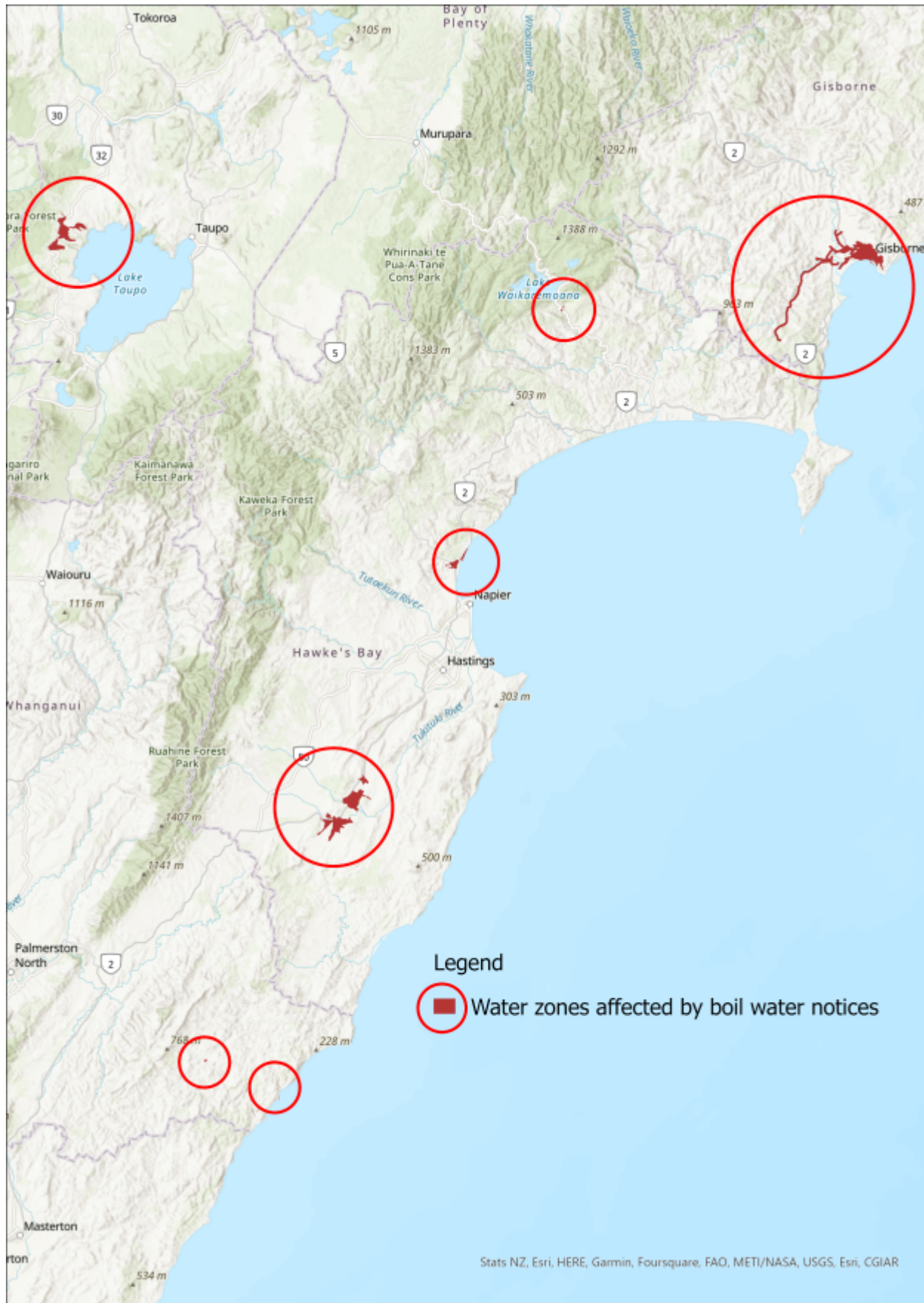
Figure 1: Water supply and distribution piping network for Gisborne

Napier had only ten hours of drinking water left after Cyclone Gabrielle hit the Hawke's Bay region cutting power to the city's bore sites. However, generators were connected to the

[bores within 14 hours](#).⁶

Auckland's Watercare, responsible for water services in Auckland, estimates the rebuild cost for its infrastructure following Cyclone Gabrielle and a preceding flood event [could reach up to \\$460m](#).⁷

Water infrastructure damage in the North Island resulted in at least eight boil water notices, lasting an average of 19 days (ranging from five to 45 days for the seven notices with complete data). Figure 2 provides an overview of the distribution of those boil water notices affecting 10 different water distribution zones. In total 43,700 people were affected, 47% (n=20,400) were Māori and 57% (n=24,748) were people living in the most deprived areas (by decile). Further details are in [the Appendix](#).



Damage to wastewater infrastructure

Napier City Council's wastewater plant at Awatoto was inundated with floodwater and silt. Raw sewage has been [pumped into the sea](#) since 14 February because of the damage to the plant.⁸

Wastewater plants were impacted in other affected areas such as Dannevirke where [the plant was "overwhelmed"](#)⁹ and Wairoa where floodwaters were treated as contaminated due to [wastewater system overload](#).¹⁰

In Auckland, Watercare reported that 38 of the 500 wastewater pump stations (8%) were overflowing on 14 February. On 2 March, Watercare reported 12 locations in north Auckland with active overflows.¹¹

In the Northland region, [Kaipara District Council estimated](#) that wastewater treatment plants needed nearly \$2m of repair work, and a further \$2.55m was needed for repairs to stormwater infrastructure.¹²

Human health and welfare impacts of these disruptions

The toll on people's mental health from storm-fuelled flooding is well-documented and expected to worsen with more frequent climate change-charged weather events.¹³ Health outcomes are worse for communities already facing structural disadvantage.¹⁴ Inability to access safe drinking water can be another stress on already fatigued, flood-weary communities.

While we found no reports of increased infectious disease that could be attributed specifically to damage to water or sewerage infrastructure – this is a topic that is worthy of further research by authorities.

Lessons from storm-induced water infrastructure damage

Given the extent of the reported damage and disruption, it is clear that NZ needs to develop greater resiliency in its water infrastructure. The NZ Government's own water infrastructure reform work noted challenges include ageing infrastructure, historical under-investment and climate resilience.¹⁵

The May 2023 Budget recognised this, with a promised \$71 billion investment in infrastructure over the next five years¹⁶ – though not all of this will go to water infrastructure. Nevertheless, \$71 billion is only a third of the Treasury estimate of \$210 billion needed for all NZ's neglected infrastructure to be appropriately upgraded.¹⁷ For Three Waters assets alone, an estimated \$120 to \$185 billion of investment will be needed over the next 30 years to replace and refurbish existing infrastructure to meet drinking water and environmental standards.¹⁸

As well as upgrades to water infrastructure, there is a need for consideration of building household-level resiliency in localities that are the most vulnerable to climate disruption and other hazards. This could include more central and local government support for:

- Roof-collected water and storage tanks (also useful for drought periods);
- Solar-powered home electricity with battery storage, to allow boiling of water;
- Electric vehicles – since some recent models can be used to supply electricity to houses in emergencies for boiling water etc (even running a whole house for several days on a battery that is fully charged).

In summary, Cyclone Gabrielle has provided additional lessons on how the country has neglected building resiliency into its water infrastructure. More work is needed to establish a clear picture of the vulnerability of water infrastructure, and both central and local government need to invest far more in upgrading such infrastructure if it is to provide the most essential of public health needs under intensifying climate disruption.

What is new in this Briefing?

- Water infrastructure providing essential drinking water and sewage disposal to New Zealanders proved not to be resilient in many regions hit by Cyclone Gabrielle.
- Around half of those impacted by the loss of safe drinking water (requiring boiled water notices) were Māori and over half were in the highest deprivation bracket.
- We identified millions of dollars of estimated repairs to this water infrastructure being required in multiple locations.

Implications for public health and policy

- Planning and further investment are needed if NZ is to provide the most essential of public health needs, reliable water infrastructure, in the face of climate change.
- Work also needs to be done to also build household-level resilience, especially in vulnerable areas.
- Further research is needed on the health and wellbeing impacts of major climate change fuelled weather events, including infectious diseases arising from disruption and damage to water infrastructure.

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Appendix

Stormwater

In this preliminary work, we have not covered damage to or resilience of stormwater in much detail, the network of drains and pipes that transport rainwater through urban landscapes. Stormwater failures are more broad and more difficult to define through the reporting on Cyclone Gabrielle. We do note however, that inadequate stormwater systems increase pressure on wastewater infrastructure and worsen damage from extreme weather events, and that it is widely acknowledged that stormwater systems failed to cope with the extremes of Cyclone Gabrielle.

Additional specific details on places requiring boil water notices

In the Tararua District, rural settlements of Ākitio and Pongaroa had a boil water notice for 11 and nine days respectively. Twenty percent of the population in Central Hawke's Bay covering Waipukurau and Waipawa were boiling their water from 10-26 days. In the Taupo district the Waihaha Rural Area was on notice for five days. Further north in the Hawke's Bay, boil water notices were only lifted for Whirinaki/Esk on 6 April, more than seven weeks after the cyclone hit. There were short-lived boil water notices in Gisborne and Wairoa, although those in the Tuai water scheme area continue to boil water. These boil water notices, established from media coverage, were confirmed by Taumata Arowai which legally must be informed when boil water notices are issued by local government.

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