NAPIER
CITY COUNCIL
Te Kaunihera o Ahuriri

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ORDINARY MEETING OF COUNCIL

Open Attachments (Under separate cover 1)

Meeting Date:	Thursday 31 July 2025
Time:	9.30am
Venue:	Large Exhibition Hall War Memorial Centre Marine Parade Napier

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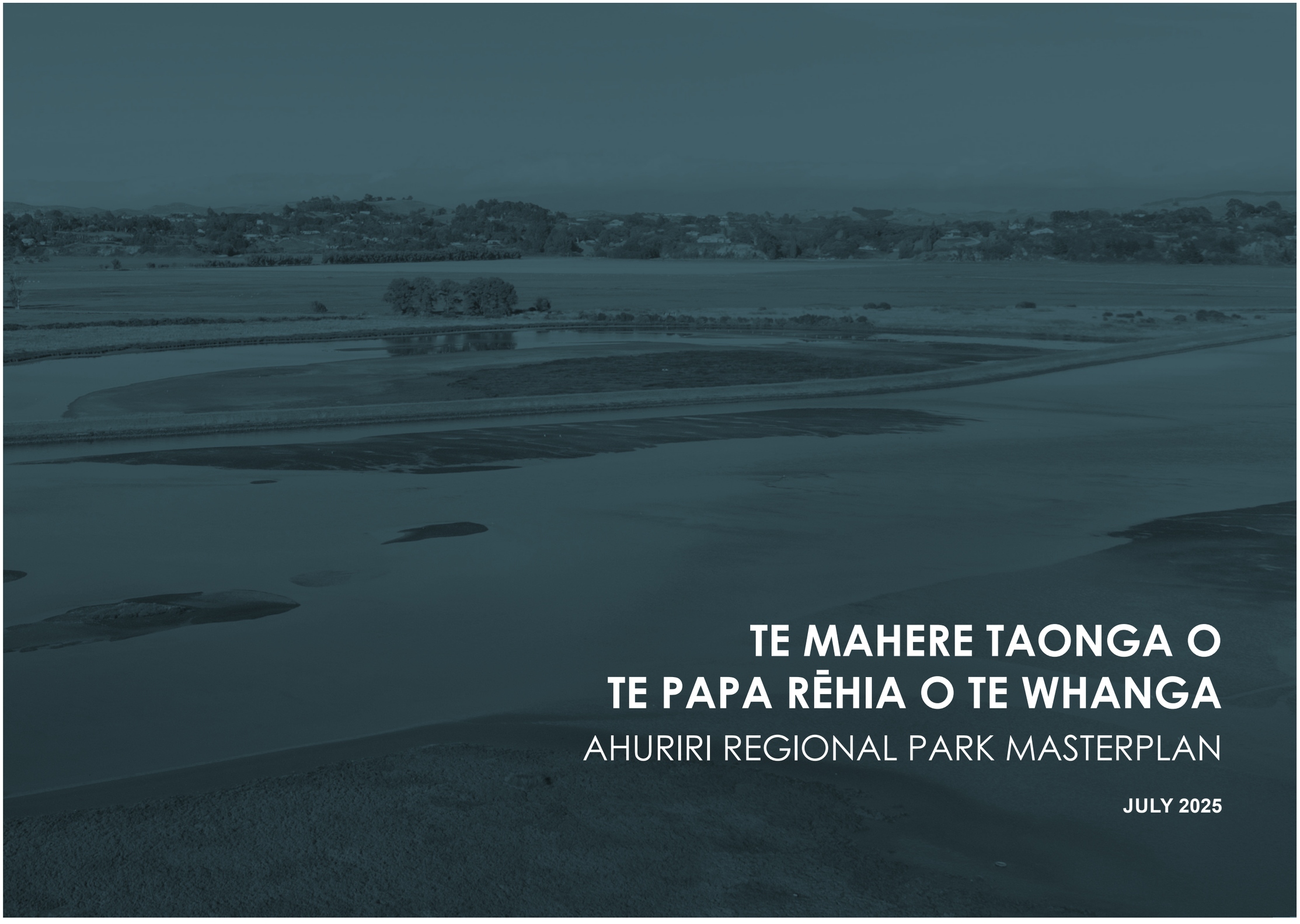
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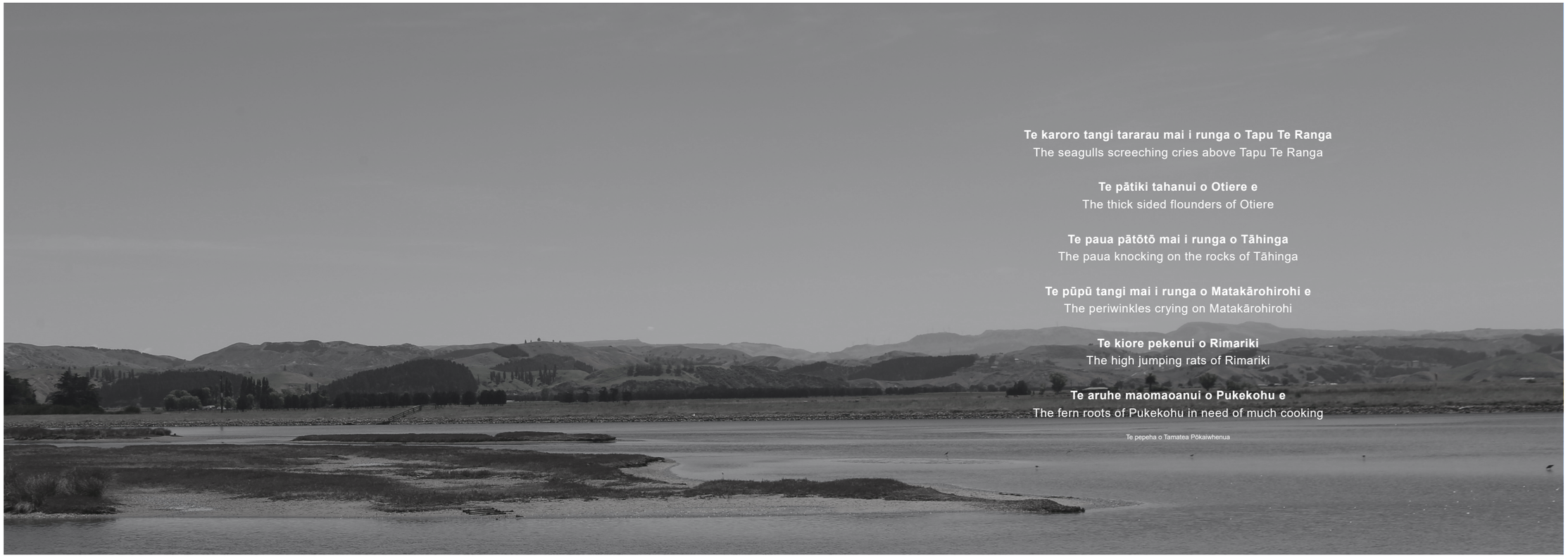
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TE MAHERE TAONGA O TE PAPA RĒHIA O TE WHANGA

AHURIRI REGIONAL PARK MASTERPLAN

JULY 2025


Te karoro tangi tararau mai i runga o Tapu Te Ranga
The seagulls screeching cries above Tapu Te Ranga
Te pātiki tahanui o Otiere e
The thick sided flounders of Otiere
Te paua pātōtō mai i runga o Tāhinga
The paua knocking on the rocks of Tāhinga
Te pūpū tangi mai i runga o Matakārohirohi e
The periwinkles crying on Matakārohirohi
Te kiore pekenui o Rimariki
The high jumping rats of Rimariki
Te aruhe maomaoanui o Pukekohu e
The fern roots of Pukekohu in need of much cooking
Te pepeha o Tamatea Pōkaiwhenua

DOCUMENT QUALITY ASSURANCE

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Report by Boffa Miskell Limited for AHURIRI REGIONAL PARK JOINT COMMITTEE.

JOINT COMMITTEE MEMBERS:	(Chair) - Deputy Mayor Annette Brosnan (NCC), (Deputy Chair) Joseph Reti (MAT) Councillor Hinewai Ormsby (HBRC),Councillor Chad Tareha (NCC), Councillor Hayley Browne (NCC), Councillor Keith Price (NCC), Councillor Martin Williams (HBRC), Mōrehu Te Tomo (MAT), Peter Eden (MAT), Evelyn Ratima (MAT), Harlem-Cruz Ihaia (MAT), Chad Tareha (MAT)
PROJECT MANAGEMENT TEAM:	Connie Whelan-Mills (NCC), Cam Drury (Stradegy), Greig Wilson (Beca), Anthony Rewcastle (NCC)
BOFFA MISKELL CONSULTANT TEAM:	Rebecca Ryder (PM), Gabe Ross, William Hatton, Ella Wood, Alexandra Rooney, Hamish Cochrane, Summer Young, Mark Lewis, Marc Baily, Boyden Evans, Anne Cunningham, Bruna Facioli
TECHNICAL ADVISORY GROUP	Bart Leslie (HBRC), Johan Kirsten (HBRC), Gareth Boyt (MAT), Parris Greening (MAT), Nick Flack (HBRA), James Feary (HBRC), Jess Soutar-Barron (NCC), Tipene Cottrell (MAT), Shade Smith (MAT), Fleur Lincoln (NCC), Syed Andrabi (NCC), Becky Shanahan (HBRC), Tiana Edwards (MAT), Lizzie Civil (PDP), Byron Munro (Tonkin & Taylor)
KEY STAKEHOLDERS AND COMMUNITY GROUPS	Department of Conservation, Hawke's Bay Regional Airport, Ahuriri Estuary Protection Society
REVIEWED BY:	Rebecca Ryder Gabe Ross
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Cover photograph: Te Whanganui-ā-Orotū, Boffa Miskell, 2024



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Whakarāpopoto | Executive Summary

The Napier City Council (NCC), Hawke's Bay Regional Council (HBRC), and Mana Ahuriri Trust (MAT) have come together as a Joint Committee (JC) to develop the Ahuriri Regional Park—a collaborative co-governance initiative dedicated to restoring the health and wellbeing of Te Whanganui-ā-Orotū (Ahuriri Estuary).

The NCC-owned 284-hectare Lagoon Farm site is of particular cultural and environmental significance to Ahuriri Hapū. Historically, it formed part of the southern edge of Te Whanganui-ā-Orotū. Tidal sand and mudflat habitats once intertwined with streams flowing into the harbour, creating a rich mahinga kai resource for local Hapū and early colonial settlers. The 1931 Napier earthquake uplifted large sections of the estuary by approximately two metres, transforming tidal wetlands into dry land. Lagoon Farm was subsequently drained and converted to farmland, bounded by the Taipō and Pūrimu Streams to the west and east, and the main Ahuriri channel to the north. Although greatly diminished, the remaining estuary retains significant cultural, ecological, and environmental value.

Today, Te Whanganui-ā-Orotū remains a valued area for recreation, biodiversity, and ecological importance. It supports diverse native and migratory bird species and serves as a nursery for ocean-going aquatic life. However, the estuary is in a degraded and unhealthy state due to cumulative environmental pressures. Untreated stormwater from urban and industrial areas carries pollutants into the estuary, resulting in a long-term build-up of harmful chemicals in the mudflats. Occasional sewage discharges, chemical spills, and oil leaks from vessels further compromise water quality and wildlife health. Shellfish gathering is frequently prohibited after rainfall due to contamination risks.

In response, the project partners have developed a proposed Ahuriri Regional Park masterplan that places water quality, environmental restoration, and biodiversity at its core. This plan provides the blueprint for future landuse programmes and facilites designed for flexible, staged implementation as funding and development partners becomes available.

Components of the plan will be subject to further design development, technical studies, consenting and where needed business case reviews. This will ensure they can be delivered in an ecologically and economically sustainable manner that meet the project goals and address key operational risks including managing bird strike risk for airport operations.

Key initiatives include:

- Construction of a 100-hectare treatment wetland at Lagoon Farm to intercept and filter the first flush of stormwater from urban catchments such as the Pūrimu before it reaches the estuary.
- Large-scale revegetation with native forest, shrubland, and wetland ecosystems to support future mahinga kai practices.
- Integration of cultural values, stories, and histories throughout the park.
- Development of recreational pathways and park facilities.
- Exploration of future partnerships for the development of public and complementary commercial facilities.

This masterplan report documents the site's history, context, and the process that informed its development. It reflects a collaborative journey involving the Joint Committee, Napier City Council staff, and the Technical Advisory Group (TAG)—a team of experts in subjects such as ecology, mātauranga Māori, flood protection, avifauna, parks, and planning.

Mana Ahuriri members and other key stakeholders, including the Department of Conservation, Hawke's Bay Regional Airport, and the Ahuriri Estuary Protection Society, have contributed valuable input. Community feedback gathered through public engagement has also informed the plan.

The design team extends its gratitude to all contributors for their wisdom and energy. We look forward to seeing the masterplan and Lagoon Farm treatment wetland project contribute positively to the health and wellbeing of Te Whanganui-ā-Orotū, the local community, and the rich biodiversity we share this landscape with.

Ngā mihi nui.

July 2025



From left: NCC Deputy Mayor Annette Brosnan, MAT Trustee Tania Eden, Clr Keith Price, ARP Founding Committee Member Maree Brown, HBRC Clr Neil Kirton, ARP Founding Committee Member Allana Hiha, HBRC Chair Hinewai Orsmby.

Whakarāpopoto | Executive Summary



Annette Brosnan,
NCC Deputy Mayor

It has been an honour to help guide the development of the Ahuriri Regional Park Masterplan on behalf of Napier City, alongside Mana Ahuriri and the Hawke's Bay Regional Council.

For me, this project speaks to the heart of who we are as Napierite's and Kiwis, our love of open space, our deep connection to nature, and our shared responsibility to leave our environment better than we found it.

Ahuriri Regional Park is a once-in-a-generation opportunity to transform a patch of land, destined for industrial use, into a thriving green space with environmental purpose — right alongside our treasured estuary. It's bold, it's forward-thinking, and it's exactly the kind of step our city needs to take if we're serious about climate resilience, biodiversity, and community wellbeing.

As a mum, and as someone deeply invested in Napier's future, I've often thought about what kind of spaces we'll leave for our kids and their kids. This masterplan is part of that answer. It's about creating a community led legacy of clean, green public space, where our city cares about its impact so that people and nature can thrive side by side.

I'm incredibly proud of this masterplan, which not only restores and protects but also champions innovative stormwater management and biodiversity initiatives that will ripple throughout our city over time, enriching our environment, resilience, and quality of life for generations to come.



Hinewai Ormsby,
Chair HBRC

It has been a true privilege to contribute to the development of the Ahuriri Masterplan on behalf of the Hawke's Bay Regional Council, in partnership with Mana Ahuriri and Napier City Council. This has been a deeply collaborative journey—bringing together passionate voices from across our community, including key stakeholders who hold a deep aroha for the Ahuriri environment and the wellbeing of Te Whanganui a Orotū.

Together, we are laying the foundations for a transformational land change—one that restores and enhances our biodiversity, revitalises ecosystem health, improves water quality, and strengthens the connection between people and place.



Joseph Reti,
Mana Ahuriri Trust

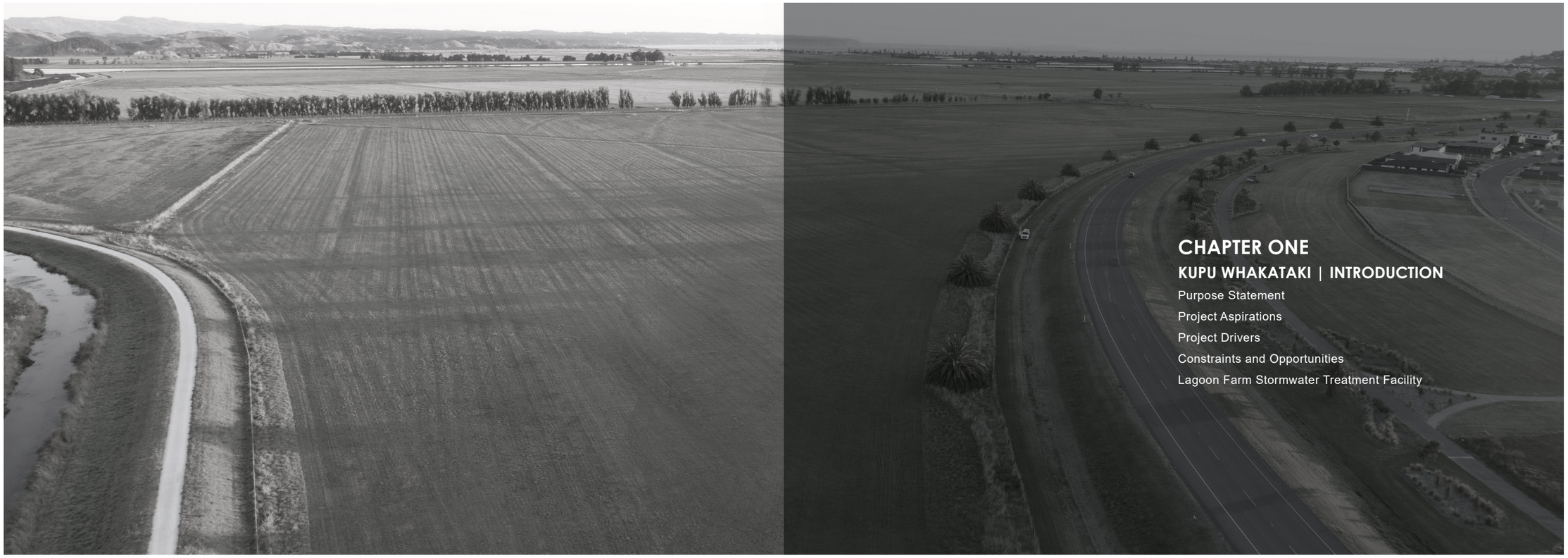
"He kāinga o te Ata, he kāinga ka Awatea, he kāinga ka Ahiahi e tama e – a place to eat in the morning, a place to eat at noon, a place to eat in the evening"; Te Whatu.

As our tūpuna wahine Te Whatu expressed, Te Whanganui-a-Orotu was a place of abundant and rich resources, which once fed and sustained the multitudes of people for generations. It is a taonga and site of great significance for us all, not only culturally but environmentally. Following the 1931 earthquake, Te Whanganui-a-Orotu was changed forever where what remained, were the memories and stories of this once thriving Whanga.

This kaupapa has allowed us to be apart in shaping the future of our rohe, our takiwā; where the stories, memories and our unique identity can thrive for years to come. It has allowed us to restore our kaitiakitanga whilst expressing manaakitanga and whanaungatanga on this meaningful journey.

Te Wai Ora, Te Taiao ora is an expression in which the mauri and mana of our lands, our waters and resources are restored, protected, and enhanced for future generations. This is more than a masterplan; it is a journey in reviving the footprints of our tūpuna.





CHAPTER ONE

KUPU WHAKATAKI | INTRODUCTION

Purpose Statement

Project Aspirations

Project Drivers

Constraints and Opportunities

Lagoon Farm Stormwater Treatment Facility

Te Pūtake | Purpose

The Napier City Council (NCC), Hawke's Bay Regional Council (HBRC), and Mana Ahuriri Trust (MAT) have partnered on the Ahuriri Regional Park project in a manner that works towards restoring the health and wellbeing of Te Whanganui-ā-Orotū (Ahuriri Estuary) through co-governance.

The vision for Ahuriri Regional Park begins with a key goal: improving the health of Te Whanganui-ā-Orotū by cleansing stormwater as it flows through the park into the estuary. This foundation supports a range of wider co-benefits, including the restoration of native lowland forests, shrublands, and wetlands; enhanced biodiversity and mahinga kai values; and greater climate resilience. The park will also provide opportunities for low-impact recreation, cultural storytelling, environmental education, and complementary commercial and community facilities. This is a long-term, adaptable vision shaped to meet the needs of our community—now and for future generations.

Through the Treaty Settlement processes, Te Komiti Muriwai o Te Whanga – whose purpose is to provide guidance and the protection and enhancement of the environmental, economic, social, spiritual, historical and cultural values of Te Whanganui-a-Orotū; these works look to establish processes to collaborate on actions to restore the mauri of the Ahuriri Estuary through planning and design with tangata whenua – Mana Ahuriri Trust, Ahuriri hapū; Napier City Council and key stakeholders.

Image at right: The Taipō Stream is a key freshwater tributary in the Ahuriri catchment, flowing through Napier's urban landscape before entering the estuarine environment of Te Whanganui-ā-Orotū (Ahuriri Estuary). Historically, it was part of a complex network of waterways that supported rich wetland ecosystems and mahinga kai for local Hapū. Today, the stream has a key role in stormwater drainage and while degraded by urban runoff and pollutants retains high ecological and cultural values.

...Ahuriri Regional Park is a long-term vision to restore the health of Te Whanganui-ā-Orotū by cleansing stormwater, revitalising native ecosystems and mahinga kai, and creating space for nature, recreation, culture, learning, and community to thrive...



Ngā Wawata | Aspirations

As part of the Joint Committees aspirations and the aspirations of Mana Ahuriri, the following highlights key aspirations envisioned for the Ahuriri Regional Park.



Ngā Urungi | Project Drivers



STORMWATER

Increase the resilience of the City's stormwater infrastructure network by maintaining and enhancing attenuation on the site as part of a series of initiatives to reduce the impacts of rainfall events on the urban areas of Napier.



WATER QUALITY

Improve the quality of water discharged from the City's urban waterways noting these form part of the municipal stormwater network.



MAURI

To return the mauri back to Te Whanganui-ā-Orotū, enhance and preserve mahinga kai and improve harmony with Papatūānuku.



ECOLOGICAL EXCELLENCE

Promote the re-establishment of native habitat values throughout the site and its interface with Te Whanganui-ā-Orotū and the Taipō Stream.



NATURAL ENVIRONMENT

To maintain a predominantly natural environment.



SIGNIFICANT INFRASTRUCTURE

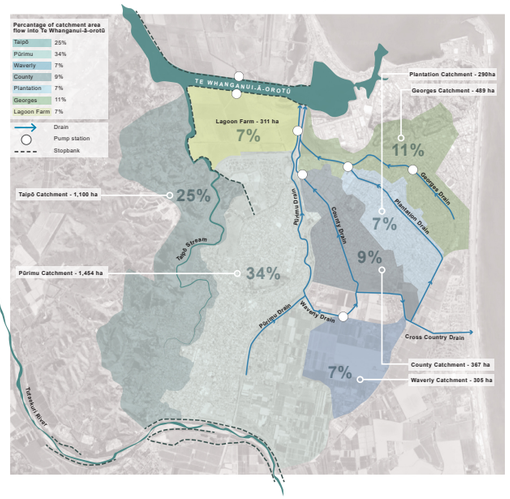
Recognise the functional need of regionally significant infrastructure.

Constraints and Opportunities

KEY DRIVERS	EXISTING SITE CONDITIONS	CONSTRAINTS	OPPORTUNITIES	CONCERNS
AHURIRI HAPŪ IDENTITY STORYTELLING & INTERPRETATION	Very little signage and storytelling of site and local hapū identity. No physical cultural expression of Ahuriri hapū. Strong wider cultural landscape connections (physical manifestation – maunga, awa, moana), no signage/ interpretation.	Access and maintenance of Ahuriri hapū identity and connection to site – Te Whanganui-ā-Orotū is limited. Protection of significant cultural expression (mahi toi). Ahuriri hapū capacity – how do we support hapū kaitiakitanga?	Ensuring safe and inclusive access to Ahuriri hapū ensuring mana rangatiratanga. Expressing pūrākau through various mediums of design and nature (mahi toi, mahinga kai, rongoā). Letting Ahuriri hapū tell their stories (what is public and private – tapu/noa) – ecotourism, cultural hub. Create a gateway experience into Napier and Hawke's Bay – utilise the four corners of site (Ngā Kokona o Te Whare | Te Whanga).	Some of the narratives told are incorrect so need to be carefully worked through with Mana Ahuriri whanui. Interpretation protocols – council are currently working with hapū to develop strategies for interpretation. There are pūrākau and taonga which are tapu, ensuring interpretation and storytelling is tika (some existing interpretation is incorrect).
ECOLOGIES, HABITATS & WATER QUALITY	Much of the internal landscape is grazed farmland. Along perimeter (outside of boundary) strong ecological corridors – Te Whanga + DOC reserve (north), Taiapō Stream Corridor (west), Pūrimu (East). Patches of raupo, wetland revegetation (Taiapō Stream), marshland beyond southern boundary (Prebensen Drive). Channels and drains/outfalls have little ecological character – poor water-quality. All existing trees are exotic, no native species within site. Strong aquatic and bird corridors.	Area prone to flooding. Airport Control Zone – a critical requirement is to design habitat and ecologies and land management practices in the park to avoid increasing (and ideally decrease) attraction of bird species that pose a high risk to airport operation through bird strike on aircraft. Streams are currently impacted by tubeworm, ensuring any works with regards to daylighting/wetland restoration is carefully considered. Bringing aquatic habitat into site – risks associated to breaking banks.	Restoring a mosaic/patchwork of various ecologies and habitat – wetlands (swamp, estuarine etc.), marshes, raupo reed lands, flax-lands, forest etc. Careful consideration of restoring native fauna habitat – eg. bird sanctuary, tuna, pātiki, inanga, etc. Restoring traditional harvest (mahinga kai) – rongoā, pā harakeke, parau, pā rauemi, etc. for cultivating and economy. Water treatment enhancement – stormwater control systems from streams (flood gates and other mechanisms). Ensuring stormwater is treated before entering Te Whanga. Mauri monitoring and instilling mātauranga a hapū regarding health of taiao, wai and whenua.	Tubeworm – further R+D to be undertaken with regards to controlling tubeworm spread into future water quality networks/systems. Ecological corridors are designed carefully.
ACCESS & CIRCULATION (PEDESTRIAN + CYCLING)	Current pathway network forms around perimeter – approx. 6km from Taiapō entrance (Prebensen Drive) around to Shed Road Main users are cyclists. Wider connections with Ahuriri and beyond.	Current extents tend to be too long for casual walking and activity. Very limited pause moments along network to engage learning and interactive opportunities. Little visual connection to Te Whanganui-a-Orotū (main pathway is behind stop banks – some key pause moments revealed); strong visual connection with Taiapō Stream. No physical interaction with 'wai'. Current network lacks inclusive access.	Establish a network of pathways that provide for varying fitness and abilities – establish smaller networks for all whānau to enjoy and that are user-friendly. Creating different experiential journeys and trails of interest – how might we tell the stories associated to place (wayfinding and interpretation). Other means of movement and circulation – waka, canoeing/kayaking. Connect to 'wai' – creating moments to pause and connect to Te Whanganui-a-Orotū.	Safety – no safe access from outer edges of site back towards populated areas. Also, main length of pathway along Te Whanga edge is located behind stop banks no strong visual connection. Over-design for trails – ensuring there is a balance, do we want areas which are private vs public (tapu + noa). Users – concerns around dog-walkers impacting ecological networks/habitats.
ACCESS & CIRCULATION (VEHICULAR + COMMERCIAL)	Strong lineal road networks across site: Poraiti Lane + Barn Road (east-west), Long Road North + Shed Road (north-south). Road networks are private use for farm (except small portion of Shed Road), road is gravel. No wider road circulation network. Close proximity to SH2 and key arterial routes from Taradale, Tamatea to Napier, Ahuriri and beyond.	Road allows for no public access, limit public interaction and accessibility/inclusivity. One entry into site, no sense of arrival. Potential risks to flooding.	Create a gateway experience into Ahuriri Regional Park. Enable vehicular movement into site – set protocols regarding circulation, public vs private. Enable safe and inclusive access into site opening up to wider users. Future connection from SH2. Future railway or public extension/connections – opportunities to restore public/private transportation (inland port, textile industry, cultural precinct, connections to town centre and wider region, etc.)	Over-design for roading and infrastructure – ensuring there is a balance, do we want areas which are private vs public (tapu + noa), undertake a 'light touch' approach. Opening park to vehicles will that diminish the mauri and experiential qualities? Establish strategy for circulation. Runoff from roads – ensuring there are treatment devices in place to treat runoff before entering Te Whanga.

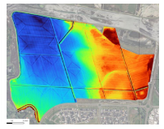
Lagoon Farm Stormwater Treatment Facility

Stormwater Treatment Wetlands – A Key Feature of the Masterplan





Above: Modelling of 1:100 year flood event



Above: Ground surface elevation map



Above: Extents of area suitable for wetland development

Design Context

Lagoon Farm sits at the bottom of a large predominately urban catchment of approximately 4,300Ha. Of this the Pūrimu comprises 34% of the land area.

To meet the water quality requirements of existing stormwater discharge consents and to improve the overall resilience of the stormwater network, a large-scale wetland system has been proposed as part of the masterplan. This system will treat urban stormwater before it reaches Te Whanganui-a-Orotū using natural wetland plants and processes to filter out contaminants. Due to the low laying nature of Napier, a pump system is still required between the Pūrimu and estuary

Whats the problem?

Like many urban catchments, the stormwater moving though the Pūrimu channel contains a wide range of pollutants including heavy metals, excess nutrients, E.coli and Faecal Coliforms. This is worse during storms when higher concentrations are flushed into the system.

These pollutants harm estuary ecosystems by reducing water quality, depleting oxygen, and making it unsafe for wildlife and people—leading to sick fish, unsafe shellfish, and fewer birds and plants.

Why Wetlands?

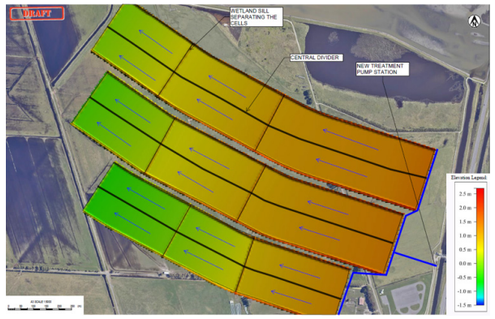
Wetlands are most effective at treating the "first flush" — the initial runoff from frequent, smaller storms, which carries the highest levels of pollutants.

Larger, less frequent storms, which are more diluted, bypass the wetland system to avoid overloading it and to reduce maintenance from sediment build-up.

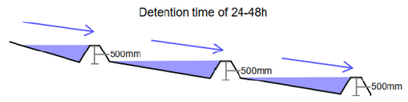
Strategic Location

Due to high groundwater and challenging soil conditions across Lagoon Farm, the wetlands are located on the highest part of the site. This allows water to flow through the system using gravity, reducing the need for energy-intensive pumping.

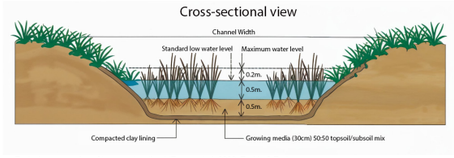
This location also sits beneath the airport flight path, so the design must carefully consider bird strike risks through ensuring no open water is provided and the environment around the wetlands and wider park discourages problem bird species.



Above: Preferred option for Lagoon Farm treatment wetlands. NCC , Tonkin & Taylor



Above: Schematic Long Section through wetland cell. Tonkin & Taylor



Above: Typical cross section of treatment wetland (Tanner et al. 2020. Tonkin & Taylor





Right: Sparks Road wetland planting detail and aerial view, Christchurch City Council

Design Overview

- Size: Approx. 106 hectares of treatment wetlands
- Structure: Three parallel bays, each with three treatment cells, separated by sills and dividers to control water flow and depth.
- Depth: Up to 500 mm at the western end of each cell.
- Flow: A new lift pump station will direct water into the wetlands via open channels or gravity pipes. Water will then flow through planted cells and exit into the existing drainage system.

Staged Implementation

The wetlands will be built in stages, likely starting with the central bay. This allows the system to be expanded to accommodate increased stormwater volumes over time.

Catchment Coverage

Once complete, the wetlands will treat stormwater from all catchments discharging to Te Whanganui-a-Orotū via the Westshore Tidal Gates (Taipō and Pandora have separate discharge points). The system is designed to treat 15–20 mm of rainfall per event — capturing 70–80% of storm events, and up to 90% of daily rainfall events in the Pūrimu Catchment.

Management and Maintenance

Wildlife monitoring and maintenance will be a critical element of the project. This will include a bird strike risk assessment and management plan that will set out how avoid increasing bird strike risk to airport operations during construction and operation of the wetlands. Key requirements will include waterfowl control/exclusion especially during plant establishment until 100% of the wetland surface is covered with vegetation.

Additional considerations will include:

- Vegetation and weed control (e.g. willows).
- Maintaining sufficient water movement in the system to keep the wetlands wet during the summer period.
- Managing surrounding vegetation to avoid creating open grass areas attractive to geese and other high risk bird species.

Other Benefits

Interweaving public access treatment wetlands can provide valuable open space and recreational opportunities for the local residents and visitors.

Incorporating diversity both in the wetland species and in the areas surround the wetlands will enhance habitat values for native land and water invertebrates, and reptiles. A densely planted wetland landscape will also deter waterfowl species that prefer the visibility afforded by open water and pasture land.



CHAPTER TWO

HOROPAKI | CONTEXT

Te Whanganui-ā-Orotū | Mana Ahuriri

Tātari Whenua: Analysis

Hawke's Bay Regional Parks

Napier City Parks

Napier City Council Plans



Te Whanganui-ā-Orotū | Mana Ahuriri

Ahuriri Hapū are based in and around Napier, in the Hawke's Bay region. The seven Ahuriri Hapū are: Ngāti Hinepare, Ngāti Māhu, Ngāti Matepū, Ngāti Pārau (which includes Ngāi Tahu Ahi), Ngāi Tāwhao, Ngāti Tū and Ngāi Te Ruruku.

Ahuriri Hapū have long maintained ahi kā roa in Ahuriri. Te Whanganui-ā-Orotu is a place of great significance to Ahuriri Hapū. It is central to their existence and identity. It is named after the ancestor Te Orotu, who was a descendant of the great explorer ancestor Māhu Tapoanui. Māhu Tapoanui is considered the very beginning of the Ahuriri people. Te Orotu's son, Whatumamoa, gave his name to Ngāti Whatumamoa, one of the earliest tribal groups that settled the Ahuriri district.

For Ahuriri Hapū, Te Whanganui-ā-Orotu has always held an elevated status, with its own mauri, wairua and spirituality. The importance of Te Whanganui-ā-Orotu as a mahinga kai is also celebrated by Ahuriri Hapū and is significant in their identity.

From the late 1830s onwards Ahuriri Māori had increasing contact with Europeans engaged in commercial activities such as whaling and trading.

By the late 1840s Ahuriri Hapū lived at settlements around Te Whanganui-ā-Orotu and the surrounding area, including pā and kāinga at Te Poraiti, Whareranga, Awatoto, Waitanoa, Kapemaihi and Pētane.

From 1851 The Crown took most of the rohe of Ahuriri Hapū and of great significance Te Whanganui-a-Orotu (1851 Ahuriri Purchase).

Treaty Settlement

The Deed of Settlement contains Crown acknowledgements of its acts and omissions that caused prejudice to Ahuriri Hapū and breached the Treaty of Waitangi and its principles.[1]

In the Deed of Settlement the Crown acknowledges that Te Whanganui-ā-Orotu and the islands in it were prized taonga of Ahuriri Hapū and remain valued today. The Crown also recognises the role of Ahuriri Hapū as Kaitiaki of Te Muriwai o Te Whanga (the Ahuriri Estuary and catchment areas).

The Crown also recognises the role of Ahuriri Hapū as Kaitiaki of Te Muriwai o Te Whanga (the Ahuriri Estuary and catchment areas). In recognition of this the settlement legislation will also establish a permanent statutory committee called Te Komiti Muriwai o Te Whanga. The purpose of the Komiti is to promote the protection and enhancement of the environmental, economic, social, spiritual, historical and cultural values of Te Muriwai o Te Whanga (Ahuriri Estuary) for present and future generations.

- Ngāti Hinepare
- Ngāti Māhu
- Ngāti Matepū
- Ngāti Pārau (which includes Ngāi Tahu Ahi)
- Ngāi Tāwhao
- Ngāti Tū

1 Ahuriri Hapū Deed of Settlement Summary



Post 1931 Earthquake History

The former landscape of Te Whanganui-ā-Orotū, the Napier inner harbour, was treasured for its rich sources of kaimoana and later became a valued place for recreation.

This expansive body of water, once dotted with islands, provided a continuous supply of shellfish, eels, and fish. Pā sites were located on the western hills and islands, reflecting the area's long history of occupation.

The harbour's shingle spits and beaches were shaped by gravels washed down from rivers, forming natural barriers that separated the former lagoon and estuary from the open ocean. European settlement later centred around Ahuriri, which offered deep-water anchorage and supported growing shipping trade.



AHURIRI LAGOON UPLIFT Horse mussels exposed after earthquake, 1931 (MTG Hawke's Bay)



PORT AHURIRI, NAPIER Industrial area and lagoon pre earthquake, 1910s (MTG Hawke's Bay)



AHURIRI RECLAMATION Drainage of lagoon of earthquake, 1936 (MTG Hawke's Bay)

Located approximately 3.4 km northeast of what is now Napier's CBD, Ahuriri Lagoon once spanned around 3,840 acres. In 1931, the 7.8 magnitude Napier earthquake uplifted the land, exposing approximately 2,230 hectares of seabed.

Today, only 289 hectares of the original lagoon remain, with Lagoon Farm forming part of this larger uplifted landform.

The historic landscape is still clearly visible—the patterns of the former lagoon are still show the subtle flow of mudflats and sandbanks reflected in the soils and growth patterns in the pasture. The flat terrain of the former lagoon contrasts sharply with the shoreline traced along the western edge of the site, where the Taipō Stream meets the base of the Poraiti Hills.

Drainage works completed over the past 90 years reclaimed and transformed the former lagoon bed into a mix of pastoral farming, industrial and housing developments which includes the Hawke's Bay Regional Airport to the north of the current lagoon channel.

A network of drains, stop banks, floodgates and pump stations maintain artificially low water levels on the site enabling agricultural use on otherwise poorly drained, flood prone areas.



Above: Taipō Stream

Tātari Whenua: Analysis

Broader Landscape Context

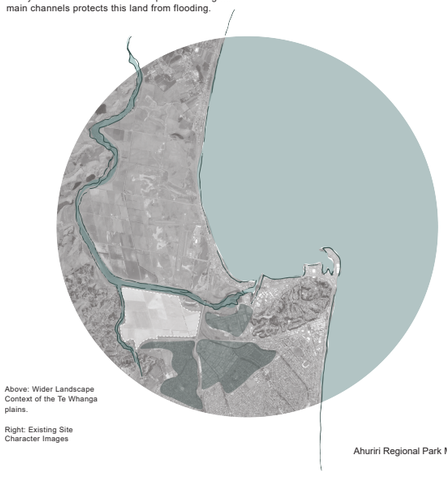
Located in the urban edge of Napier City the Ahuriri Regional Park site (also known as Lagoon Farm) forms a key opportunity for connection, a green gateway for the Napier City. Cradled by the Taipō stream to the west and Pūrimu stream to the east the main Ahuriri channel forms the northern boundary. The Hawke's Bay airport is located immediately north of the site with a key flight path bisecting the site north-south. Prebenson Drive forms the southern boundary and defines the current urban edge of the city.

To the west the Poraiti Hills from the backdrop to the wider Te Whanga plains. Like the Lagoon Farm site the land has been drained and converted to farmland over successive years post the 1931 earthquake. Today an extensive network of stop banks along the main channels protects this land from flooding.

The former islands Otiere, and Taputeranga remain as markers in the wider plains and have high cultural values as former settlement sites used by the local Hapū.

The uplifted bed to Te Whanga has evolved into low lying, poorly drained farmland with areas of high water tables reflected in a mosaic of wetlands throughout the wider plains. Immediately to the north east the site, the DOC managed South Marsh provides important bird habitat.

The Lagoon Farm cycleway provides public access around the periphery of the site while the estuary channel is tidally accessible by boats, kayak and waka.



Above: Wider Landscape Context of the Te Whanga plains.

Right: Existing Site Character Images













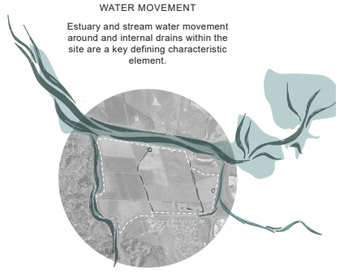




Site Elements and Qualities

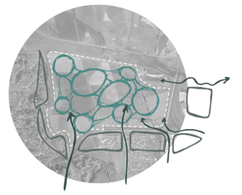
WATER MOVEMENT

Estuary and stream water movement around and internal drains within the site are a key defining characteristic element.



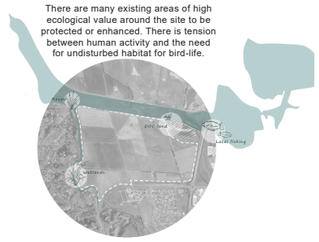
MOVEMENT + CONNECTIONS

Opportunities to improve connectivity to the adjacent areas and neighbourhoods. Given the large scale of the site there is potential for multiple internal circulation paths and activity zones.



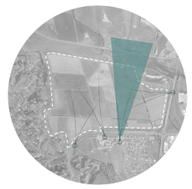
ECOLOGICAL SIGNIFICANCE

There are many existing areas of high ecological value around the site to be protected or enhanced. There is tension between human activity and the need for undisturbed habitat for bird-life.



AIRPORT AND VIEWS

The Airport control boundary and flight path bisects the site and forms a critical constraint in terms of noise and the need to avoid increasing bird strike risk to aircraft. Given the flat, wide, expanse of the site, the design should consider key views from the road boundaries.



HISTORIC PATTERNS AND SITES

Hidden within the modern landscape are the stories and landforms of the historic Te Whanganui-ā-Orotū land and seascape. This includes historic pā and kāinga sites, patterns of sand spits and estuary flow forms and the renowned shellfish beds of Te Whanganui-ā-Orotū.

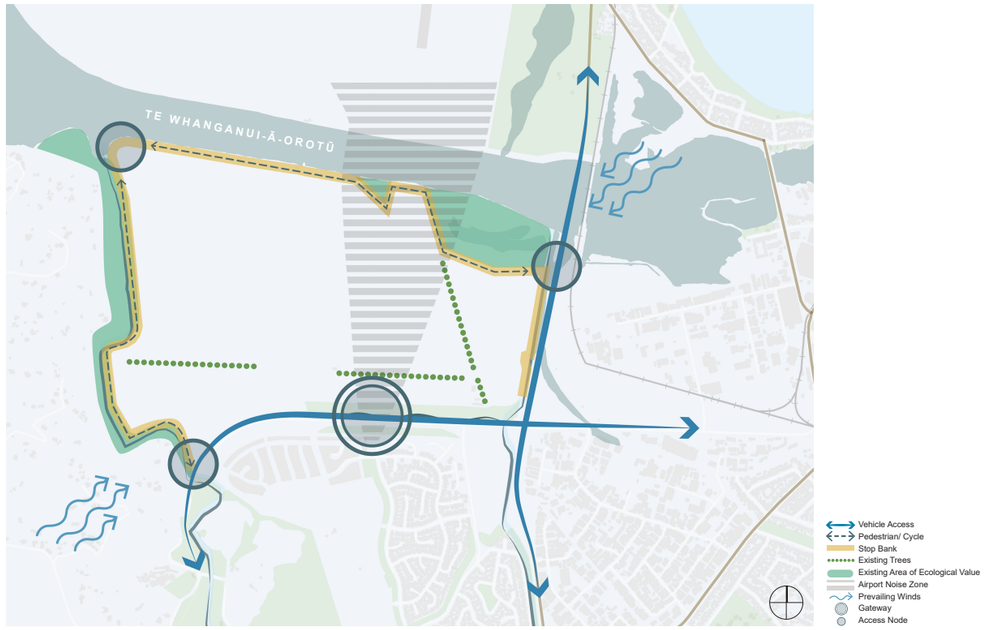


FLOOD ZONES

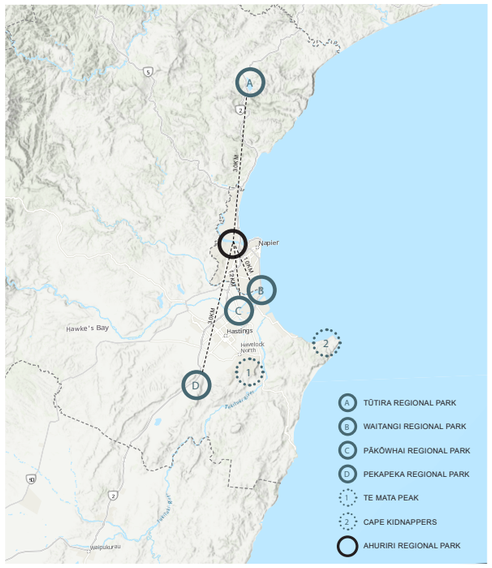
Low lying areas of the site lie below high tide water levels. The site provides storage for stormwater inflows from several urban catchments. Stopbanks protect the west and north sides of the site. Pumping maintains ground water levels at artificially low levels.



Tātari Whenua: Site Analysis Diagram



Hawke's Bay Regional Parks



Overview

Hawke's Bay Regional Council (HBRC) currently manages four significant Regional Parks, which provide a mix of cultural, environmental, economic, and recreational opportunities for both residents and visitors.

While not formally classified as Regional Parks, other important open spaces in the region—such as Te Mata o Rongokako (Te Mata Peak) and Cape Kidnappers—also hold high cultural and environmental value.

Through the Hawke's Bay Regional Park Network Plan, local councils have developed a strategic vision that highlights the role of parks in fostering healthy communities. These parks support active lifestyles and offer opportunities for people to connect with nature and learn about the environment.

Regional Parks serve a unique role, sitting between urban parks and conservation parks in terms of scale, accessibility, and purpose. HBRC's regional parks, for example, offer a range of conservation and restoration environments alongside recreation, with a focus on protecting values of regional significance. They attract visitors from across the region as well as from outside it.

In contrast, urban parks tend to cater to local communities, offering sports fields, playgrounds, reserves, and coastal areas within or near towns and cities. These often provide more developed facilities—such as toilets, changing rooms, formal gardens, and high-use infrastructure—designed for intensive local use.

At the other end of the spectrum are conservation parks and reserves, typically managed by the Department of Conservation. These spaces offer informal outdoor experiences like walking, tramping, mountain biking, picnicking, and camping in more natural and remote settings.

The proposed Ahuriri Regional Park is unique. While it aligns with the regional park network, its core focus is on delivering critical infrastructure—particularly stormwater management—alongside cultural, ecological, economic, and recreational benefits. Its location, close to Napier's urban centre and within a distinctive estuarine setting, positions it as a complementary yet different offering within the regional park system, providing a new kind of visitor and community experience.

Hawke's Bay Regional Parks










A. Tūtira Regional Park (464ha)

Nestled under steep, dramatic hills north of Napier is Tūtira Regional Park, bordering twin lakes. The park has an important function as a sustainable land use demonstration area and many of the trees were planted by school students, community groups, organisations, and HBRC staff volunteers. The park is a handy camping base for exploring Tūtira-Maungaharuru district's many adventure and recreation opportunities - Boundary Stream Mainland Island and Shine Falls, Lake Opouahi scenic reserve and kiwi crèche, Waipatiki Beach and scenic reserve, Tangoio Falls scenic reserve and White Pine Bush.

B. Waitangi Regional Park (300ha)

Along the coast between Awatoto and Haumoana, Waitangi is a haven for wildlife and sportspeople alike. The Park links a significant chain of river and coastal reserve areas which have ecological and biodiversity values. Resident and migratory bird species include white heron, royal spoonbill, godwits, and gannets. Seals often come inshore. Visitors are asked to take care stepping off tracks and trails or on the gravel banks as birds are roosting or nesting. The lower reaches of the rivers are popular for fishing, whitebaiting, rowing, waka ama, kayaking, jetboating, jetskiing and kite surfing. The Waitangi Estuary area was an early arrival site for both Māori and Europeans. On Waitangi Day (6 February) a popular festival on the Clive River features a re-enactment of the arrival of the first European settlers.

C. Pākōwhai Regional Park (22.3ha)

Pākōwhai is an attractive country-style park close to Hastings and an easy drive from Napier. Locally it is known as 'The Dog Park' as dogs are permitted off lead although under the control of their owners. The Raupere Stream flows through the park and is crossed by small bridges connecting the approximately two kilometres of easy paths. There are many specimen trees, a pine plantation and open grass areas making the park popular for walking and family outings.

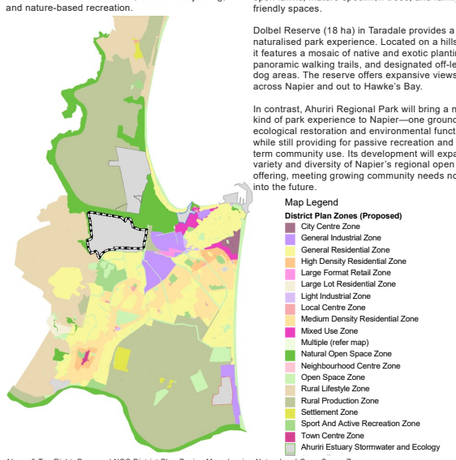
D. Pekapeka Regional Park (98ha)

Pekapeka is a great place to discover wetland wildlife. Some rare bird species, such as bittern, are found here. This 4.5km long and 800m wide wetland covers 98 hectares and has been the focus of a 17-year community biodiversity enhancement programme that still continues. Public access is to a small central area of the wetland where you can explore pathways and boardwalks, and walk up to the lookout for a panoramic view of the valley.

Napier City Parks

The proposed Ahuriri Regional Park occupies a strategically important location within the existing Napier City Council parks network and will represent a significant addition to the city's open space network. Unlike nearby parks such as Park Island, Anderson Park, and Dolbel Reserve, Ahuriri will offer a distinctive landscape character and focus—centred on stormwater treatment wetlands and large-scale ecological restoration.

This unique foundation will support a different suite of recreational opportunities and provide potential for future community facilities and amenities aligned with environmental education, cultural storytelling, and nature-based recreation.



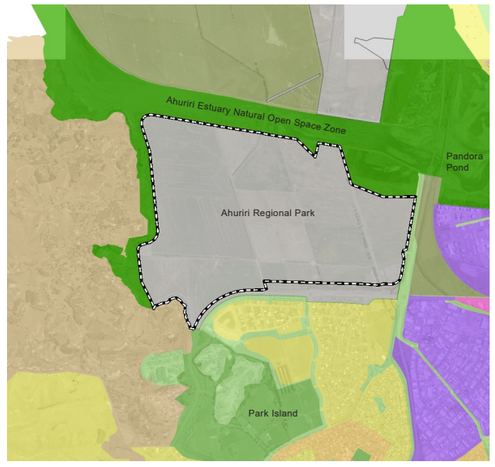
Above & Top Right: Proposed NCC District Plan Zoning Map showing Natural and Open Space Zones

Park Island (68 ha), located just south of the Ahuriri site, is Napier's premier sports and recreation hub. It offers extensive facilities for organised sports, including Bluewater Stadium, multi-code sports fields, fieldhouses, and changing pavilions. A network of trails also provides opportunities for walking and cycling throughout the park.

Anderson Park (36 ha) in Greenmeadows is a suburban destination park known for its diverse recreational offerings. These include an award-winning inclusive playground, disc golf, a skate park, model railway, and model boat pond, all set within open lawns, mature specimen trees, and family-friendly spaces.

Dolbel Reserve (18 ha) in Taradale provides a more naturalised park experience. Located on a hillside, it features a mosaic of native and exotic plantings, panoramic walking trails, and designated off-leash dog areas. The reserve offers expansive views across Napier and out to Hawke's Bay.

In contrast, Ahuriri Regional Park will bring a new kind of park experience to Napier—one grounded in ecological restoration and environmental function, while still providing for passive recreation and long-term community use. Its development will expand the variety and diversity of Napier's regional open space offering, meeting growing community needs now and into the future.





Above: Park Island Bluewater Stadium



Above: Anderson Park Play Space

Napier City Council Plans

Ahuriri Estuary and Coastal Edge Masterplan (2017)

The Ahuriri Estuary and Coastal Edge Masterplan aims to deliver on these broad principles for the estuary and adjacent coastal edge environment, presenting Napier City Council's vision for the estuary for inclusion in the development of Te Muriwai o Te Whanga - Ahuriri Estuary Management Plan.

The City Vision supports the use of Te Aranga Design Principles as outlined adjacent, to enhance mana whenua presence, visibility and participation. opportunities identified throughout the masterplan process for planning and redevelopment within three character areas reflecting the character of the water based areas and their urban interface:

- Upper Estuary & Former Lagoon
- Lower Estuary & Pandora
- Inner Harbour & Ahuriri

Napier City Council District Plans

Te Whanganui-ā-Orotū (Ahuriri Estuary) Ecology & Stormwater Treatment Zone

The Ahuriri Estuary Ecology & Stormwater Treatment Zone (AESZ) applies to the southernmost area of land adjacent to Te Whanganui-ā-Orotū (Ahuriri Estuary).

The vision for this park prioritises the use of the site for stormwater detention during high intensity rainfall events. Councils are also investigating ways that the normal flow of stormwater into the Estuary could be channelled through a series of created wetlands to remove sediments and contaminants before it is discharged into Te Whanga (the Ahuriri Estuary).

With these stormwater improvement measures, it is intended to improve biodiversity outcomes through improved habitat creation. Aside from being beautiful, a park would provide wildlife with a home, reduce our climate change risks and increase recreational opportunities.

The AESZ recognises the importance of the restoration of the estuary and its margins, caters for those activities that are compatible with the ecological values of the estuary, and considers the operational requirements of the nearby airport.



Ahuriri Estuary and Coastal Edge Masterplan (Isthmus 2017)

The types of activities that are provided as without resource consent include:

- Planting, plant maintenance, pest control, conservation activities
- Growing and supplying of plants
- Activities associated with stormwater collection, retention, treatment and disposal
- Recreational activities
- Māori purpose activities (eg mahinga kai activities, wānanga, hui, Matariki and Pūanga observance activities)
- Community activities
- Primary production activities

Open Space & Recreation Zone

The Open Space and Stadium Zones chapters of the Proposed District Plan enable a range of recreation activities across our city, while managing the interface with neighbouring residential properties.

Open Space Zone

The purpose of an Open Space Zone is to provide for a range of passive and active recreational activities, along with the facili-ties and structures necessary to support them. Open Space Zones replace the Reserve Zone, Foreshore Reserve Zone and Marine Parade Recreation Zone of the current District Plan. To ensure that the primary recreation and community purpose of Open Space Zones are retained, commercial activities (including coffee carts and hire activities) are classed as a discretionary activity and require resource consent where they do not meet conditions. Residential and industrial activities are prohibited with Open Space Zones where they are not required for on-site management, which means that a zone change would be re-quired before a park or reserve could be repurposed for development.

Additional rules apply to Open Space Zones within the coastal environment and along the Marine Parade foreshore to recognise the special character of these areas.

Natural Open Space Zone

The purpose of the Natural Open Space Zone is to retain and enhance the natural environment and to ensure activities, build-ings and other structures are compatible with the natural characteristics of the zone. The range of permitted activities is restricted in this zone to protect natural values. Buildings require resource consent in order to allow Council to assess the impact of the buildings on the special characteristics of the park or reserve.

Sports & Active Recreation Zone

The purpose of the Sport and Active Recreation Zone is to provide for a range of indoor and outdoor sport and active recreational activities, along with associated facilities and structures. Specific rules apply to new activities and buildings in the Park Island Development

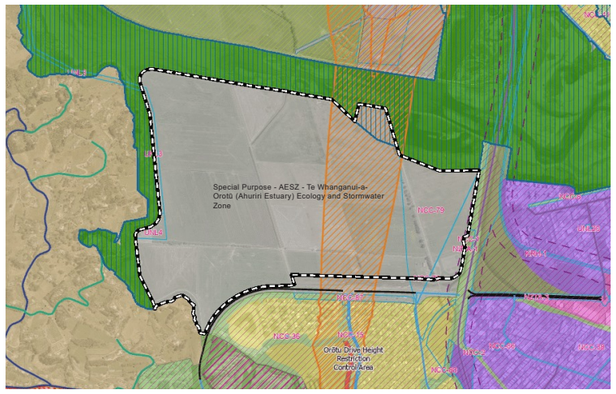
Māori Purpose Zone

The Māori Purpose Zone is a new zone that recognises and provides for a range of activities that specifically meet Māori cultural needs, including but not limited to, residential and commercial activities. This zone recognises and provides for the relationship of Māori and their culture and traditions.

Māori Purpose Activities is defined as:

Means the use of land and/or buildings for a range of activities or Māori cultural, community and living purposes, and/or integrated Māori development, including but not limited to one or more of the following activities:

- Powhiri & Kapa haka
- Wānanga
- Customary activities
- Kīngitanga events
- Home occupation activities
- Arts and cultural activities
- Cultural education and research activities
- Rongoā & Māori cultural activities
- Childcare services, kohanga reo or kura (schools), and Faith practices



Left: Napier City Proposed District Plan Map - Note orange Airport Noise Boundary Overlay and blue highway designation on east side of site.



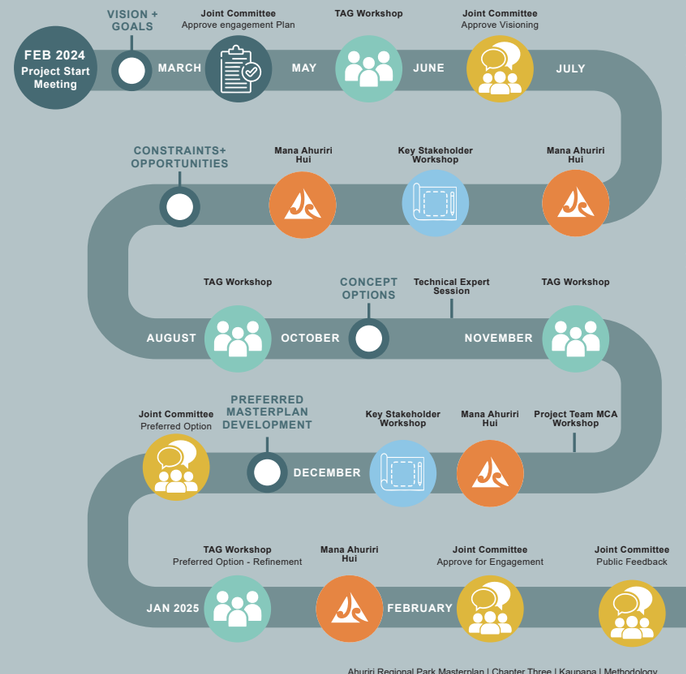
CHAPTER THREE

KAUPAPA | METHODOLOGY

Masterplan Methodology

Summary of Engagement

Masterplan Methodology



Engagement

The diagram at left outlines the collaborative process used to develop the Ahuriri Regional Park masterplan. A co-design approach was undertaken through a series of wānanga (workshops) involving the Joint Committee, Technical Advisory Group (TAG), design team, and Napier City Council staff at key stages.

Engagement with mana whenua and key stakeholders helped shape the direction of the plan, while a public engagement process was used to test the preferred concept with the wider community.

Discovery & Visioning

This phase focused on understanding the values, aspirations, and challenges identified by project partners, stakeholders, and the community—building a shared vision and stronger relationship with the site.

Optioneering

The design team developed and tested a range of concepts aligned with identified opportunities and constraints. As the process evolved, options were refined in response to new information, including Lagoon Farm wetland engineering inputs, cost estimates, stopbank modifications, and the need to mitigate bird strike risks near the airport. A multi-criteria analysis was used to identify a preferred concept, which was reviewed by the Joint Committee and TAG before being shared for public feedback.

Refinement

Following public feedback, the preferred concept was refined into the proposed masterplan. It outlines a range of sub-projects and priorities, with core projects forming the initial stages of development.

All projects identified in the masterplan will require further design development, technical analysis, and cost estimates before progressing through consenting, council approvals, and eventual construction.

Future Stage 2 and 3 projects are more aspirational and will progress as funding and partnerships allow. Many of the stage 2 and 3 components will require further detailed business case reviews to ensure feasibility and long-term sustainability.

Summary of Engagement

Engagement Strategy

At the March 2024 Joint Committee meeting, the engagement plan was approved to support the development of the Ahuriri Regional Park Masterplan and guide the process for preparing a draft for project partner, stakeholder and public feedback. The purpose of the public engagement was to update and inform the community about the direction of the Masterplan, including integration of the key driving project—the Lagoon Farm Stormwater Treatment Wetlands.

Review and analysis of the feedback received is summarised in this report and have informed the changes to be made to the final proposed Masterplan.

Prior Engagement

Delivering on the projects Engagement Strategy and Plan, targeted engagement was undertaken to develop the Draft Masterplan report

- 2 x Key Stakeholder Design Workshops
- 1 x Mana Ahuriri Wānanga
- 1 x Hui-a-hapu presentation
- Presentation to Mana Ahuriri Trust Board
- One on One engagement with Napier Airport Authority - Led by Stradegy, Napier City Council and Chair of the joint Committee.
- Technical Advisory Group Workshops
- Specialist Expert services have also been engaged to address the Planning framework, Stormwater Treatment Wetland Design, Avifauna habitat and mitigating measures for bird strike.

Summaries of the input and ideas from these workshops and sessions have been reported through prior Joint Committee Workshops and Meetings through out 2024 and 2025. This input has guided the Draft Ahuriri Regional Park Masterplan issued for public engagement



Image Above: Stakeholder Engagement Workshop

Discovery & Visioning Workshop

Mana Ahuriri Hapū

The intent of this wānanga was to listen, learn and understand from Mana Ahuriri hapū as equal partners, their response of Ahuriri Regional Park and the longstanding relationship held with Te Whanganui-a-Orotu.

Working with hapū, we developed a set of key values important to them as ahi kā to support the project moving forward. To help guide the works, significant pepeha and whakataukī were provided.

Five priority values were captured and discussed as part of the workshop:

- Te Mana o Te Taiao
- Te Mana o Te Wai
- Whakapapa | Genealogy and Identity
- Ahuwhenua | Activation and recreation (hauora)
- Ōhanga | Economy

Key Stakeholders

The intent of the first workshop with key stakeholders looked to understand their response towards Ahuriri Regional Park | Lagoon Farm. The project themes were expressed and shared inviting a response from those in attendance.

The workshop also asked those in attendance to step outside of their own perspective and together understand what are the key challenges and opportunities with site that we face as a community.

Over 100 Post-It responses were captured and distilled into key challenge topics and opportunities following the workshop (refer to appendix table).

Four key themes/opportunities were captured under environmental wellbeing, activation and cultivation, economic prosperity and healthy communities.

Optioneering Workshop

Key Stakeholders

Following the 'Visioning Workshop' the distillation of information from Workshop 1 was presented back to the key stakeholders. The summary provided collated challenges and opportunities and explored potential designs based on the four guiding design drivers.

As part of the 'Optioneering Workshop' stakeholders were asked to provide feedback on three spatial concepts based around the concept design for the Treatment Wetlands.

The three options explored were:

- **Option 1: Recreational Focus** - balance of recreational / commercial activities. Space for potential future sports facilities and complementary commercial use such as nursery, cultural tourism etc. Focus on human activity to the south with ecological to the north.
- **Option 2: Interwoven Landuse** - Interwoven ecological and recreational landuse with more dispersed commercial and recreational areas. Islands, forming nodes within the wetland area that reflect historic Ahuriri lagoon islands.
- **Option 3: Nature First** - Putting nature first - predator fence / control area around wetlands and coastal forest / shrubland, creating an ecologically enhanced exclusion area. Trails and educational hub within the coastal forest zones allow exploration within the predator free area.

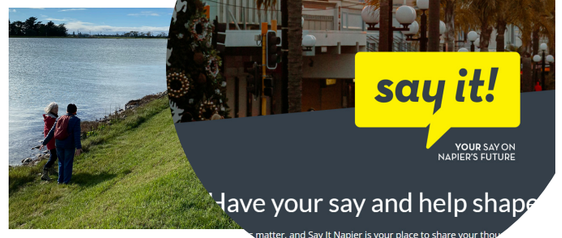
Precedent imagery was provided to show stakeholders potential landuses that could be explored for the development phases. The stakeholders preferred design was **Option 2: Interwoven Landuse** with some revisions to incorporate elements of Option 3: Nature First.

All three schemes were also put through a Multi-Criteria Analysis (MCA) to seek an objective measure of how well they meet the key project goals and priorities mapped out in the Discovery and Visioning stages. This affirmed that Option 2 and 3 scored the highest.

The three options and MCA results were reviewed with both the TAG and JC groups to verify the preferred design selection and further refinements confirmed.







Public Engagement Period

The design team prepared an engagement package of graphics and information to support the public engagement process that was facilitated by Napier City Council staff.

The Public Engagement period opened on Wednesday 16th of April 2025 and closed on Friday the 9th of May 2025.

Engagement Material

The following collateral was provided for the engagement

- Draft Ahuriri Regional Park Masterplan Document
- Video Footage - Introducing the Project

Engagement Methods

Several methods for pubic engagement were provided through Napier City Council and Hawke's Bay Regional Council. These being:

- Ahuriri Regional Park Masterplan webpage - Napier City Council
- Say It! - Ahuriri Regional Park Masterplan - seeking feedback
- Invitation for Written Submissions
- Facebook Page
- Stall at NCC 'Open House' event (15/04/2025) with 30 Information packs collected.
- Hosting of an Open Day at the site on Saturday 3rd of May 2025 - 10am - 12pm



CHAPTER FOUR

TE MAHERE TAONGA O TE WHANGA | FRAMEWORK

Pou Tarāwaho | Framework

Ngā Mātāpono | Masterplan Principles (Aspirations)

Stage 1 - Core Regional Park Programmes

Stage 2 Regional Park Programmes

Stage 3 Non-Funded Potential Future Partnership Opportunities

Enlargement Plans and Character Images

Masterplan Diagrams

Te oriori o Te Whatu | The lullaby of Te Whatu

Kia hora te haere ngā taumata i Te Whanga i Te Pōraiti,
Ko te kāinga tena i pepehatia e o tūpuna,
Ko rua te paia ko Te Whanga,
He kāinga to te Ata,
He kāinga ka Awatea,
He kāinga ka Ahiahi e tama e.

Go quickly to the land that is Te Whanga and Te Pōraiti,
For that is the land in a proverb of your ancestors,
Te Whanga is the storhouse that never closed, providing;
A meal in the morning,
A meal a noon,
A meal in the evening my son.

Te pepeha o Tamatea Pōkaiwhenua | The motto of Tamatea Pōkaiwhenua

Te Kāroro tangi tararau mai i runga o Tapu Te Ranga.
Te Pātiki tahanui o Otiere e.
Te Pāua patoto mai i runga o Tuhinga.
Te Pūpū tangi mai i runga o Matakarohirohi.
Te Kīore pekenui o Rimariki
Te Aruhe maomaonui o Pukekohu

The seagulls cry as they hover above Tapu Te Ranga.
The fat flounders of Otiere.
The pāua knocking on the rocks at Tahinga.
The pūpū crying at Matakarohirohi.
The rats jumping at Rimariki.
The thick-fleshed fern roots of Pukehou.

MOEMOEĀ| VISION

MAHINGA KAI (CULTURAL NARRATIVE) - A PLACE OF GATHERING

Ahuriri Hapū have long maintained ahi kā roa in Ahuriri. Te Whanganui-ā-Orotū is a place of great significance to Ahuriri Hapū which is central to their existence and identity and wellbeing (Te Whare Tapa Whā). Te Whanganui-a-Orotū was a significant mahinga kai resource. From the earliest of times it was highly prized for its enormous food resources and its access to major river systems and forest areas. So greatly was it valued through the generations that songs were sung, poetry composed and dances created in praise of its productiveness. It was the most valuable part of the patrimony.

This oriori by Ngāti Mahu ancestress Te Whatu forms a foundation for the masterplan.

NGĀ UARA | OVERARCHING VALUES

Mauri *– vitality of all living things*
Tikanga *– philosophies related to whakapapa*
Mana *– power of autonomy to protect, define rights, decide and develop*
Rangatiratanga *– self determination and working together kānohi ki te kānohi for better outcomes*
Manaakitanga *– respect and care for one another*
Kaitiakitanga *– responsibility fulfilling the roles of guardians and stewardship of te taiao*
Ahi kā roa *– the longstanding residence of iwi, hapū maintaining tikanga, kawa and mātauranga*
Mahinga Kai *– traditional economy of transmitting mātauranga through the sharing and gathering of resources*
Whakapapa *– linking past, present and future; the continuance of mauri and mana*
Whānaungatanga | ***Movement of People*** *– movement of people and relationships to place*

NGĀ MĀTĀPONO | GUIDING PRINCIPLES APPROACHES

NGĀ KAI O TE WHANGA - THE BOUNTIFUL FOOD OF TE WHANGA

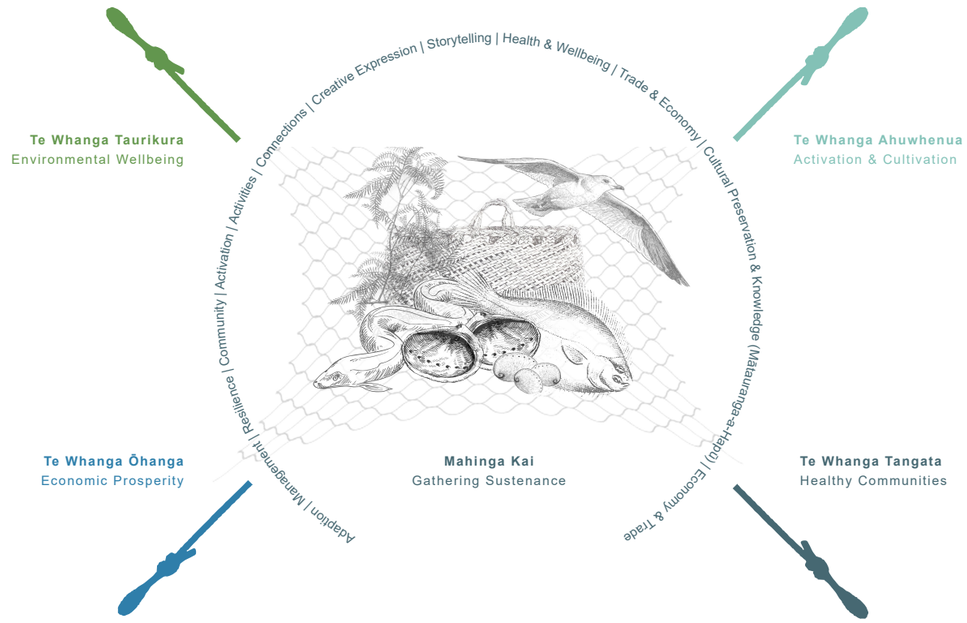
The pepeha of Tamatea Pōkaiwhenua reflects the rich and plentiful resources (kai) within Te Whanga. These six kaitiaki (guardians) or tohu (symbols) weave together the skies, the seas/waters and the land. This reflects the interconnected relationship between Te Taiao (the natural world) and Tangata Moana Tangata Whenua.

Theses six kaitiaki/tohu some guiding values interpreting the nature of each to inform the overall masterplan development. Together, they create a holistic and interconnected system.

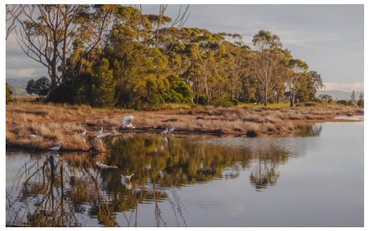
The six guiding principles reflect:

- **Kāroro** - Adaption, Management and Resilience
- **Pātiki** - Sustainable Communities
- **Pāua** - Connections and Creative Expressions
- **Pūpū** - Cultural Preservation and Knowledge (Mātauranga-a-hapū)
- **Kīore** - Economy & Trade
- Aruhe - Health and Wellbeing

Pou Tarāwaho | Framework



Ngā Mātāpono | Masterplan Principles (Aspirations)



Te Whanga Taurikura
Environmental Wellbeing

- Importance of 'Wai' – letting water back in and restoring connections to Te Whanganui-ā-Orotū (physical and spiritual), reclaiming natural ecosystems (wetlands, freshwater habitat).
- Improving water quality and establishing effective stormwater management practices led from a mātauranga-ā-hapū lens and understanding the wider catchment – ki uta ki tai (mountains to sea).
- Restore indigenous diverse ecosystems (saltmeadows, saltmarsh, raupo reedland, flaxland, wetlands, swamp forest, mānuka-kahikatea forest) recreating habitats for significant indigenous fauna (endangered and common – birds, fish, mammals).
- Enhancement of areas to replace monoculture habitat with a rich diversity of indigenous lowland and aquatic margin habitats.
- Restoring natural resources to sustain life and people – rongoā, rauemi, kai.
- Embedding nature-based solutions and softening the estuarine edge.



Te Whanga Ahuwhenua
Activation & Cultivation

- Restore mātauranga-ā-hapū (ngā mana whenua) activating traditional practices that we once prevalent within Te Whanganui-ā-Orotū – waka building/voyaging, gathering kai, harvesting materials (pā harakeke – whare pora), construction.
- Celebrating the uniqueness of Ahuriri and Te Whanganui-ā-Orotū as a place with long association with 'Kai' building on the overall ethos of Te Matau-a-Maui (Hawke's Bay) as a food destination.
- Supporting opportunities to establish multifunctional recreational activities for walking, cycling and exploration, enabling a unique regional park for community to connect to nature and their environments. Are there opportunities for commercial activities associated to water – pools, waka voyages.
- Offering opportunities for people to learn and grow knowledge of their environment, water systems and quality, and stormwater management – education centre, cultural hubs.
- Allowing spaces to change and adapt with climate enabling areas for activities to change with climate – detention vs retention.



Te Whanga Ōhanga
Economic Prosperity

- Opportunity to develop a sustainable and localised economy for community attracting visitors. Opportunities:
  - Eco-sanctuary – could the site become an ecosanctuary to support endemic habitats and environments.
  - Cultural Hub – establishing a cultural heart which supports mana whenua, could mana whenua establish their HQ, facilities on this whenua.
  - Eco-tourism/accommodation – close proximity to the airport, is there an opportunity for visitors to stay, eco-pods, marae.
  - Nursery – opportunity to develop a nursery to support community.
  - Art Park – celebrate the local creativity of community through various art mediums and modes – land art, sculptures (temporary/ permanent), mahi toi hub (raranga, rongoā).
  - Recreational Activities – retain blow carts, water sports (pools, waka, kayaking, boat tours), horse riding, camping, playgrounds, adventure park, skatepark.
  - Production – food and resources
  - Establishing a whare wānanga focusing on science and technologies (wai and kai), and arts.
- Implementing stormwater infrastructure to manage high intensity rainfall events and flooding, protecting residential areas, and saving millions on potential loss.



Te Whanga Tangata
Healthy Communities

- Enhancing mana whenua identity by celebrating local pūrākau and placemaking/storytelling opportunities – narrative trails, mahi toi (artwork).
- Ensuring community awareness and education of water and how we live, work and interact with it.
- Activating the coastal edge for communities to connect and interact with – an area which has been shut off.
- Ensuring safe and inclusive access for all communities and recognising mana whenua exclusive rights as kaitiaki.
- Creating a place of welcome and manaakitanga (hospitality) – welcoming visitors from afar (the airport and SH2 as the main entrances into Te Whanganui-ā-Orotū.
- Enabling the concept of Te Whare Tapa Whā for our overall health and wellbeing (connection to land, social/cultural, physical, mental, and spiritual dimensions).




Ahuriri Regional Park - Vision 2050
Viewpoint A - Taipō Stream
TE WHANGANUI-Ā-OROTŪ
TAIPŌ STREAM
Viewpoint B - Pump station
Viewpoint C - Native Wetlands
Viewpoint D - Visitor Centre
Viewpoint E - Treatment Wetlands

Stage 1 - Core Regional Park Programmes



Toilets
Wayfinding and Cultural Story telling nodes
Existing waterway link to wetland south of stop bank maintained
Existing Blokart Hawke's Bay Facility
Proposed vehicle access
Pedestrian/ cycleway

CORE REGIONAL PARK PROGRAMMES

1. Ahuriri Regional Park Waharoa | Entrance
2. Lagoon Farm Treatment Wetlands (Delivered as separate project)
3. Carpark
4. Entry plaza and welcoming space
5. Plant production nursery for on-site use
6. Naturalisation of existing drain channel as part of wetland earthworks
7. Manuka/ Kanuka Plantation
8. Trail connections to existing cycleway
9. Island nodes with Picnic facilities
10. South Marsh and estuary viewpoint
11. Pump station Waka Landing
12. Community Foraging Zone
13. Grazing land retained as interim landuse

The core park programmes are prioritised to support the establishment of the Lagoon Farm Wetlands—the first step in addressing water quality challenges in the receiving estuary. The first priority is to create a new entry point off the Ōrotu Drive roundabout, featuring a waharoa (gateway) to mark the entrance to the site. This will improve construction access and serve as the primary public entry to the wider park.

Space for a nursery is allocated - this could be an expansion of the existing council nursery or a partnership with a commercial operator or NGO to supply onsite plant materials.

During the wetland earthworks, the northern section of the receiving drain will be naturalised, with excess cut material used to create mounding south of the wetland. Restoration planting will begin around the wetland area, converting existing pasture into native tree and shrublands less attractive to bird species which pose a risk to airport operations.

A welcoming entry space developed at the Ōrotu Drive access will provide parking, toilets, signage, furniture, shelter, and interpretive and cultural storytelling/wayfinding information. Pedestrian and cycling trails will be built across the site.

Existing farming operations will continue on the remaining land.

Stage 2 Regional Park Programmes



Toilets
Wayfinding and Cultural Story telling nodes
Existing waterway link to wetland south of stop bank maintained
Existing Blokart Hawke's Bay Facility
Proposed vehicle acces
Pedestrian/ cycleway

STAGE 2 REGIONAL PARK PROGRAMMES

1. Ahuriri Regional Park Visitor Hub
2. Regenerating Native Wetland and shrubland
3. Te Wao Nui | Regenerating Forest (staged planting with community groups)
4. Trail connections and network connections
5. Taipō Stream confluence viewpoint and high tide waka and kayak landing
6. Discovery + Learning | Play + Sculptural Park
7. Pa Harakeke flax collection
8. Flexible use amphitheatre space
9. Redeveloped Woolshed multi-use Community Events Centre
10. Community Foraging Trails
11. Regional Park Eco Camp - organised groups such as schools and scouts

Once the core park programmes are completed, secondary site initiatives can be developed as funding becomes available.

A key component of this next stage is the expansion of the welcome area to include a visitor centre that enhances the overall visitor experience. The scale and form of this facility will be determined through a detailed business case, ranging from a simple shelter with interpretive information to a fully staffed centre with a café and multi-use community spaces.

Revegetation across the wider site will continue in stages. The existing farming operation will be phased out once remaining pasture is no longer viable. The existing woolshed complex is identified for redevelopment into a bookable community facility, with an open amphitheatre space to the north offering scenic views over the wetlands.

A site-wide trail network is also planned, along with an eco-camping facility on the western side of the site. This area is intended for organised groups such as schools, scouts, and other community organisations, and would likely be managed by a private operator.

Supplementary furniture, play and learning nodes sculpture and art would be progressively installed over time, as funding allows.

Stage 3 Non-funded Potential Future Partnership Opportunities



Toilets
Wayfinding and Cultural Story telling nodes
Existing waterway link to wetland south of stop bank maintained
Existing Blokart Hawke's Bay Facility
Proposed vehicle access
Pedestrian/ cycleway
Predator proof fence
Predator proof fence gateway

NON-FUNDED POTENTIAL FUTURE PARTNERSHIP OPPORTUNITIES

(Developed with public + private partnerships and NGOs)

A Expansion to Plant nursery for commercial, retail & educational capacity
B Expansion area for active recreational activities
C Development of complementary commercial use area
D Whare Wānanga | House of learning multi-use facility with accommodation. Focused on education around healing, restoration and renewal of te taiao | natural world
E Eco-Sanctuary Main Entrance
F Predator Proof Fence (indicative potential alignment only)
G Freshwater research and demonstration ponds (e.g. tuna | eel, kōura | freshwater crayfish)
H Salt water research and demonstration ponds (e.g. Papaka | Crab, Patiki | Flounder, Pūrimu | Cockles)
I Whare Wānanga | Learning & Research Hub
J Te Whanganui-a-Orotu Landmark Gateway Pedestrian/Cycle Bridge.

Stage 3 initiatives are aspirational elements intended to enhance the park's wider function and amenity. These projects are not intended to be funded by ratepayers and will rely on external funding sources such as central government, commercial partnerships, or support from NGOs.

Whilst the masterplan allocates space for these potential developments, it remains flexible—able to adapt if only some or none of the initiatives prove viable. Alternative uses or facilities may be proposed in future as opportunities arise.

Any built structures within flood-prone areas must be designed to withstand flooding and challenging ground conditions. These developments are envisioned to showcase regenerative architecture, incorporating sustainable materials and self-sufficient energy and water systems.

Potential commercial development along the park's southern boundary is intended to complement the overall vision. Possible uses include businesses focused on native mahinga kai processing (food, fibre, and medicine), cultural and eco-tourism, or environmental services.



VIEWPOINT A - TAIPŌ CONFLUENCE

A viewing structure, nestled within regenerating native forest, provides elevated views over the existing stopbank and across Te Whanganui-ā-Orotū. Internally, it offers sightlines over the replanted forest and wetland areas to the east. The existing bike and walking trail connects to an informal access point leading to the water's edge, featuring seating, cultural and interpretive signage, and sculptural elements that celebrate the site's natural and cultural heritage.





VIEWPOINT B - LAGOON FARM

The existing pump station building is retained, with an adjacent viewpoint and informal landing providing access to the water's edge. Seating, along with wayfinding and interpretive signage, encourages visitors to pause and enjoy the dynamic, ever-changing views across the estuary. During higher tides, there is also an opportunity for canoe or waka to travel up the estuary and access these landing points. This will be key node for trail access back into the regional park.





VIEWPOINT C - NATURALISATION OF THE EXISTING LONG DRAIN

Building on the cleaner water flowing from the treatment wetland, the existing farm drain is recontoured to create a more natural stream profile and planted with native wetland and riparian species of trees and shrubs. While open water areas will be limited to minimise attraction of waterfowl, carefully designed overflow points and small pools will provide opportunities for visitor interaction, play, and education about wetland ecosystems.
The alignment of the wetland and channel is designed to work around the existing powerline corridor. The pathways will provide a north-south connection across the site.





VIEWPOINT D - AHURIRI REGIONAL PARK ENTRANCE AND FUTURE VISITOR CENTRE

This image illustrates a potential long-term opportunity to develop a visitor centre at the Orotu Drive entry. The centre could include a range of built forms to accommodate multiple uses—such as office and administration spaces, exhibition areas, a café, and educational facilities.

Parking is located to the south, with stormwater runoff managed through vegetated swales. An expanded nursery operation could supply plant material for both the regional park and other restoration projects across the wider region. This nursery could serve both retail and wholesale markets, with opportunities for training, community enterprise, local iwi and other NGO involvement.

The development is anchored by a welcoming entry space that frames views across the treatment wetland and features a landmark sculptural pou element. Mown grass areas would be strictly limited to minimise attractants for waterfowl and associated risks to airport operations.





VIEWPOINT E - TREATMENT WETLANDS

This view captures one of the mounded 'islands' within the central treatment wetlands. Maintenance access tracks along the wetland edges double as pedestrian and cycle paths, encouraging active exploration of the site. Boardwalk structures span the spreader sills between wetland cells, allowing safe public access through the treatment area.

Massed wetland vegetation is complemented by diverse shrub and tree plantings on the islands, creating sheltered spaces for picnics and large sculptural features that invite visitors to engage with the landscape as they move through this expansive environment.



Park Entry Zone Enlargement



CORE REGIONAL PARK PROGRAMMES

1. Ahuriri Regional Park Waharoa | Entrance
2. Carpark
3. Entry plaza and welcoming space
4. Plant production nursery for on-site use

STAGE 2 PROGRAMMES

1. Ahuriri Regional Park Visitor Hub
2. Discovery + Learning | Play + Sculptural Park

STAGE 3 OPPORTUNITIES

1. Expansion to Plant nursery for commercial, retail & educational capacity
2. Development of complementary commercial use area
3. Eco-Sanctuary Main Entrance
4. Development of complementary commercial use area

Entry Zone

The primary access to Ahuriri Regional Park is proposed via a new connection from the existing Orotu Drive roundabout. This new crossing will accommodate vehicle, pedestrian and cycle connections, linking to external trail networks and providing direct access for neighbouring communities to the south.

A key design feature of this entry will be the construction of a landmark bridge element, with detailing to create a formal wāharoa (gateway) that marks the transition into the park and welcomes visitors.

Parking facilities are planned on both the eastern and western sides of the entry point. These will be staged over time, in line with park development and visitor capacity needs. A core intent of the park design is to minimise internal vehicle movement, creating a predominantly traffic-free environment that enhances visitor experience and protects sensitive ecological areas and wildlife habitats.

Flanking the entry, areas have been identified for potential limited commercial or community development in the future. Any development would be staged and subject to further investigation and business case assessment. Opportunities may include partnerships with commercial or community organisations, with the aim of creating revenue streams to support ongoing investment in the park.

Any such development would be required to align with and support the broader goals of the park, ensuring compatibility with its ecological, cultural, and recreational values.

Character Images

Ahuriri Regional Park Waharoa| Entrance

The primary site entry is off the existing Prebensen/Orotu Drive roundabout across the Prebenson Drive Reserve channel. This is envisioned as a landmark bridge or culvert crossing with a strong axial viewshaft into the proposed Lagoon Farm treatment wetlands to form the primary waharoa / entry to the park. The entry is flanked by stormwater filtration swales that will collect and cleanse surface runoff from hardstand areas before it enters the Prebenson Reserve Channel. Design elements on the sides of the bridge.

Ahuriri Regional Park Visitor Hub

The Regional Park Visitor Hub is orientated around central landmark Pou and plaza space facing an interactive wetland play zone.

The buildings wrapping around the open space area could be phased initially as a simple shelter with static information and signage. In the long term this can be replaced or complemented with a purpose designed visitor education & discovery centre that provides a range of spaces space for displays and exhibits telling the cultural and natural histories of the park and wider Te whanganui a orotū landscape.

Complementing this could be a cafe, gift shop and multi-use community spaces. A second building to the east would accommodate other compatible uses such as museum or tertiary education outreach space, research, consulting, tourist and visitor services. Supporting this will be seating, picnic tables and shelters. The proposed location is on the higher part of the site than therefore more resilient to current and future flood risks.


PAPAMOA HILLS CULTURAL HERITAGE PARK, TAURANGA


PUNAKAIKI VISITOR CENTRE, PUNAKAIKI


POU AIO-NUKU AIO-RANGI, TAUPŌ


TE KURA WHARE | TE URU TAUMATUA, TĀNEATUA


TE KAARORO NATURE PRECINCT, HAMILTON


EXAMPLE OF SCULPTURAL GATEWAYS


EXAMPLE OF ECOLOGICALLY INSPIRED SCULPTURE


POUWHENUA, PAKOWHAI


ARDMORE NURSERIES, AUCKLAND


WAIKURA MANUKA, EAST CAPE

Landmark Toi & Interactive Wetland

The landmark pou is sited on the shore of an interactive wetland play area. While this is visually connected the lagoon farm treatment wetlands, is proposed to be hydraulically separate to allow this to be managed for learning and interactive play for visitors to explore, an outdoor classroom. The pou sculptural element sits on the main entry axis and will provide a visual beacon to draw visitors into the site navigate through the wider landscape. It would serve as a key cultural narrative statement opportunity.

Discovery + Learning | Play + Sculptural Park

To the east of the visitor hub excess materials from the wetland construction would be sculpted into a series of mound to form 'island' formations with clusters of trees for shade and biodiversity values set amongst a native shrubland and periodically mown meadow areas. Set within this will be pathways linking several nature-play zones potentially incorporating Maori play activities. Additional sites for sculptural art are available in this zone and could form the nucleus for a park wide sculptural trail.

Plant Nursery

Part of the commercial opportunities identified is a Native Plant Nursery, in the first stage this would be aimed at supplying onsite planting needs. This maybe an iwi or community managed operation or could be leased back to an existing operation. As a second stage it is suggested that this could be expanded to supply wholesale and retail markets with potential of research and training opportunities. This could include an agri-solar component where plant production is undertaken amongst and under solar panel arrays.

South-western Zone Enlargement



CORE REGIONAL PARK PROGRAMMES

The Western side of the site featured in the plan to the left will remain as grazed land prior to stage 2 and 3 being developed.

STAGE 2 PROGRAMMES

1. Te Wao Nui | Regenerating Forest (staged planting with community groups)
2. Trail connections and network connections
3. Pa Harakeke flax collection
4. Regional Park Eco Camp - organised groups such as schools and scouts

STAGE 3 OPPORTUNITIES

1. Whare Wānanga | House of learning multi-use facility with accommodation. Focused on education around healing, restoration and renewal of te taiao | natural world
2. Predator Proof Fence (indicative potential alignment only)
3. Freshwater research and demonstration ponds (e.g. tuna | eel, kōura | freshwater crayfish)
4. Whare Wānanga | Learning & Research Hub

South Western Zone

This part of the site is relatively sheltered—set back from main airport flight paths and nestled alongside the Taipō Stream—making it well-suited to quieter, more passive uses.

Initial works, following the retirement of grazing, will focus on restoration planting, preserving flexibility for future Stage 2 development and other potential programmes. Due to the low-lying nature of the land, any future development will require careful design to ensure resilience to flooding and climate impacts.

Character Images

Pā Harakeke | Flax Collection

Boardering Prebenson Road to the west of the park is a large area is identified for a future collection of Harekeke | Flax that can be utilised for traditional weaving arts. This would be structured with access trails and, where appropriate, interpretation information. A biodiverse arrangement of shrubs interplanted with areas of harekeke will be utilised to increase ecological value and reduce attraction of large flocks of starlings that are identified as a risk species for the airport operations.

Whare Wānanga | Learning & Research Hub

Co-located with the Pa Harakeke, the Whare Wānanga facility is positioned in the south-west corner of the site fronting the Prebenson Drive frontage. A new vehicle entry connects to a parking area and multiuse buildings. Program opportunities include a school of weaving based on use of traditional fibres such as harakeke and tī kōuka harvested onsite. This could be a flexible space that can accommodate a variety of other cultural education and tourism activities such as whakairo | carving, and mahinga kai tours.

Though a joint venture with crown, university or private institute, the hub can focus on the science underpinning restoration of these low-lying coastal landscapes, carbon sequestration, biodiversity credits and opportunities for fresh and brackish to saltwater aquaculture.

As an extension to the Whare Wānanga a short stay accommodation facility is illustrated set into the regenerating forest as an alternative option to the more basic eco-camp to the north. This could offering wellness related activities that complement the Wānanga learning programmes. A series of well-designed cabin units are arranged around a central water feature that could be designed as a natural swimming pool. Spaces are provided for practice of traditional rongoā including gathering and use of medicinal plants and other resources from within the park.





TE PUIA WHARE WĀNANGA | WHARE WHAKAIRO, ROTORUA

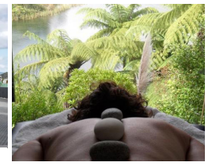








TAHUAROA, WAITANGI TREATY GROUNDS, WAITANGI



Regional Park Eco/Education Camp

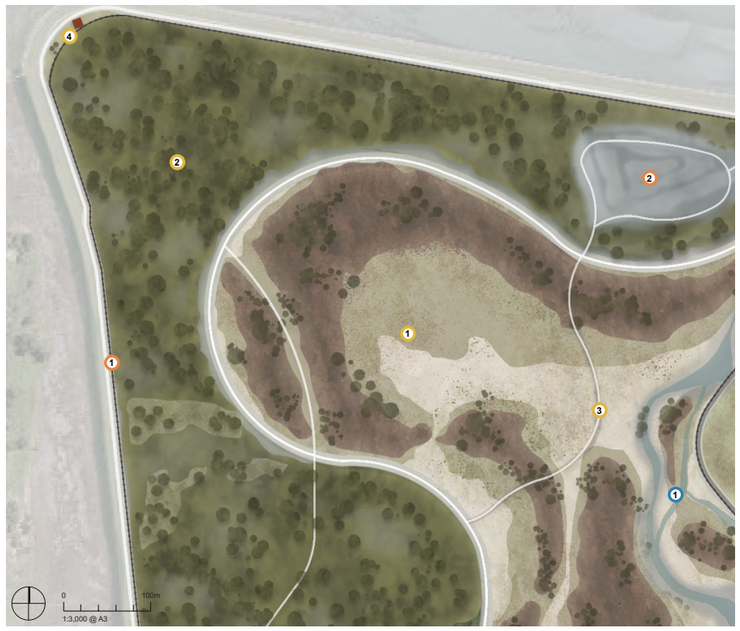
Offering a unique experience of staying in a wilderness on the doorstep to the City the . Camping & Eco Village Accommodation offers short term stays in cabins or glamping style tents, catering to organised school and community groups such as scouts. This is modelled on similar facilities within in other regional parks around the country and is intended to offer the opportunity to be immersed in learning and experiences around regeneration of the native ecosystems, matauranga māori, mahinga kai practice and potentially participate in restoration activities. This would be particularly special should a wildlife sanctuary be established this will allow guests to experience staying amongst a variety of native birds, lizards and invertebrates.







North-western Zone Enlargement



CORE REGIONAL PARK PROGRAMMES

The western side of the site featured in the plan to the left will remain as grazed land prior to stage 2 and 3 being developed.

1. Naturalisation of existing drain channel as part of wetland earthworks

STAGE 2 PROGRAMMES

1. Regenerating Native Wetland and shrubland
2. Te Wao Nui | Regenerating Forest (staged planting with community groups)
3. Trail connections and network connections
4. Taipō confluence viewpoint and high tide waka and kayak landing

STAGE 3 OPPORTUNITIES

1. Predator Proof Fence (indicative potential alignment only)
2. Salt water research and demonstration ponds (e.g. Papaka | Crab, Patiki | Flounder, Pōrimu | Cockles)

North Western Zone

As the lowest and most flood-prone part of the site, this zone is proposed for restoration with native forest, shrub, and wetland plant communities that can withstand periodic inundation. Planting could be staged and delivered in collaboration with community groups and volunteers.

Wetland construction will include regrading the existing Long Drain into a more naturalised channel. Excess earth from this work can be used to create gentle mounding, adding topographic variation and enhancing habitat diversity.

Character Images

Te Reporepo | Regenerating Native Wetland

Working with the existing slow lying topography in the north-western corner of the site, an expansive wetland plain is proposed to be created through shallow regrading of the existing drains and surfaces. This will be supported by the additional water from the treatment wetlands and periodic inundation when large flows pass through the site via the Prebenson Channel. Open water will be minimised, and dense plantings of reeds, flax, shrubs and trees are proposed to reduce habitat attractiveness for waterfowl and wading birds that pose the most risk for airport operations.







Te Wao Nui | Regenerating Forest

The ambition is to support development of Kahikatea / Pukatea Forest that can tolerate occasional flooding and support ongoing mahingakai activities including Tōtara for long term use for whakaaro |carving & waka, and plants for rongoā. The planting strategy will need to be adapted to suit the existing soils and groundwater conditions and allow room for future evolution and adaption as these change due to factors such as sea level rise. The final species composition and succession sequence to enable transition from the current pastoral landuse will be developed in consultation with experts from local mana whenua, and ecological restoration groups.











Saltwater Research and Demonstration Ponds

Given the proximity to the estuary channel, there is potential to establish saline pools to support research and demonstration ponds for cultivating key species such as papaka (crab), pātiki (flounder), and pūrimū (cockles), either for harvest or reseeding into the wider estuary. This could potentially be incorporated in the predator proof zone should a fenced sanctuary be established. This initiative would require partnership with a research organisation and/or tourism operator and must be carefully managed to avoid attracting high-risk bird species that could impact airport operations.







Complementary Recreational Activities

As the park facilities are established complementary businesses such as bike rental and waka tours could can accommodated on a seasonal or full time basis depending on demand. Informally the park will offer a wide range of recreational opportunities including running, cycling, walking, bird watching, learning and play.

Wetland Trail & Eastern Boundary





CORE REGIONAL PARK PROGRAMMES

1. Lagoon Farm Treatment Wetlands (Delivered as separate project)
2. Manuka/ Kanuka Plantation
3. Trail connections to existing cycleway
4. Island nodes with Picnic facilities
5. South Marsh and estuary viewpoint
6. Community Foraging Zone

STAGE 2 PROGRAMMES

1. Flexible use amphitheatre space
2. Redeveloped Woolshed multi-use Community Events Centre

STAGE 3 OPPORTUNITIES

1. Expansion area for active recreational activities
2. Te Whanganui-a-Orotu Landmark Gateway Pedestrian/Cycle Bridge.

Wetland Trail and Eastern Boundary

To encourage community engagement with the wetland area, a network of pedestrian and cycle paths will provide access around and across the wetlands. Island nodes within the wetland will serve as pause points, offering opportunities for picnicking, art installations, and quiet reflection.

Along the northern boundary, a lookout and rest area is proposed near the South Marsh. This space will be carefully designed to minimise disturbance to wildlife, and its use is expected to be brief or transitional due to its proximity to aircraft activity—especially with potential future jet services.

The eastern portion of the site lies within an New Zealand Transportation Agency (NZTA) designation zone, meaning any development in this area must consider the potential for future removal to accommodate highway-related works.

Character Images

Mānuka Plantation

On the northern boundary of the treatment wetlands a large area of mānuka dominated planting is proposed to provide a low hardy vegetation cover for this part of the site with low bird attractiveness and opportunity for harvest of oils and honey. It will be interspersed with bands of herbaceous low flammability planting for added biodiversity value and fire risk mitigation.

Lagoon Farm Treatment Wetlands

Currently being designed as part of a separate workstream, the masterplan has been shaped around the engineering requirements to site the proposed Lagoon Farm treatment wetlands on the highest part of the site to allow gravity fed flow through the wetlands. The system will receive water pumped from the Pūrimu channel on the eastern boundary that will flow through a series of up to six flow channels though densely planted wetlands. Urban pollutants and excess pollutants will be captured before the cleansed water overflows from the western end of the wetland cells into the wider drainage system that is picked up by Lagoon Farm pump station and discharged to the estuary. An access road will surround the wetland cells offer access for pedestrian and cyclists. The proposed planting patterns use contrasting foliage to form bold patterns within the wetlands that reference the forms of sandbanks and channels captured in historic maps of the former lagoon. The final shape and form of the wetlands may vary from that depicted in the masterplan so it will be essential to allow for a degree of flexibility in the masterplan implementation to adapt to this.









PEKAPEAK WETLANDS, HASTINGS











PUKEKURA BOWL & AMPHITHEATRE, NEW PLYMOUTH



TE PARAPARA MAARA, HAMILTON GARDENS



WAIKURA MANUKA, EAST CAPE

Flexible Amphitheatre Open Space

To the east of the Visitor Hub a grassed amphitheatre area is proposed adjacent to the existing Lagoon Farm Woolshed complex that can host a variety of concert, festival and market events. Existing and supplementary trees will screen and shelter this area from the east and south while allowing for views out over the treatment wetlands to the Poraiti Hills. Turf areas may require treatment with bird deterrent inoculants to reduce the attractiveness to waterfowl and other species that present a higher risk to airport operations.

Woolshed Multiuse Community Events Hub & Restaurant

A renovated and re-purposed woolshed building provides opportunity for a multi-use community events centre that will complement the amphitheatre space. This could include opportunity for a hosting seasonal market celebrations food and materials grown in adjacent gardens and gathered from the wider park space and the greater region.

Forage Garden & Trails

Along the eastern boundary of the park the area between the Purimū and Treatment Wetlands provide a productive landuse opportunity with plantings of fruit, nut and other food producing plant species. More intensive areas of urban agriculture could be provided within this zone as lease opportunities for small scale urban farmers supporting local markets, stalls or vegetable box subscriptions. This area will accommodate public trails and visual interest for viewers passing along the highway corridor. As this lies within a New Zealand Transport Agency (NZTA) designation long term restoration or wetland treatment infrastructure have not been proposed in this area.

Masterplan Diagrams

Programming

Site programming within the masterplan is intended to be flexible to allow for refinement as individual projects are progressed through detailed design and construction. Facilities outside of the core park programs will be subject to further business case studies and, in many instances, funding partnerships.



- Regenerating Forest, wetland & shrubland (175 Ha)
- Nurseries (14.5 Ha)
- Cultivation and Production (30 Ha)
- Eco-camp and Village (8 Ha)
- Arts, Research and Wellbeing Precinct (4 Ha)
- Adventure Recreation Precinct - Existing Blokart course
- Treatment Wetlands (85 Ha)
- Entrance hub Facilities (1 Ha)
- Complementary Commercial Hub (1.5 Ha)

Habitat Typologies

Transition from existing pasture to native tree, shrub and wetlands will be carefully designed to reduce attractiveness for bird species that pose a higher risk to airport operations. Treatment wetlands to be fully planted out with no areas of open water.

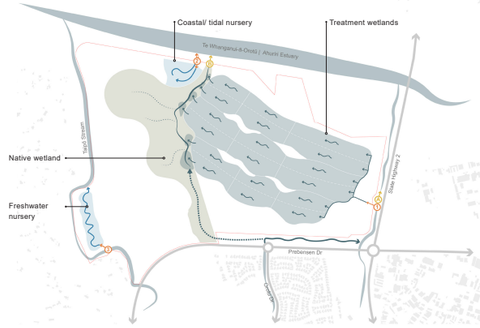


- Regenerating native coastal Forest (53 Ha)
- Native shrubland medium (8 Ha)
- Native shrubland low (4 Ha)
- Native wetland (43 Ha)
- Treatment wetland (85 Ha)
- Coastal Tidal Nursery - Patiki & Pakaka (4.5 Ha)
- Freshwater Nursery - Tuna & Eel (4 Ha)
- Harakeke plantation (9 Ha)
- Kanuka/ Manuka Plantation (11 Ha)
- Community and Cultural use areas (75 Ha)
- Fenced sanctuary (111 Ha)

Masterplan Diagrams

Water flow/ distribution

Proposed water movement through the Site based on the proposed treatment wetland scheme runs from the Purimu westwards before being pumped via the existing Lagoon Farm pump station to the estuary.



- High flow channel
- Treatment wetland water flow
- Coastal and stream nursery flow
- (A) Existing Pūrimu Stream Pump House
- (B) Existing Lagoon Farm Pump House
- (1) Proposed Pūrimu Stream Pump House
- (2) Potential Future Coastal Nursery Pump House
- (3) Potential Future Stream Nursery Pump House

Way finding and public art strategy

Conceptual network of waharoa / pou, wayfinding and interpretative signage installations throughout the site. Nature play and public art installations provide additional points of visitor engagement.



- Waharoa/ Pou
- Wayfinding installations
- Public art
- Nature play areas

Masterplan Diagrams

Access and circulation

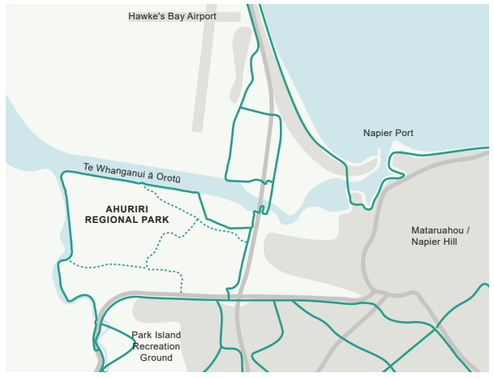
Public vehicle access is generally restricted to the southern part of the Site. Multiple trail routes provide a high degree of access into and across the Site around areas of low disturbance to support wildlife habitat values.



- Cycleways/ pedestrian (approx 8km)
- Pedestrian pathways (approx 8km)
- Vehicle access (approx 2.5km)
- Shared access - Vehicle and cycle/ walk (approx 2.2 km)

Wider context cycleway connections

The proposed cycle connections within the Site complement the existing trail network connections that link to the airport, Napier Port, central city, beaches and suburbs.

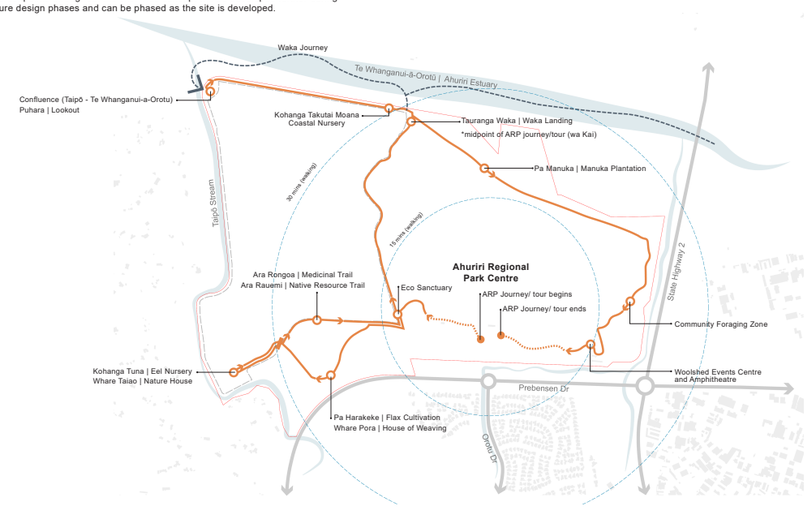


- Existing cycleways
- Potential future connections
- Major roads

Masterplan Diagrams

Ahuriri Regional Park day tour/ journey

Indicative site way-finding layout showing potential for a diverse range of visitor interest points throughout the site. This concept will be developed further during future design phases and can be phased as the site is developed.







APITIHANGA | APPENDICES

Option Studies

Program Staging

Engagement Summaries

Masterplan Staging

CORE REGIONAL PARK PROGRAMMES

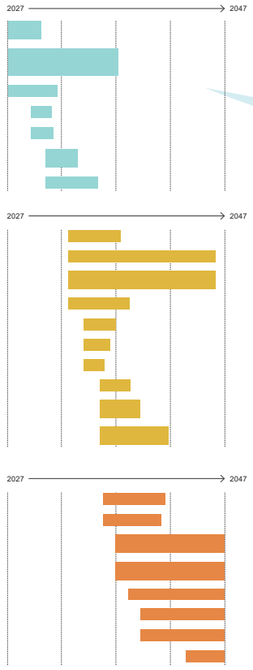
- (a) Ahuriri Regional Park Waharoa | Entrance
- (b) Lagoon Farm Treatment Wetlands and earthworks for naturalisation of existing drain channel
- (c) Plant Nursery for on-site use
- (d) Manuka and Plantation
- (e) Creation of Island nodes
- (f) South Marsh & Pump station Waka Landing and Viewpoints
- (g) Community Foraging Zone and Trails

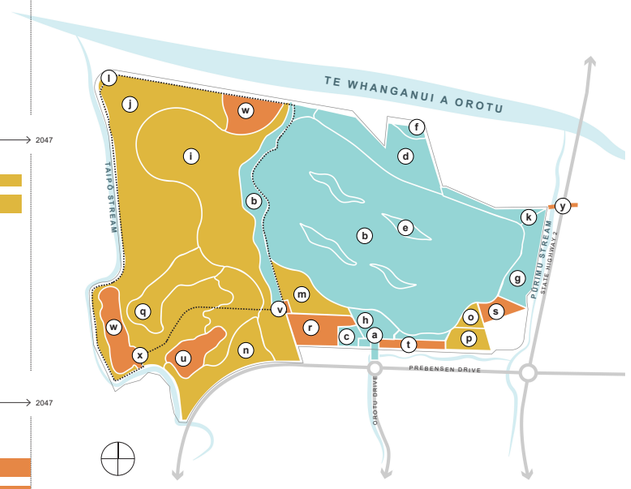
STAGE 2 PROGRAMMES

- (h) Ahuriri Regional Park Visitor Hub
- (i) Regenerating Native Wetland
- (j) Te Wao Nui | Regenerating Forest and Shrubland
- (k) Trails and Cycleways
- (l) Taipō Viewpoint and Waka/ Kayak landing
- (m) Discovery/ Learning Sculptural Park
- (n) Pa Harakeke flax collection
- (o) Flexible use Amphitheatre Space
- (p) Woolshed Multi-use Community Events Centre
- (q) Regional Park Eco Camp - short stay guests

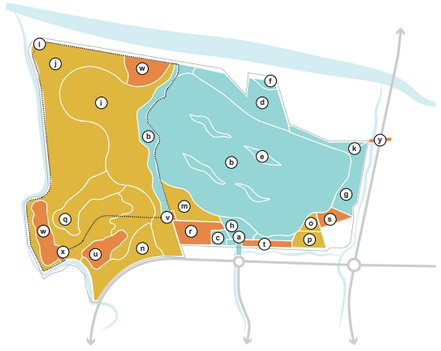
STAGE 3 POTENTIAL OPPORTUNITIES

- (r) Expansion to Plant Nursery
- (s) Expansion of Recreational Area
- (t) Complementary Commercial-use Development
- (u) Whare Wānanga| House of Learning multi-use facility
- (v) Predator Proof Fence/ Eco-Sanctuary Hub
- (w) Fresh and Saltwater Research Ponds
- (x) Learning & Research Hub
- (y) Te Whanganui-a-Orotu Landmark Bridge





Masterplan program and outcomes



Key

- Core Regional Park Programmes
- Stage 2 Regional Park Programmes
- Stage 3 - Non funded potential Future partnership opportunities

- Te Whanga Taurikura Environmental Wellbeing
- Te Whanga Ahuwhenua Activation & Cultivation
- Te Whanga Ōhanga Economic Prosperity
- Te Whanga Tangata Healthy Communities
- Resilient Water Infrastructure

Core Regional Park Programmes

KEY	PROGRAM	AREA/UNIT	PROJECT PRINCIPLES
a	Ahuriri Regional Park Waharoa | Entrance	0.5 Ha	
b	Lagoon Farm Treatment Wetlands and earthworks for naturalisation of existing drain channel	85 Ha	
c	Plant Nursery for on-site use	3.5 Ha	
d	Manuka and Plantation	20 Ha	
e	Creation of Island nodes	2 Ha	
f	South Marsh & Pump station Waka Landing and Viewpoints	0.6 Ha	
g	Community Foraging Zone and Trails	5 Ha	

Stage 2 Regional Park Programmes

KEY	PROGRAM	AREA/UNIT	PROJECT PRINCIPLES
h	Ahuriri Regional Park Visitor Hub Area	2.5 Ha	
i	Regenerating Native Wetland	43 Ha	
j	Te Wao Nui | Regenerating Forest and Shrubland	64 Ha	
k	Trails and Cycleways	10 675 Lm	
l	Taipō Viewpoint and Waka/ Kayak landing	0.1 Ha	
m	Discovery/ Learning Sculptural Park	5.5 Ha	
n	Pa Harakeke flax collection	3.5 Ha	
o	Flexible use Amphitheatre Space	0.7 Ha	
p	Woolshed Multi-use Community Events Centre	2 Ha	
q	Regional Park Eco Camp - short stay guests	8 Ha	

Stage 3 Potential opportunities

KEY	PROGRAM	AREA/UNIT	PROJECT PRINCIPLES
r	Expansion to Plant Nursery	2 Ha	
s	Expansion of Recreational Area	1.5 Ha	
t	Complementary Commercial-use Development	1.6 Ha	
u	Whare Wānanga| House of Learning multi-use facility	1.7 Ha	
v	Predator Proof Fence/ Eco-Sanctuary Hub (110 Ha)	5000 Lm	
w	Fresh and Saltwater Research Ponds	8.4 Ha	
x	Learning & Research Hub	0.4 Ha	
y	Te Whanganui-a-Orotu Landmark Bridge	x1	

Ngā Aheinga | Optioneering



OPTION 1: RECREATIONAL FOCUS

Option 1 provides for a larger proportion of recreational activity and areas allocated towards development of facilities including a visitor hub, education, and cultural hubs. An area for complementary commercial activity is included along with allowance for a larger recreation area that could be used for a variety of future active and passive sports activities. The west part of the site is within the flood hazard zone so any development or built elements in this area will need to be adaptable and resilient to this environment. Human activity is focused on the southern part of the site with the northern part of the site offering a more natural environment.

This option has been the least preferred when reviewed with the TAG and Key stakeholder groups. Concerns were raised about the level of development and related costs compromising the nature first priority of the project.



OPTION 2: INTERWOVEN LANDSCAPE

This option provides a more balanced approach with programmes and development opportunities still generally located on the southern portion of the site but more dispersed and at a smaller scale set within larger restoration areas. The recreational open space zone is replaced with larger areas of coastal forest and shrubland. Several island forms are dispersed through the site will reuse excess cut material from the wetland construction and provide a sequence of vantage points though the site echoing the landforms in the wider coastal landscape.

This option had more support amongst the Key Stakeholder Group as this seems to have the best balance of recreation and nature priorities with opportunity for some economic return. This is also most consistent with the four pou identified in the design masterplan framework



OPTION 3: NATURE FIRST

Option 3 explores consolidation of the majority of the proposed development programmes to a more compact zone around the proposed entry off Prebenson Drive. This option illustrates the Tonkin Taylor option 2 wetland that has a smaller footprint with reduced treatment capacity. Should the larger option 1 wetland (as shown in the masterplan option 1 and 2) be selected this would reduce the area available for the proposed developed projects by about 50%.

A key element of this concept is the provision for an 8km long predator proof fence enclosing 234 Ha of the site to create a mainland island that could support a diverse range of native wildlife on the doorstep to Napier. For reference the Zealandia Te Māra a Tāne sanctuary in Wellington is 225Ha with an 8.6km long predator fence. Within the fenced area smaller scale eco-camp/cultural hub is located on the western boundary of the Taipō. This Hub will provide opportunity for a wilderness experience on the doorstep of the City where visitors can be immersed in an expansive, regenerating mosaic of native forest, shrubland and wetlands. The Hub and could accommodate school, community, and possibly eco/cultural tourism groups.

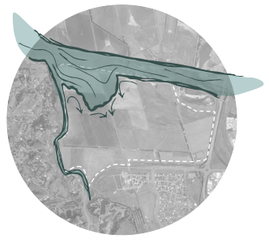
Ngā Aheinga | Optioneering

PREFERRED OPTION: REVISED OPTION 2



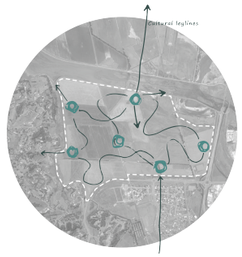
Tātari Whenua: Analysis

Initial Sketch Explorations



BRINGING ESTUARY IN

Testing whether the stopbanks could retreat inland to provide more room for the estuary. This was put aside due to significant cost of relocating stopbanks that are currently in good condition and potential in increase bird strike risk for the airport.



CULTURAL JOURNEY MAPPING

Given the huge scale of the site there are opportunities to create a cultural journey that showcase different ecosystems and associated significance for Mana Ahuriri Hapū both historically and into the future.



REDEFINING STOPBANK EDGES

This tested whether there was opportunity to increase the diversity of the stopbank edges to create enhanced habitats and visual interest. Engineering review highlighted cost to modify stop banks as prohibitive and the structural integrity is reliant on a smooth consistent estuary side surface to reduce erosion potential



ECOLOGICAL + HUMAN INTERACTION

A key consideration was how to balance areas of human activity with providing habitat of undisturbed habitat for sensitive species such as Bitten birds. While the arrangement of this has been modified by the final proposed wetland layouts, this thinking has been carried though into the draft masterplan.

Multi-criteria Analysis (MCA)

Option Evaluation

The MCA process was used to objectively evaluate the three concept options using a range of criteria. These criteria were developed by the design team and assigned weightings or level of importance based on feedback from the Joint Committee,Technical Advisory Group, and feedback from mana whenua and key stakeholders. The weighted and unweighted scores are added together to provide a total score that reflects the relative 'positivity' of each option.

		Do nothing	Design Options for Ahuriri Regional Park						
			Option 1		Option 2		Option 3		R = Raw W = Weighted
			1 R	1 W	2 R	2 W	3 R	3 W	
			Increased recreational cultural and and economic focus		Balance of Ecological Community, and Economic Activity		Ecological Priority		Level of Importance - adjust drop down boxes to select weighting
Te Whanga Taurikura | Environmental Wellbeing	**Commentary/Focus**	**-0.9**	**1.3**	**2.0**	**1.6**	**2.3**	**1.9**	**2.8**	**HIGH**
Improved quality of water discharged from urban Purimu catchment	Proposed wetland scheme provides effective treatment of contaminants from this catchment before being discharged to the estuary	-1	3	4.5	3	4.5	2	3.0	HIGH
Improved flood attenuation	Engineering studies have indicated attenuation on the site will have little effect on attenuation of upstream flooding so a dedicated detention function is no longer recommended. Enhancement of high flow channel from Prebension drive into the site is proposed in all options.	-2	-1	-0.8	-1	-0.8	-1	-0.8	LOW
Ecological values enhanced within site and adjacent waterbodies	Extensive restoration of native plant communities across all options will offer considerable ecological benefits. Option 2 and 3 score higher due to increased restoration area.	-2	2	3.0	3	4.5	3	4.5	HIGH
Accommodation of natural processes and indigenous evolution - regenerative design	Allowing space for natural regeneration and succession of plant communities throughout the site. Option 3 scored highest due to larger area dedicated towards this.	-2	2	3.0	2	3.0	3	4.5	HIGH
Positive environmental impacts of development long term	What degree of positive environmental impacts will the project provide in the long term.	0	1	1.0	1	1.0	2	2.0	MED
Environmental impacts during construction	To achieve the project goals all options will have a similar impact during construction due to bulk earthworks. Impacts include, dust, noise, carbon emissions and disturbance of existing ecological values.	0	2	1.6	2	1.6	2	1.6	LOW
Opportunity for enhanced control via predator fencing	How much contiguous area is available to potentially be protected by a predator proof fence.	0	1	0.8	2	1.6	3	2.4	LOW
Maintains a predominately natural environment	Does the proposal maintain the character of a predominantly natural environment vs. a modified/developed environment	0	2	3.0	2	3.0	3	4.5	HIGH
Te Whanga Ahuwhenua | Activation and Cultivation		**-1.3**	**1.7**	**2.5**	**2.3**	**3.5**	**2.7**	**4.0**	**HIGH**
Returns mauri back to Te Whanga	Does the proposal reinvigourate the life force of the place (acknowledging we cannot recreate the original lagoon ecosystem)	-1	1	1.5	2	3.0	2	3.0	HIGH
Mahinga kai opportunities restored	Will the project deliver future opportunities to gather and harvest food, fibre and other resources.	-2	2	3.0	2	3.0	3	4.5	HIGH
Diverse spaces and ecologies for gathering and harvesting	Does the project accomodate diverse ranges of ecosystem types that can support mahinga kai activities	-1	2	2.0	3	3.0	3	3.0	MED
Te Whanga Ōhanga | Economic Prosperity		**0.7**	**0.8**	**0.8**	**0.8**	**0.8**	**0.5**	**0.5**	MED
Construction Costs	Based on high level measurements of key landuse types what are the comparative estimated costs of each option. This does not consider potential economic return from activities on the site.	0	-3	-3.0	-2	-2.0	-2	-2.0	MED
Ongoing Maintenance and Management Costs	What are the likely comparative costs of operating and maintaining the proposed regional park.	0	-3	-4.5	-2	-3.0	-1	-1.5	HIGH
Flexibility - ability to phase and scale stages of development	All options include a high degree of program and staging flexibility given the large scale of the site.	0	3	4.5	3	4.5	3	4.5	HIGH
Opportunities for compatible economic use (cultural economy, education & eco tourism)	Does the option provide opportunity for economic activities that could provide initial and ongoing capital to help support the park development.	1	3	3.0	2	2.0	1	1.0	MED
Connections to wider economy - Waka tours etc	Could the option accomodate activities and businesses that can contribute positively to the wider economy - cultural and nature tourism, accommodation, education that can draw people to the region and support other local businesses.	0	2	1.6	2	1.6	1	0.8	LOW
Room for future diversification of economic uses (recreation, energy, food and fibre)	Allowing space for activities such as manufacturing of compatible products (eg rongoa, food and fibre), solar installations, spas, nature/cultural retreats etc.	3	3	2.4	2	1.6	1	0.8	LOW

Te Whanga Tangata | Healthy Communities		**0.1**	**2.3**	**3.5**	**2.2**	**3.3**	**1.5**	**2.3**	HIGH
Supports kaitiakitanga for Mana Ahuriri	Can the project provide opportunity to practise, learn and teach traditional kaitiaki tikanga for both Mana Ahuriri, manuhiri and the wider community. Through the Joint Committee it is expected Mana Ahuriri will play a key role in the planning, construction and management of the regional park.	0	1	1.5	2	3.0	2	3.0	HIGH
Allows Passive recreational opportunities	How much opportunity is provided for passive activates such as walking, running, biking, fishing, bird watching, picnics and other informal recreational.	0	3	4.5	2	3.0	1	1.5	HIGH
Allows Active recreation opportunities	How much opportunity is provided for active activates such as organised sports, mountain bike skills and pump tracks, disk golf or others.	0	3	2.4	2	1.6	0	0.0	LOW
Provision of multiple community gathering spaces	Does the proposal offer multiple nodes of across the site that can be used for community gathering spaces.	0	3	3.0	2	2.0	1	1.0	MED
User experience - connection to te taio	What degree of wilderness experience will the proposal offer. Will you feel immersed in nature and te taio when you are visiting the park.	1	1	1.5	2	3.0	3	4.5	HIGH
Accessibility to full site area (vs ecological protection)	How much of the site will be accessible to visitors vs areas of restricted access to reduce adverse disturbance of the ecological values.	0	3	2.4	3	2.4	2	1.6	LOW
Constructability & Resilience		**0**	**-2**	**-1.7**	**-1.0**	**-1.0**	**0.3**	**0.3**	MED
Level of construction challenge / complexity (horizontal land development works outside of the wetland areas)	How difficult (and costly will it be to build the proposed horizonal infrastructure such as roads & electrical and 3 waters services in the identified locations considering flooding hazards, access and geotechnical issues.	0	-2	-2.0	-1	-1.0	-1	-1.0	MED
Provides for positive sustainability outcomes (carbon emissions etc during construction)	Can the construction be undertaken in a manner that provides positive sustainability outcomes during construction. This will largely be driven by the potential amount and type of built forms (roading, servicing, bulk earthworks required)	0	-2	-3.0	-1	-1.5	1	1.5	HIGH
Vertical development location suitablity to site ground conditions.	How difficult (and costly will it be to build the proposed vertical infrastructure such as buildings and other built elements in the identified locations considering flooding hazards and geotechnical issues.	0	-1	-0.8	-1	-0.8	1	0.8	LOW
Consenting and Approvals		**0**	**0.0**	**0.0**	**-0.3**	**0.0**	**-0.7**	**0.0**	**HIGH**
Compatibility with Airport Operational zones and flight paths	Does the proposal locate facilites near or within airport flight paths/operational zone that will be sensitive to noise effects or increase bird strike risk factors.	0	1	1.5	-1	-1.5	-2	-3.0	HIGH
Consenting pathway / activity status	What consenting challenges will the proposal trigger, how much risk will there in seeking relevant consents, approvals and authorities.	0	-1	-1.5	-1	-1.5	-2	-3.0	HIGH
Sub Rows		31	36	34	41	34	43		
Category Headings		5	7	6	9	6	10		

Magnitude	Definition	Score
Large positive (+ve)	Major positive impacts resulting in substantial and long-term improvements or enhancements of the existing environment.	3
Moderate positive (+ve)	Moderate positive impact, possibly of short-, medium- or long-term duration. Positive outcome may be in terms of new opportunities and outcomes of enhancement or improvement.	2
Slight positive (+ve)	Minimal positive impact, possibly only lasting over the short term. May be confined to a limited area.	1
Neutral	Neutral – no discernible or predicted positive or negative impact.	0
Slight negative (-ve)	Minimal negative impact, possibly only lasting over the short term, and definitely able to be managed or mitigated. May be confined to a small area.	-1
Moderate negative (-ve)	Moderate negative impact. Impacts may be short, medium or long term and are highly likely to respond to management actions.	-2
Large negative (-ve)	Impacts with serious, long-term and possibly irreversible effect leading to serious damage, degradation or deterioration of the physical, economic, cultural or social environment. Required major rescope of concept, design, location and justification, or	-3

MCA Outcomes

Based on the assigned criteria Option 1 with a focus on recreation, cultural and economic activity scored lowest. Option 2 and 3 that put more priority on ecological outcomes scored more positively with Option 3 marginally higher. This aligned with general preferences expressed by both the TAG and JC groups and reinforced the selection of option 3 to carry forward as the preferred scheme



AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI

CLIMATE CHANGE RISK ASSESSMENT

He mea whakarite maim ō te rohe o Te Matau a Māui

Prepared for the Hawke's Bay Region

Arotake Tūraru Panonitanga ā-Āhuarangi ki Te Matau-a-Māui

Hawke's Bay Regional Climate Change Risk Assessment

Prepared by Urban Intelligence

Revision	Description	Date
Version 0.1	Discussion Document	3 September 2024
Version 1.0	Draft Regional Climate Change Risk Assessment	13 January 2025
Version 2.0	Draft Regional Climate Change Risk Assessment, reflecting feedback from council staff review.	24 February 2025
Version 2.1	Minor updates and revisions. Figure updates.	17 March 2025
Version 2.2	Minor updates and revisions.	24 March 2025
Version 2.3	Updating executive summary and minor word changes	14 April 2025
Version 2.4	Updates to references	5 May 2025

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AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI KI TE MATAU-A-MĀUI | HAWKE'S BAY REGIONAL CLIMATE CHANGE RISK ASSESSMENT

01

Whakarāpopototanga Matua | Executive Summary

URBAN INTELLIGENCE

Whakarāpopototanga Matua | Executive Summary

This report presents the findings of a regional climate change risk assessment for the Hawke's Bay region. It aims to increase understanding of the broad range of climate change risks the region faces, now and over the longer term. It is a report for everyone; councils, iwi/hapū, local communities, sectors, businesses and individuals.

This first pass risk assessment is a starting point. It brings together best available, suitable information and evidence to provide a comprehensive snapshot in time about how the impacts of a changing climate will likely be experienced across the region. This report includes an overview of risks at a regional and district level, using a consistent analytical approach while acknowledging the variations in underlying data. The findings of this assessment therefore provide a foundational, evidence base to support risk-informed decisions and adaptation planning across the region.

This report is the first regional assessment of climate change risks for Hawke's Bay. It synthesises existing data and knowledge with expert analysis to provide a comprehensive understanding of how natural hazards and climate change may affect the region. While understanding of climate change will continue to evolve, this assessment provides a foundation for managing these risks while identifying knowledge gaps that can be addressed through future work.

Adaptation is a locally-led process of managing risks over time. It is a continuous process, one of assessing risks, planning, implementing, monitoring and adjusting as needed. This regional assessment identifies hazards and a broad range of climate-related risks; assessing risks is an important foundation for adaptation action (Figure 1.1). Yet, as the Climate Change Commission acknowledged in 2024, Aotearoa New Zealand is not moving at the pace required to address the critical climate issues facing our communities. This risk assessment provides the communities of Hawke's Bay an opportunity to take decisive steps toward addressing these critical climate-related challenges.

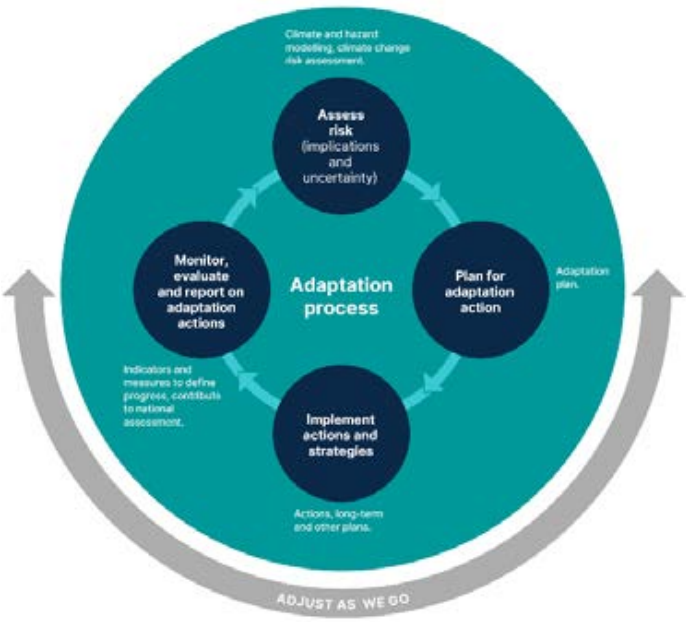


Figure 1.1. The Adaptation Process.

Risk Informed Decision Making

Climate change poses significant and increasing risks to communities and to the built and natural environments across Hawke's Bay. Councils and communities are familiar with managing risk posed by natural hazards, but climate change is impacting many of the assumptions underpinning our way of life, including how and where we live.

Risk arises when there is uncertainty about how something a community or individual cares about might be affected, recognising that different individuals and communities may have diverse priorities and objectives. That is, risk is the potential for and severity of consequences in the presence of uncertainty. Following best practices as outlined by the Ministry for the Environment's guidance and international standards, this assessment incorporates both quantitative and qualitative methods and includes:

- consideration of multiple hazards (including coastal flooding, river and rainfall flooding and landslide)
- use of the latest climate projections and sea-level rise scenarios. Following recommendations from the First National Adaptation Plan and updated Coastal Hazards and Climate Change Guidance, SSP2-4.5 and SSP5-8.5 scenarios were applied and projected out to 2040 and 2090, and 2130
- assessment of elements such as residential, commercial and industrial buildings, roads, three waters infrastructure, socioeconomic metrics including deprivation index, employment and GDP contribution
- incorporation of local knowledge and values, and
- assessment of risks across value domains (Natural Environment, Built Environment, Human, Economic, Governance and Iwi/Māori).

This risk assessment is also based on current information about the present state i.e. it does not account for future changes in land-use, investment in risk reduction measures or population changes. This is why risk assessments must be periodically undertaken as part of the iterative adaptation process whereby risks change over time[1].

This assessment provides a foundation for understanding climate risks while highlighting opportunities to enhance hazard modelling, climate information, and other related data. Currently, hazard modelling varies significantly between districts in methodology, coverage, and how it accounts for risk reducing measures (e.g. flood protection). This variability in datasets means it is not possible to make direct comparisons of findings in this assessment between different districts.

[1] For example, the National Climate Change Risk Assessment is undertaken every six years.

Hazard Data Limitations and Opportunities

This assessment provides a foundation for understanding climate risks while identifying data limitations that present opportunities for improvement. Currently, hazard modelling varies significantly between districts in methodology, coverage, and how it accounts for risk-reducing measures (e.g., flood protection).

As shown in Table 1-1, the availability and quality of hazard data differs across the region, with some districts having detailed information for certain hazards while others have gaps. This being the case, the assessment should not be used to compare risk between the districts. Instead, it identifies risks within each district that need attention.

Developing consistent, comprehensive climate-related hazard modelling would strengthen future risk assessments and enable more nuanced vulnerability analysis beyond the exposure assessment presented here. This presents a key opportunity for regional collaboration to build a stronger evidence base for adaptation planning and prepare for the changing climate.

Table 1-1. Summary of Hazard Data Availability and Suitability Across Hawke's Bay Districts

Hazard	Central Hawke's Bay	Hastings	Napier	Wairoa	Regional Consistency
Coastal Flooding	Limited (extent only)	Moderate (multiple datasets)	Moderate (multiple datasets)	Limited (extent only)	Varying methodologies and timeframes
River & Rainfall Flooding	Moderate (includes climate scenario)	Low (limited coverage, no climate scenarios)	Moderate (flood depths, single timeframe)	Low (2007 data, no climate scenarios)	Incompatible return periods and scenarios
Shallow Groundwater	No suitable data	No suitable data	Moderate (current day only)	No suitable data	Substantial data gap
Landslides	Moderate (susceptibility mapping)	Moderate (susceptibility mapping)	Moderate (susceptibility mapping)	Moderate (susceptibility mapping)	Consistent approach, but lacking climate change
Coastal Erosion	No suitable data	High (detailed mapping)	High (detailed mapping)	No suitable data	No suitable data available for Central Hawke's Bay or Wairoa
Liquefaction	No suitable data	Moderate (three scenarios)	High (three scenarios)	No suitable data	No suitable data available for Central Hawke's Bay or Wairoa
Tsunami	Low (extent only)	High (multiple scenarios)	High (multiple scenarios)	Low (extent only)	Varying detail and scenarios
Wildfire	No suitable data	No suitable data	No suitable data	No suitable data	No suitable data

Suitability ratings: "High" indicates comprehensive data suitable for adaptation planning; "Moderate" indicates partial data with some limitations; "Low" indicates minimal data with significant limitations; "No suitable data" indicates absence of data appropriate for adaptation planning.

Key Regional Assessment Findings

Climate Change is projected to substantially alter meteorological patterns and environmental conditions in the Hawke's Bay Region in the coming decades, with significant implications for the human, built and natural environments. Ex-tropical cyclones are likely to become more intense, packing stronger winds and heavier rainfall. Fire seasons will get longer and more dangerous, with increased risks of wildfires. Droughts will become more common, putting additional stress on primary industries and water resources. The region will see more hot days and fewer overnight frosts. This means warmer temperatures overall, which will affect everything from farming to local wildlife.

Natural Environment. Climate change will exacerbate existing threats to Hawke's Bay biodiversity. These can include increased pressures from mammalian predators, faster spread of invasive species, accelerated habitat loss and fragmentation, and increased sedimentation in waterways following extreme rainfall events. Native species already under pressure will face additional stresses as temperature and rainfall patterns shift. Marine environments will experience rising temperatures, ocean acidification, and sea level rise, affecting coastal habitats and marine species.

Built Environment. Some of the region's buildings and infrastructure face increasing risks from multiple hazards. Coastal flooding will progressively impact more assets as sea levels rise, particularly in low-lying urban areas. River and rainfall flooding poses immediate and increasing risks to commercial, residential, and industrial buildings across all districts. Infrastructure networks including transportation, electricity distribution, and three waters systems show substantial exposure, with potential for cascading failures during extreme events.

Human Domain. Climate change will impact community wellbeing through both direct exposure to hazards and indirect effects on social systems. Vulnerable populations, including those in areas of higher socioeconomic deprivation, face disproportionate risks from flooding and isolation. Mental health impacts are expected to increase from both acute disaster events and chronic stressors like drought or recurring floods. Community cohesion may be challenged as climate impacts affect liveability in certain areas. Access to essential services could be compromised during hazard events, with isolation risks particularly high in rural areas.

Economic Domain. The regional economy faces significant disruption from climate change, with both direct damage to assets and broader challenges to tourism, industries, manufacturing and the service sector region wide. Primary industries including agriculture, horticulture and forestry will experience shifting seasonal patterns affecting production cycles, increased water stress during critical growing periods, and greater risks from extreme weather events. Manufacturing, retail, and service sectors face substantial risks from infrastructure disruption and isolation, potentially affecting supply chains and workforce availability. Tourism may experience both challenges from extreme events and opportunities from longer summer seasons.

Governance Domain. Climate change presents complex challenges for the region's governance domain. Unmitigated climate impacts may be perceived by communities as a failure of authorities to protect property and life, eroding trust in governing institutions. This erosion will be accelerated where impacts exacerbate existing socioeconomic inequities. Key governance challenges include balancing immediate priorities with long-term planning, working across traditional disciplinary boundaries, and maintaining progress through political cycles. The potential for misalignment between national policy frameworks and local implementation capacity creates additional complexity, as councils must translate broad strategic direction into practical local actions with limited resources. The increasing frequency of emergency response operations further strains governance capacity and potentially diverts resources and funds from adaptation planning.

Iwi/Māori Domain. Māori in the region face unique exposure, risks and sensitivities to climate change. Key hazards as identified in this assessment are river, rainfall, and coastal flooding. The harms associated with being exposed to these hazards can be exacerbated by the existing health and socioeconomic inequities that many Māori experience. Such hazards can undermine Māori cultural wellbeing through the degradation of and/or loss of connection to the natural environment and damage and/or loss of cultural sites and associated practices.

Key Findings for the Central Hawke's Bay District

- **River and rainfall flooding risk is the most severe hazard influenced by climate change for Central Hawke's Bay** with commercial properties and residential properties exposed.
- **Three waters infrastructure is susceptible to flooding,** with stormwater pipes exposed.
- **Limited direct exposure to landslides**, with the greatest risk being to industrial buildings. Isolation associated with landslides, however, is a risk for residents.
- **Multiple sectors face disruption and damage from climate-related events**
  - The agriculture sector faces isolation risk from landslides
  - The transport sector shows exposure to river and rainfall flooding
  - The manufacturing sector is vulnerable to multiple hazards, including landslide isolation risk.
- **Increasing risk of economic shocks and disruption from seasonal variability,** with a 3.0–3.5°C temperature increase by 2081-2100 under SSP3-7.0 and significant seasonal rainfall changes affecting primary industries.
- **Areas of high-moderate deprivation are more exposed to flooding and isolation risks**. Areas of lower deprivation (NZDep1-4) are more exposed to landslides and isolation associated with landslides.

Key Findings for the Hastings District

- **River and rainfall flooding risk is the most severe hazard for Hastings**, with commercial properties, and residential properties exposed and a high proportion of the population at risk of isolation.
- **Notable exposure of three waters infrastructure**, with the wastewater treatment plant, stormwater infrastructure and wastewater infrastructure directly exposed to more than 10cm of flooding from river and rainfall.
- **Coastal flooding exposure is increasing** with climate change, affecting residential properties
- **Landslides** are a significant source of isolation risk, with the potential to isolate residents, largely in rural areas. Landslide exposure is concentrated in less deprived areas, with the majority of exposed properties located in NZDep1-2 areas.
- **River and rainfall flooding poses the greatest risk to local economic activity**, with commercial and service sectors facing the greatest risk of direct exposure and isolation.
- **Areas of high deprivation are more exposed to flooding and isolation risks,** with those living in areas of high deprivation (NZDep7-10) the most directly exposed to more than 10cm of river and rainfall flooding, and at greatest risk of isolation.
- **Increasing risks to communities and primary sector industry from an increase in temperatures,** with a projected **3.1°C temperature increase** by 2100 under SSP3-7.0, leading to more hot days (>25°C) annually and a decrease in winter rainfall.

Key Findings for Napier City

- **Coastal flooding is a significant and increasing risk.**
- **River and rainfall flooding also poses a significant risk** to the built environment including lifeline infrastructure, residential properties, commercial properties and industrial buildings.
- **Three waters infrastructure is significantly vulnerable to all types of flooding**, particularly water supply in a 1% AEP river and rainfall flood event, and wastewater exposure to coastal flooding by 2100 (SSP2-4.5).
- **High risk of business isolation during river, rainfall, and coastal flooding**, with the potential for significant disruption to Napier's economy, even in areas not directly flooded.
- **Increasing risk of economic shocks and disruptions from seasonal variability** with a 3.0–3.5°C temperature increase by 2081-2100 under SSP3-7.0, and increased water stress affecting primary industries.
- **Areas of high deprivation are more exposed to flooding and isolation risks**, with those living in areas of high deprivation (NZDep7-10) the most directly exposed to more than 10cm of river and rainfall flooding and coastal flooding.

Key Findings for the Wairoa District

- **River and rainfall flooding is the most severe hazard**, affecting residential properties and the manufacturing sector.
- **High risk of business isolation during landslide events**, particularly for primary industries and mining operations.
- **Three waters infrastructure** (including pipes and components such as pump stations) **is significantly exposed to river and rainfall flooding**.
- **Increasing risk of economic shocks and disruption from seasonal variability**, and significant seasonal rainfall changes affecting primary industries.
- **High population vulnerability to hazard impacts** and cascading risks due to low-income levels, dispersed population and isolation exposure. Significant number of residents exposed to more than 10cm of river and rainfall flooding. High proportion of residents exposed to more than 10cm of coastal flooding (by 2130 SSP5-8.5) are living in areas of high deprivation (NZDep9-10).
- **Limited natural hazards modelling** makes climate change adaptation planning challenging.

Next Steps and Opportunities for Further Action

This assessment provides a foundation for understanding climate risks in Hawke's Bay while highlighting opportunities for continued development of the region's climate adaptation capacity. Key opportunities include:

Enhancing the regional evidence base: Developing consistent hazard modelling across districts would substantially strengthen future risk assessments and adaptation planning. Priorities include comprehensive flood modelling, coastal assessments, groundwater monitoring, and improved understanding of infrastructure vulnerabilities.

Supporting infrastructure resilience: Continued collaboration with lifeline providers and the Hawke's Bay Lifelines Group to examine interdependencies between critical systems will strengthen regional resilience planning.

Enabling Māori-led adaptation: The findings can support climate adaptation and resilience kaupapa across the region by weaving together mātauranga Māori with technical assessments to strengthen understanding of climate risks.

Integrating climate risk considerations: Councils and organisations can embed climate risk considerations into operations and long-term strategies through regional guidelines, monitoring frameworks, and collaborative initiatives.

Empowering locally-led action: Each district can deepen their understanding through local assessments of vulnerable infrastructure and community engagement to define adaptation priorities and risk tolerances that reflect local values.

This risk assessment marks a critical starting point in Hawke's Bay's climate adaptation journey. By identifying risks and data gaps, it creates a foundation for coordinated, evidence-based action across the region. As the Climate Change Commission acknowledged in 2024, Aotearoa New Zealand is not moving at the pace required to address the critical climate issues facing our communities. This risk assessment provides the communities of Hawke's Bay an opportunity to take decisive steps toward addressing these critical climate-related challenges. Through combining regional leadership with locally-led adaptation planning—informed by consistent, high-quality hazard data and meaningful community engagement—Hawke's Bay can build the resilience needed to thrive in a changing climate.

AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI KI TE MATAU-A-MĀUI | HAWKE'S BAY REGIONAL CLIMATE CHANGE RISK ASSESSMENT

02

Kupu whakataki Introduction

URBAN INTELLIGENCE

1 Introduction

1.1 Purpose and scope

This report presents the findings of the first regional climate change risk assessment for the Hawke's Bay region. It aims to increase understanding of the broad range of climate change risks the region faces, now and over the longer term. It is a report for everyone; councils, iwi/hapū, local communities, sectors, businesses, and individuals.

This first pass risk assessment is a starting point. It synthesises the best available suitable information and evidence and aims to provide a comprehensive snapshot in time of what is known right now about the ways that the impacts of a changing climate will likely be experienced across the region. The report includes an overview of risks at a regional and district level, with selected hazards analysed using a consistent methodology while recognising the variations in data quality and coverage between districts. The findings of this assessment therefore are the first step in providing a foundational evidence base to support risk-informed decisions as well as adaptation planning and asset management planning across the region.

While there are key findings for each district, this initial assessment is focused on establishing a **structured approach to climate risk assessment to enable and accelerate further risk assessment and adaptation planning at both local and regional levels.** As such, this first pass assessment does not compare or prioritise the risks identified at regional and district levels, nor does it identify risks at a more localised or property scale. This report also does not extend to the next step of making recommendations for councils or communities on what the appropriate adaptation responses are to address risks discussed in this report.

The nature of the information available to inform this first assessment means the focus is on the exposure of people and assets to climate-exacerbated natural hazard events. This focus does not cover all natural hazard events, for example earthquakes, tsunami, volcanoes and is limited by available information in others such as wildfire. Nor does it provide detailed exposure and vulnerability analysis of ecosystems, including how ecosystem services will be affected by climate change and what impacts that will have on people and assets.

Despite variations in available datasets for each district, a consistent approach has been taken to assess risk. Coastal flooding, river and rainfall flooding, and landslides were selected as the hazards to analyse at a district level. Specifically, this assessment:

- evaluates the exposure and potential impacts to selected climate hazards on elements within the Hawke's Bay region
- considers both current and future risks under different climate change scenarios, including relative sea-level change projections specific to the Hawke's Bay region (where data is available)
- assesses social and environmental implications alongside physical and economic impacts.

While a consistent approach has been taken to assess risk, the variability of available hazard data means that the district-level findings in this report cannot be directly compared.

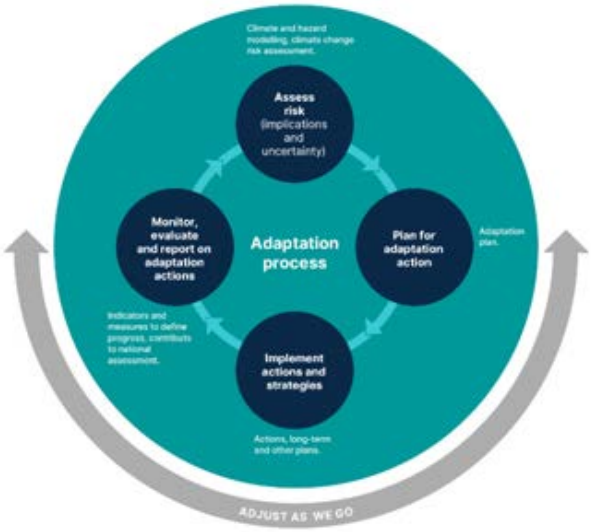


Figure 1.1. The Adaptation Process

1.2 The role of climate change risk assessments

Risk assessments provide decision-makers with an evidence base to support and inform future planning, identifying what is known as well as what is unknown. The findings of this risk assessment will support councils and communities within Hawke's Bay to make decisions about prioritisation of risks, and adaptation actions to reduce these risks. It will also support the region to capitalise on adaptation opportunities that arise in the process of adjusting to a changing climate.

Adaptation: A locally-led process

Adapting to climate change is a process of managing risk over time – of identifying hazards, putting in place plans to address prioritised risks, implementing adaptative plans (including adaptation solutions or options) and evaluating how effective action has been in reducing risks over time (Figure 1.1).

Understanding risk is an ongoing process because information about hazards and the trajectory of climate change continues to change. This assessment builds on previous work on climate hazards, including coastal hazards, flooding risks and climate projections for the region. It integrates this information with other sources to form a greater understanding of the range of climate risks for Hawke's Bay. As more data is gathered, and actions are taken to reduce risks over time, the regional and district risk profiles are expected to change.

While national-level planning and frameworks are crucial for enabling adaptation, climate impacts are felt locally, and effective adaptation ultimately requires local action. The Climate Change Commission's 2024 report on adaptation progress emphasises that "existing legislative, planning, and decision-making frameworks are not well-suited to planning for and dealing with changing and uncertain risks from climate change" [1]. In this context, local risk assessments and adaptation planning become even more critical.

This first assessment is a key step in the region's journey of adapting to the impacts of climate change and is an important example of local-level action in the face of global and national-level challenges.

Why conduct risk assessments?

Risk assessments help communities and decision-makers understand what is at stake, where vulnerabilities exist, and what they need to know more about. By systematically evaluating hazards and their potential impacts, they highlight priorities and reveal important knowledge gaps. This information provides a foundation for local climate adaptation planning.

While often presented as sequential steps, the Ministry for the Environment's (MfE) ten-step decision cycle (Figure 1.2) is best understood as an iterative process where steps can overlap and be revisited as understanding deepens [2]. The cycle begins with setting context and preparing (Step 1) and assessing hazards (Step 2), and these initial assessments are typically refined through community engagement about values and objectives (Step 3) which then inform more detailed risk assessments (Step 4).



Figure 1.2. MfE's 10-step decision cycle for climate and coastal adaptation planning [2].

This report addresses elements of Steps 1 through 4. It provides a robust technical foundation by systematically analysing available hazard information and evaluating potential impacts across the region. However, it is recognised that further community engagement will be needed to fully understand local values, vulnerabilities, and priorities.

The findings presented here should therefore be viewed as a living document that will evolve as:

- detailed local hazard information becomes available
- communities share their knowledge and priorities
- understanding of vulnerabilities deepens through engagement
- adaptation planning progresses through later steps in the cycle
- implementation of adaptation plans reduce risk.

This approach allows for immediate progress on understanding and addressing climate risks while acknowledging that adaptation planning is an ongoing process that requires regular review and adjustment as circumstances change.

2 Context

2.1 Risk in a climate change context

Describing risk

Climate change poses significant and increasing risks to communities and natural environments across Hawke's Bay. Councils and communities are familiar with managing risk posed by natural hazards, but climate change is impacting many of the assumptions underpinning our way of life, including how and where we live.

Extreme weather events like flooding, ex-tropical cyclones and other climate-related natural hazards are expected to worsen over time, with changes in frequency and increases in severity. Climate change also poses other challenges, like slow on-set changes (such as sea-level rise) and shifts in seasonal weather patterns and variability (such as hotter days, longer wet seasons). Understanding the different risks posed by climate change is critical to knowing where, when, and how to take action to prepare for a changing climate. These changes require proactive planning and adaptation to reduce their negative impacts and maximise opportunities.

Risk arises when something of value may be impacted. That risk is the potential for and severity of consequences in the presence of uncertainty [3]. Figure 2.1 illustrates how hazards/changes can impact elements or assets that a community cares about, and how they might intervene to reduce or manage the risk.

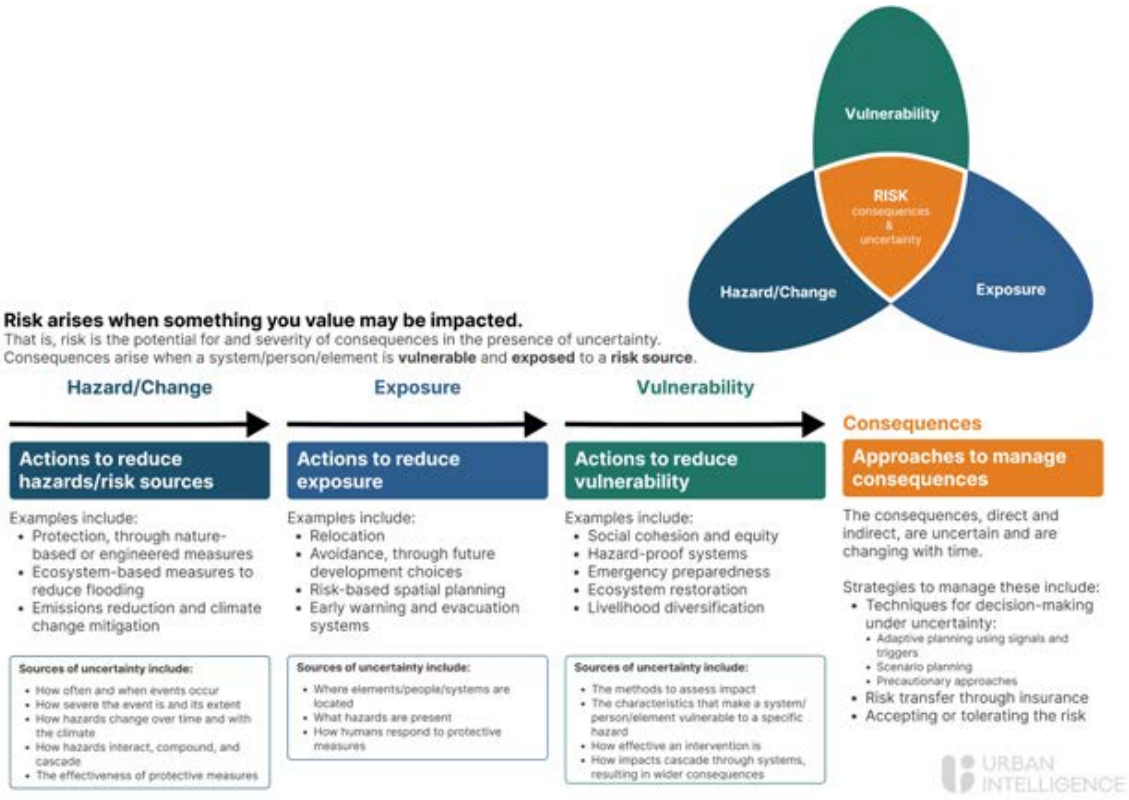


Figure 2.1. Risk arises when something valued could be impacted. That risk is the combination of consequences and uncertainty. In a natural hazards and climate change context, consequences arise when something that is vulnerable is exposed to a hazard or change. Risk can be reduced by intervening at each of these stages or it can be accepted or managed.

Elements, exposure and vulnerability

For physical hazards, risk for an event is assessed as a function of an element's exposure to a hazard, the intensity of that exposure, and the element's characteristics that make it vulnerable. In simplified terms, risk exists when an element you care about may be impacted by a hazard or change. Both qualitative and quantitative information can be used to assess the exposure and vulnerability of elements from different climate hazards.

- **"Elements"** is a catch-all term for things of value: people, built assets, taonga, species, ecosystems, or sectors
- An element is **exposed** when it is in the presence of a hazard or change
- An element is **vulnerable** when its characteristics make it more likely to be adversely impacted by a hazard/change, due to increased sensitivity or lack of adaptive capacity.

Direct and indirect impacts

This risk assessment assesses both **direct** risks and impacts and **indirect, cascading or compounding** risks/impacts (Figure 2.2). These secondary risks and impacts are complex and multi-dimensional and often correlate to how vulnerable natural and human systems are, rather than the original hazard. The distribution of direct and indirect impacts between socio-demographic groups and economic sectors

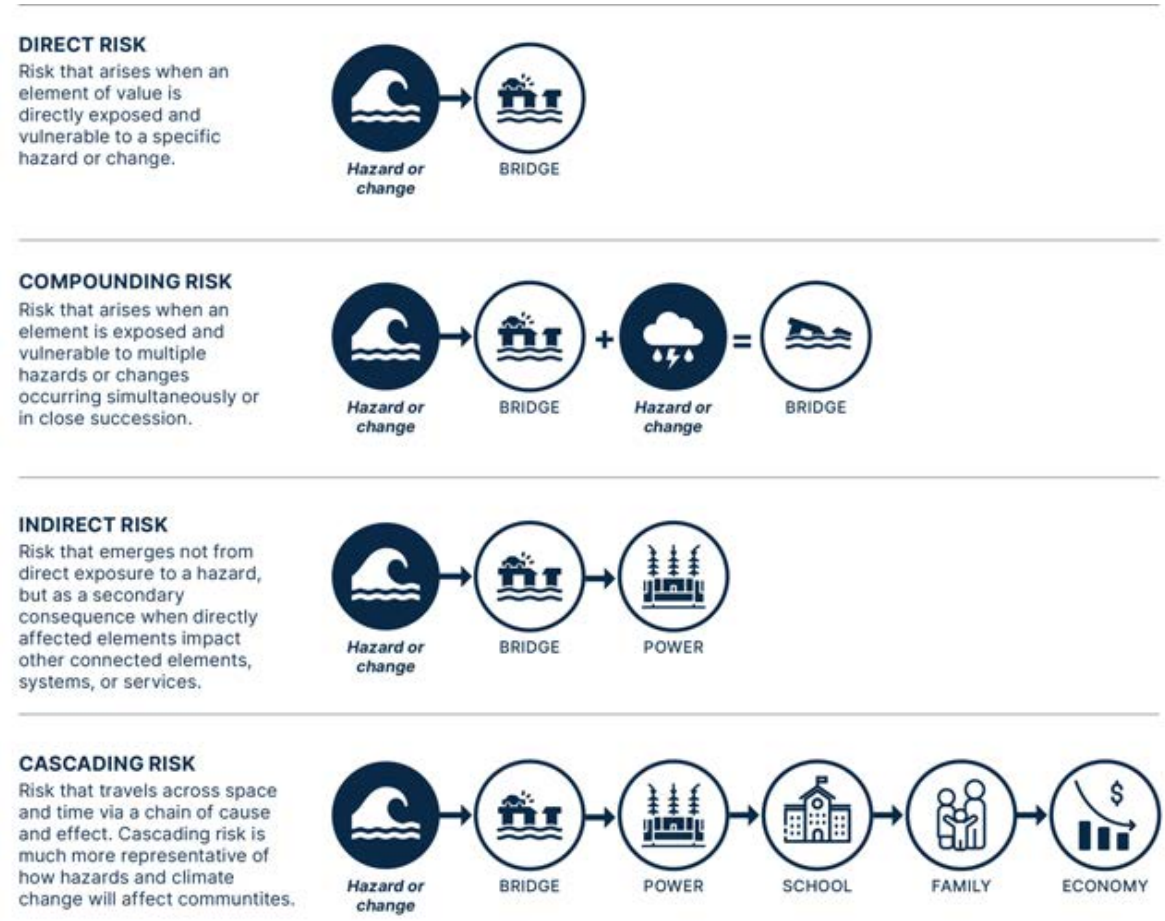


Figure 2.2. Illustration of different types of climate risks. Direct risks are immediate impacts from a hazard (e.g. flood damage to a road), while indirect risks are secondary effects (e.g. communities being isolated due to the damaged road). Cascading risks show how impacts can trigger chain reactions across different systems (e.g. road damage leading to community isolation, which affects access to healthcare and essential services). Compounding risks occur when multiple hazards or impacts overlap and interact to create more severe consequences (e.g. a storm surge coinciding with heavy rainfall and high tide).

helps to evaluate intervention options. These groups have varying sensitivity and adaptive capacities to the hazards they may experience, which needs to be considered when prioritising adaptation actions.

Cascading risks refer to the chain reactions of impacts that can occur across different domains and systems, often resulting in consequences that are far more severe and wide-reaching than the initial impact. For example, one quantitative way of capturing indirect risk is if a road is damaged, then the potential isolation of communities is considered.

The indirect and cascading risks in this first pass risk assessment were further evaluated through workshops with technical experts from councils and lifeline representatives. The potential implications of these identified direct and indirect risks being realised, including how they may interact and cascade through other domains, has been explored at a high-level in this first pass assessment.

Cascading impacts can be orders of magnitude higher than direct risk alone and often relate to what communities' value most. This means that actions and priorities may change significantly when cascading risks are taken into account.

As noted in MfE guidance [2], assessment of climate risks is inherently complex and uncertain. Local government needs to cope with rising risks that cascade and compound at a distance from the hazard drivers and those emerging in many different areas simultaneously. This approach to risk assessment, considering cascading impacts, allows for a more comprehensive understanding of potential climate change impacts and informs more effective adaptation strategies.

2.2 International context

Aotearoa New Zealand is a signatory to several international agreements that support action to reduce vulnerability and enhance resilience, including:

- the Sendai Framework for Disaster Risk Reduction 2015-2030 [4]
- the 2030 Agenda for Sustainable Development [5]
- agreements under the United Nations Framework Convention on Climate Change (UNFCCC), including the Paris Agreement. [6]

The Paris Agreement, in seeking to strengthen the global response to climate change, reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees [6]. Article 7 of the Paris Agreement defines a global goal on adaptation to enhance adaptive capacity and resilience and to reduce vulnerability, with a view to contributing to sustainable development. The Agreement requires all Parties to engage in adaptation planning and implementation.

2.3 National context

Legislative frameworks for adaptation

Successfully addressing climate risks requires coordinated progress across multiple sectors and levels of government. This assessment aligns with the existing national legislative and policy framework for climate adaptation. It provides councils with an evidence base for reporting requirements and demonstrates consistency with national frameworks for adaptation action.

- **The Resource Management Act 1991** [7] requires local authorities to have particular regard to the effects of climate change in relation to managing the use, development, and protection of natural and physical resources [1]. When preparing or changing a regional policy statement, regional plan or district plan, councils must have regard to any emissions reduction and national adaptation plan produced under the Climate Change Response Act 2002. There are also requirements relating to the management of significant risks from natural hazards[1].
- **The Climate Change Response Act 2002** [8] sets out New Zealand's legislative framework for

[1] Where required, "having regard" means giving the matter genuine attention before deciding on how to reflect the matter in planning decisions, and in most cases, providing a reason for how the matter was considered.

developing and implementing climate change policies in line with international commitments. It requires the Government to develop and implement policies for climate change mitigation and adaptation, including by producing National Climate Change Risk Assessments to identify New Zealand's most significant risks, and developing National Adaptation Plans that respond to these risks.

- **Section 5ZW of the Climate Change Response Act 2002** [8] specifically requires local authorities to provide information on climate change adaptation, when requested by the Minister of Climate Change, including risks and opportunities arising from climate change, the processes used to identify, assess and manage risks and effects, and the metrics and targets used in related processes.
- **The Local Government Act 2002** [9] requires councils to prepare 30-year infrastructure strategies to manage its infrastructure assets, by identifying and managing natural hazard risks and making appropriate financial provision for those risks.
- **The New Zealand Coastal Policy Statement 2010 (NZCPS)** [10] requires local authorities to identify areas in the coastal environment that are potentially affected by coastal hazards and assess these risks looking out to at least 100 years in the future, having regard to the effects of climate change.
- **The National Policy Statement for Urban Development 2020** [11] includes an objective that New Zealand's urban environments are resilient to the current and future effects of climate change.
- **The National Climate Change Risk Assessment 2020 (NCCRA)** [12] identifies priority climate change risks for New Zealand over a six-year period across five value domains (natural environment, human, economy, built environment and governance).
- **The National Adaptation Plan 2022 (NAP)** [13] contains New Zealand's national adaptation strategy and sets out the government's six-year plan (actions) in response to the risks identified in the NCCRA. This NAP includes a long-term adaptation strategy including national adaptation goals and, in addition to setting out the government's work programme, directs councils to use climate scenarios and downscaled climate projections to stress-test plans, policies and strategies.

2.4 Regional context

The Hawke's Bay Climate Action Joint Committee

The Climate Action Joint Committee was established after the 2022 local body elections to drive regional leadership and collaboration for climate action, including supporting the region to adapt to a changing climate. The Terms of Reference for the Joint Committee include overseeing the development of this regional climate change risk assessment as a key objective.

Other Hawke's Bay regional or joint committees with responsibilities for and governance oversight of climate related initiatives, include the:

- Regional Transport Committee
- Hawke's Bay Civil Defence Emergency Management (HBCDEM) Group Joint Committee
- Clifton to Tangoio Coastal Hazards Strategy Joint Committee
- Napier-Hastings Future Development Strategy Joint Committee.
- Ahuriri Regional Park Joint Committee.

Overview of current council-led climate adaptation work programmes

Hawke's Bay councils are working to respond to a changing climate through the delivery of regional and district-level work programmes, and support for community-led action. This includes several significant collaborative work programmes, including the Regional Water Security Programme, which is focused on ensuring long-term water security for the region, and the North Island Weather Event (NIWE) Flood Resilience Programme, which is delivering infrastructure repairs and upgrades following Cyclone Gabrielle in 2023. Flood scheme reviews and local stormwater/drainage upgrade projects are also underway to reduce direct flooding risks to assets and communities. NIWE funding is also enabling repairs and upgrades to bridges and roads to address isolation.

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The development of the Clifton to Tangoio Coastal Hazards Management Strategy 2120 [14] showcases how adaptation planning can address short, medium and long-term coastal hazard challenges, including sea-level rise. Biodiversity programmes, which include pest control, riparian planting, habitat restoration, and ongoing public education and engagement encourage community involvement in addressing climate challenges. Councils are also embedding climate change considerations in their Long-Term and Strategic Plans, Infrastructure Strategies, and Regional/District Plans, in addition to their operational decision-making and work programmes.



3 Method overview

This risk assessment follows best practices outlined in the MfE guidance and international standards, incorporating both quantitative and qualitative methods. Key components include:

- use of the latest climate projections and sea-level rise scenarios
- consideration of multiple hazards (including coastal flooding, landslide, and river and rainfall flooding)
- incorporation of local knowledge and values, and
- assessment of risks across value domains (natural environment, built environment, economy, human/social, and governance).

A detailed description of the methodology can be found in Appendix A1.

3.1 Use of future climate scenarios and projections

To understand potential future risks, the assessment uses internationally recognised climate scenarios that combine socioeconomic pathways (SSPs) with different greenhouse gas emission levels (RCPs). These scenarios help us explore how different social and economic developments might affect future climate change and our ability to adapt.

The scenarios range from optimistic futures with a strong sustainability focus to more challenging scenarios with higher emissions, as shown in Table 3-1. Most guidance documents discourage the use of the SSP1-1.9 scenario, as, while aspirational, it is not useful for planning coastal adaptation as emissions have surpassed the associated future warming range.

Table 3-1. The Shared Socioeconomic Pathways.

Scenario	Description	Estimated warming by 2100 (°C)
SSP1 – 1.9	A world that shifts towards a more sustainable path, focusing on inclusive development and respecting environmental boundaries.	1.0 – 1.8
SSP1 – 2.6	Similar to SSP1-1.9, but with slightly higher emissions. Still represents a sustainable pathway.	1.3 – 2.4
SSP2 – 4.5	A "middle of the road" future where trends broadly follow historical patterns.	2.1 – 3.5
SSP3 – 7.0	A future with regional rivalries, where countries focus on domestic issues due to concerns about security and competitiveness.	2.8 – 4.6
SSP5 – 8.5	A world that relies heavily on fossil fuels, with rapid technological progress and development of human capital.	3.3 – 5.7

3.2 Evidence base

This risk assessment focuses on the physical risk associated with climate change and does not address transitional risks associated with the shift to a low-emissions, climate-resilient society (such as changing migration patterns, shifts in supply chains, reduced international travel, and changes in consumer preferences) or external factors (such as geopolitical tensions, disruptions to supply chains due to climate change, migration or climate refugees, and other impacts beyond the borders of Hawke's Bay).

Direct and indirect risks are considered (Section 2.1) to provide an initial picture of what could happen and why it matters. For example, a flooded road might lead to isolated communities, which could then affect access to essential services and economic activity. This approach helps identify where adaptation efforts might be most needed and most effective.

Data collection and suitability

Urban Intelligence worked with Hawke's Bay Regional Council, the four District Councils and the Civil Defence Emergency Management (CDEM) Group to collect data for this assessment. While both regional and territorial authorities hold and maintain relevant datasets, under the Resource Management Act 1991 (RMA), regional councils have primary responsibility for natural hazards identification and modelling to inform land use planning. District councils often develop complementary hazard data for specific purposes such as stormwater management, though this data is not intended for broader natural hazard and resource management purposes due to differences in modelling parameters, coverage, or objectives.

To enable district-level analysis using a consistent methodology, coastal flooding, river and rainfall flooding, and landslides were selected as the hazards to analyse at a district level, based on data availability across the region.

Hazard data suitable for adaptation planning would ideally include:

1. Complete spatial coverage of the entire region or district
2. Detailed impact information showing hazard severity (e.g. flood depths, flow velocities)
3. Sufficient geographic detail enabling property-level decision making
4. Multiple environmental change increments rather than specific timeframes - this helps planners understand how hazards evolve with different levels of change rather than being tied to specific years, providing more flexibility in adaptation pathways
5. A range of event likelihoods from frequent to rare events - this spectrum helps communities make informed decisions about acceptable risk levels for different assets and functions
6. Sophisticated modelling approaches that accurately represent physical processes
7. Current data reflecting recent scientific understanding and physical conditions

Dataset Limitations

Variations exist in data quality and coverage across districts for use within risk assessment and long-term adaptation planning. For example, river and rainfall flood modelling approaches vary considerably in methodology and coverage (Table 3-2), making regional-scale comparison and analysis challenging. For instance, whether and how flood protection infrastructure is accounted for varies between the available models. This variation in modelling approaches means that the exposure figures presented for buildings and infrastructure should be interpreted as indicating areas of potential risk rather than as predictions of outcomes during specific flood events. Dataset variability means that direct comparisons cannot be made between the district-level findings.

These inconsistencies and data gaps highlight the need for coordinated investment in modelling and data collection to support future adaptation planning and decision-making. The available hazard data for each district provided for this assessment is further summarised in

Table 3-3. A comprehensive regional approach to flood and other natural hazard modelling would enable more effective adaptation planning and help ensure consistent standards of risk assessment across all districts (see Section 17 Next Steps and Further Opportunities).

This risk assessment is also based on current information about the present state i.e. it does not account for future changes in land-use, investment in risk reduction measures or population changes. This is why risk assessments must be periodically undertaken as part of the iterative adaptation process where risks change over time[1].

Table 3-2. Current river and rainfall flood modelling availability and suitability for climate change adaptation and natural hazard mitigation planning.

District	Coverage	Event Likelihood (Return Period)	Environmental Change or Scenario and Timeframe	Suitability for Adaptation Planning
Napier City	District-wide stormwater modelling	1%, 2%, and 10% AEP event	2100 RCP8.5	Moderate – only provides a single time period
Hastings District	Four centres	2% AEP	Present Day	Low - limited geographic coverage and scenarios
Wairoa District	Wairoa township	1% and 2% AEP events	Present Day	Low – modelling completed in 2007
Central Hawke's Bay	Three towns	1% and 10% AEP	Present Day & 2100 RCP8.5	Moderate - includes future scenarios but limited coverage

[1] For example, the National Climate Change Risk Assessment is undertaken every six years.

Table 3-3. Hazard data availability for selected hazards by district.

Council	Hazard	Event Likelihood (Return Period)	Environmental Change or Scenario and Timeframe
Napier City	Coastal flooding	1% AEP	0-2m SLR
	River and rainfall flooding	1% AEP	2100 RCP8.5
	Landslides	Susceptibility	Present Day
Hastings District	Coastal flooding	1% AEP	0-2m SLR
	River and rainfall flooding	2% AEP	Present Day
	Landslides	Susceptibility	Present Day
Wairoa District	Coastal flooding	1% AEP	0-2m SLR
	River and rainfall flooding	1% AEP	Present Day
	Landslides	Susceptibility	Present Day
Central Hawke's Bay	Coastal flooding	1% AEP	0-2m SLR
	River and rainfall flooding	1% AEP	Present Day & 2100 RCP8.5
	Landslides	Susceptibility	Present Day

Using spatial information to assess district-level risks

District-level risks are identified in this assessment by assessing the exposure of various elements to mapped hazards. Exposure analysis provides the first step of understanding potential impacts on residents, businesses, and economic activity. It is important for identifying areas that need attention to determine the sensitivity and adaptive capacity to these hazards, before estimating the potential consequences [2]. An element is exposed if it intersects with the spatial extent of a hazard. For flood models, water depths exceeding 10cm are considered for exposure. The exposure is calculated by overlaying element data with hazard maps.

To represent vulnerability in the human domain, this assessment incorporates the New Zealand Deprivation Index (NZDep)—a widely used composite indicator of relative socioeconomic disadvantage. NZDep combines data from the national census (including income, employment, housing, and education) to assign a deprivation score to small geographic areas (e.g. meshblocks or SA1s). Higher deprivation is understood to be associated with increased sensitivity to hazards and reduced adaptive capacity, making it a useful proxy for understanding where communities may experience greater hardship and face more challenges in recovering from climate-related impacts.

Exposure doesn't automatically equate to damage. Some exposed assets may be designed to withstand certain hazard levels without damage or disruption. For example, a building on raised foundations may be exposed to shallow flooding but experience no significant impacts. The vulnerability of each asset—its sensitivity to hazards and capacity to cope—determines whether exposure translates to actual harm.

This methodology identifies direct hazard exposure to infrastructure, but further work in identifying interdependencies is required to understand how a reduction in service here can affect unexposed infrastructure. For example, severe flooding may collapse bridges carrying fibre optic cables, resulting in the failure of otherwise unexposed cell phone towers.

Incorporation of local knowledge

The Hawke's Bay Climate Action Joint Committee Technical Advisory Group and relevant staff from across the five councils and CDEM provided valuable local knowledge and guidance throughout this assessment. Initial engagement with technical staff and lifelines representatives helped validate findings and identify regional and district-level risks. This assessment creates a foundation to accelerate future engagement by providing consistent baseline information to enable meaningful discussion about local impacts. The framework is designed to readily incorporate local knowledge, mātauranga Māori, and sector expertise as regional and local work programmes develop.

4 Papa kupu | Glossary

Term	Definition
Accommodate	Modifications to existing assets or systems to reduce their vulnerability to hazards while keeping them in place.
Accept	Consciously acknowledging certain risks without specific intervention, based on risk tolerance, cost-benefit considerations, or resource prioritisation.
Adaptation	The process of adjustment to actual or possible climate change and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities [15].
Adaptation Options (Risk Treatments)	Specific interventions, strategies, or approaches that may reduce risk, including avoid, retreat, accommodate, protect, and accept.
Adaptation Pathways	Sequences of adaptation actions over time that maintain flexibility to respond to changing conditions and new information.
Adaptive Capacity	The ability of systems, institutions, humans, and other organisms to adjust to potential or actual climate impacts, take advantage of opportunities, or respond to consequences. This includes access to resources, information, skills, and social networks that enable adaptation actions [15].
AEP	Annual Exceedance Probability. The probability that an event of a certain size will occur in a given year. Note that a 1% AEP event has approximately a 1-in-4 (26%) chance of occurring at least once within a 30-year period.
ANZSIC	A classification used across New Zealand and Australia to group together common types of industrial activity allowing comparison across sectors.
Avoid	Land-use planning and regulatory approaches that prevent new development or infrastructure in hazard-prone areas.
Built Environment Domain	The set and configuration of physical infrastructure, transport, and buildings.
Cascading Consequences	Consequences that propagate through interconnected systems, triggering impacts across different sectors, geographical areas, or timeframes beyond those initially affected.
Cascading Hazards	A sequence of hazards where an initial hazard triggers or exacerbates subsequent hazards, creating a chain reaction of events.
Cascading Risk	Risk that travels across interconnected systems, sectors, or geographies through chains of cause and effect, often amplifying in scope and scale beyond the initial

Term	Definition
	impact, over time. Cascading risk is much more representative of how hazards and climate change will affect communities.
Compound Hazards	The occurrence of multiple hazards affecting the same region simultaneously or in close succession, potentially creating impacts greater than the sum of individual hazards.
Compound Risk	Risk that arises when an element is exposed and vulnerable to multiple hazards or changes occurring simultaneously or in close succession.
Compounding Consequences	Consequences that intensify as multiple impacts interact, creating effects that are more severe than if each impact occurred in isolation.
Consequences	The outcome of an event or change, which may be positive or negative, direct or indirect.
Criticality	The relative importance of a system aspect (e.g. road, electrical substation, etc.) to the desired function or level of service.
Deep Uncertainty	A state of knowledge where experts or stakeholders cannot know or agree on the appropriate models that describe relationships among key forces in a system, the probabilities representing uncertainty about important variables, and/or how to evaluate and prioritise different possible outcomes. Deep uncertainty extends beyond regular uncertainty by involving fundamental disagreements about how systems function, the likelihood of different futures, and which outcomes are most desirable.
Direct Risk	Risk that arises when an element of value is directly exposed and vulnerable to a specific hazard or change.
Domain	A grouping or categorisation of our world and things we value within it. Often referred to as wellbeing or value domains which are a hybrid of the NZ Treasury's Living Standards Framework.
Economic Domain	The set and arrangement of inter-related production, distribution, trade, and consumption that allocate scarce resources.
Element	The assets, taonga, people, places, and specific systems that may be at risk.
Exposure	The state or condition of being subjected to or encountering a risk source, which can occur in a binary manner where one is either exposed or not, or in a continuous manner where the level or intensity of exposure varies.
Fluvial Flooding (River Flooding)	Flooding caused by rivers overflowing their banks due to heavy or prolonged rainfall, snowmelt, or blockages in river channels. For the purpose of this report, an asset is considered exposed to river flooding when the depth is more than 10cm.
Fragility	The system's likelihood to experience negative consequences, given some amount of exposure.

AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI KI TE MATAU-A-MĀUI

Term	Definition
Governance Domain	The governance architecture and processes in and between governments, and economic and social institutions. Institutions hold the rules and norms that shape interactions and decisions, and the agents that act within their frameworks.
Growing Degree Days	The accumulated daily temperature above a base threshold (5°C and 10°C) per year. Indicates the amount of warmth available for plant growth.
Hazard	A potential source of harm, which may be a natural process or phenomenon or human activity that may cause loss of life, injury, or other health impacts, property damage, social and economic disruption, or environmental degradation.
Human Domain	People's skills, knowledge, and physical and mental health (human); the norms, rules, and institutions of society (social); and the knowledge, heritage, beliefs, arts, morals, laws, and customs that infuse society, including culturally significant buildings and structures (cultural).
IPCC	The Intergovernmental Panel on Climate Change
Isolation	The state of property temporarily or permanently losing access to one or more essential services (e.g. school, hospital, or fire station) due to hazard/change impacts on the transportation network.
Iwi/Māori Domain	The whānau, hapū, and iwi networks; Māori businesses and economic assets; and taonga (inherited treasures), including whenua, wai, and ecosystems, central to Māori identity, well-being, and kaitiakitanga.
Maladaptation	Actions or interventions that inadvertently increase a system's exposure or vulnerability to natural hazard impacts.
Mitigation (Climate Change)	The process of reducing the severity of climate change through emissions reduction or carbon sequestration. Contrast with: Risk Mitigation.
NAP	National Adaptation Plan
Natural Environment Domain	All aspects of the natural environment that support the full range of our indigenous species, he kura taiao (living treasures), and the ecosystems in terrestrial, freshwater, and marine environments.
NCCRA	National Climate Change Risk Assessment
NZDep	New Zealand Deprivation Index. An area-based index of socioeconomic deprivation based on census information, with 1 representing the least deprived areas and 10 representing the most deprived areas. It combines census variables including income, employment, qualifications, and housing. In this report, it is used as a proxy for community vulnerability, with higher deprivation scores likely indicative of reduced adaptive capacity and increased sensitivity to climate-related hazards.

Term	Definition
Path Dependency	Refers to the influence of past decisions on future societal processes and outcomes, shaping adaptation strategies and hindering the implementation of alternative solutions.
PED	Potential evapotranspiration deficit (PED) is a drought index. It is the gap between water demand and water availability, and it affects the moisture retained in soil and plant growth. An increase in PED indicates an increase in drought severity.
Pluvial Flooding (Rainfall Flooding)	Flooding caused by intense rainfall that exceeds the drainage capacity of the land, stormwater systems, or urban surfaces, leading to localised water accumulation. For the purpose of this report, an asset is considered exposed to rainfall flooding when the depth is more than 10cm.
Protect	Structural or non-structural interventions that shield assets or areas from hazards, such as seawalls, dikes, or ecosystem-based approaches.
RCP	A suite of future scenarios of additional radiative heat forcing at the Earth's surface by 2100 (in Watts per square metre), which is the net change in the balance between incoming solar radiation and outgoing energy, radiated back up in the atmosphere. Each RCP can be expressed as a greenhouse gas concentration (not emissions) trajectory.
Relative Sea-level Rise (RSLR)	The increase in sea level relative to a local land benchmark, incorporating both global sea-level rise and local land movement.
Resilience	The capacity of social, economic, and environmental systems to absorb disturbances and reorganise while maintaining essential function, identity, and structure, as well as the capacity for adaptation and transformation.
Resilient	"A state where a system can withstand, recover from, and adapt to climate hazards and stresses while maintaining its essential functions and structure. A resilient system has sufficiently reduced vulnerability and enhanced adaptive capacity to manage climate risks at levels deemed acceptable by stakeholders.
Retreat	The planned relocation of assets, infrastructure, or communities away from areas of high risk.
Risk	The potential for and severity of consequences on things we value in the presence of uncertainty [3]. Risk exists when there is uncertainty about how something we care about might be affected, recognising that different individuals and communities may have diverse priorities and objectives.
Risk Mitigation	The process of identifying, assessing, and prioritising risks, followed by the coordinated application of resources to minimise, monitor, and control the probability or impact of adverse events. Risk mitigation strategies include avoidance, reduction, transfer, and acceptance of risks. Contrast with: Mitigation (Climate Change).
Risk Source	An action, sub-activity, component, system, or event which alone or in combination with other elements has the potential to give rise to some specified consequences

Term	Definition
	(typically undesirable consequences) [3]. Often referred to within this report as hazard/change.
Scenario	A plausible description or representation of future events, conditions, or situations used for analysis or planning.
Sensitivity	The degree to which a system is affected, either adversely or beneficially, by a hazard or climate-related stimuli
Shock	A sudden, disruptive event that affects a system, community, or asset, typically occurring with limited warning and requiring immediate response. Examples include floods, storms, and heatwaves.
Signals	Observable changes that indicate conditions are shifting, serving as early warnings that action may be needed.
Significant	In this report, the term *significant*, is used in its plain English sense – referring to risks or consequences that are notable, considerable, or meaningful in the context of climate change impacts. It is **not** used in the legal sense defined under any New Zealand legislation. Where legal significance is intended, it is explicitly stated.
Social Vulnerability	The susceptibility of social groups to the adverse impacts of hazards and changes, influenced by factors such as socioeconomic status, age, disability, housing characteristics, and access to resources.
SSP	Shared Socioeconomic Pathways. Scenarios of projected socioeconomic global changes up to 2150 and 2500, used to analyse how societal choices will affect greenhouse gas emissions and climate change mitigation challenges.
Stressor	A chronic or ongoing pressure that gradually affects a system, community, or asset over an extended period. Examples include sea-level rise, changing rainfall patterns, and increasing temperatures.
Sustainable	The capacity to endure and thrive over time, balancing social, economic, and environmental considerations.
Three waters	The collective term used to describe drinking water, wastewater, and stormwater infrastructure and services. This includes the physical networks of pipes, pump stations, treatment plants and other components that manage these three water systems.
Threshold	A level of magnitude of a process at which sudden or rapid change occurs, beyond which certain impacts become significant or intolerable.
Triggers	Pre-determined decision points based on signals that initiate a shift from one adaptation option or pathway to another.
Uncertainty	A state of incomplete knowledge that can result from multiple sources: natural variability or randomness in systems being studied, limitations in our current knowledge that could be reduced with more research, and differing interpretations of available information. It may arise from imprecise data, measurement limitations,

Term	Definition
	ambiguously defined concepts or terminology, or the inherent unpredictability of complex human and natural systems.
Values	What communities care about and want to protect or enhance; the qualities, principles, or assets considered important or beneficial.
Vulnerability	The propensity or predisposition to be adversely affected, encompassing sensitivity to harm and lack of capacity to cope and adapt.
Vulnerable Populations	Individuals or collectives that have characteristics that would traditionally represent a lower adaptive capacity or ability to cope and respond to different events. Also referred to as underserved populations. Vulnerability exists across all segments of society, as climate hazards can affect anyone, though in different ways and to varying degrees.

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03

Te Arotakenga ā-Rohe Regional Assessment

URBAN INTELLIGENCE

5 Regional Overview

5.1 Hawke's Bay / Te Matau-a-Māui regional summary

The Hawke's Bay region is located on the east coast of the North Island, Aotearoa New Zealand (Figure 5.1). The following information provides a snapshot of the region, with data synthesised from the Hawke's Bay Regional Council's Three Year Plan 2024-2027, the Hawke's Bay Regional Land Transport Plan 2024-2034, and Statistics New Zealand [16] [17] [18]:

The Hawke's Bay Region

- **Population of 185,400** with two major cities Hastings and Napier, three main towns Wairoa, Waipawa and Waipukurau and other smaller settlements throughout the region
- 11 iwi, 91 hapū and 79 marae
- **14,200km² land area** 80% of land is hill country or mountainous terrain with 12% flat to gently rolling terrain
- **165,000 ha of plantation forestry** with the Napier Port handling 2.9 million tonnes of logs in 2024
- **353 km coastline** includes cliffs, sandy beaches, dunes, rocky reefs, and estuaries, and **1,600 km rivers and streams** spread over 8 catchments, 41 lakes and 2 groundwater sources
- **60% of New Zealand's apples** are produced in the region and the wider horticulture sector provides $1.2 billion to the national GDP
- **One of the top 12 wine capitals in the world** including 3,600 ha of the Heretaunga Plains dedicated to viticulture
- **Critical highway connections include SH2 North** providing lifelines to Wairoa and Gisborne, **SH2 South** linking Napier and Hastings to Central Hawke's Bay and on to Wellington, and **SH5** connecting Napier to SH1 at Taupō
- **Mean annual rainfall 800-2000mm**, and **2,200 hours of annual sunshine** in coastal areas



Figure 5.1 Map of the Hawke's Bay Region

5.2 Experiences with natural hazards in Hawke's Bay

Understanding a community's lived experiences with natural hazards is crucial when assessing and communicating climate change risks. People think about risk through the lens of their cultural and personal experiences [19]. These perspectives also influence the acceptance of risk-reducing actions and behavioural changes. Hawke's Bay's experiences with natural hazards therefore provide important context for this risk assessment and future adaptation planning conversations. An overview of natural hazards experienced in Hawke's Bay is provided in the following sub-sections.

Earthquakes

Hawke's Bay is at high risk of earthquakes. The Hikurangi subduction zone is an active source of seismic activity, with the potential to generate severe earthquakes and associated tsunami events, as well as slow slip movement of land over longer periods of time. Parts of Hawke's Bay such as the Heretaunga Plains and Napier City are particularly vulnerable to liquefaction associated with earthquakes given its geology.

The deadly 1931 earthquake significantly altered the Hawke's Bay shoreline and subsequently the region's risk to coastal flooding [20]. Nearly 2 metres of uplift allowed for new development in the north, along with backshore infill and construction of a seawall eliminating what had been frequent coastal flooding in downtown Napier [20]. However, other areas south of Napier experienced a 1 metre drop in elevation during the earthquake. Over time, this has resulted in coastal erosion that has caused significant damage to beachfront properties, particularly at Te Awanga and Haumoana [20]. Future major earthquakes are considered more likely to result in land subsidence rather than uplift, potentially exacerbating the threat of coastal erosion [21].

Coastal hazards

Coastal erosion is also increasing due to slow land subsidence and rising sea levels, resulting in barrier overtopping and damage to some beachfront properties [22]. Notable coastal storms include those in 1974, 2002, 2008, 2010, 2011, 2015, and 2017. Communities in Hawke's Bay are aware of, and concerned with, the increasing risk posed by coastal hazards. A 2016 survey of public perceptions regarding coastal hazards and hazard management found a majority of respondents (69%) believed coastal hazards were already being experienced in the region [23]. Coastal erosion was the coastal hazard of greatest concern. Rising sea levels also pose a risk to areas such as Napier, with the potential to raise the already high-water table that often sits close to the surface [24]. Coastal cliffs in Hawke's Bay are relatively unpopulated but many of the cliff shorelines are vulnerable to erosive and landslip forces.

Drought

The Hawke's Bay region is also subject to droughts, which are being exacerbated by changing rainfall patterns that increase evapotranspiration deficits, particularly in the south of the region [25]. Notable historical droughts have included those in 1982-83, 1997-98, 2012-13, and most recently in 2020. Such droughts resulted in challenging horticultural growing conditions leading to reduced yields and quality and the cessation of pasture growth, in turn leading to the need to prematurely dry off, cull, and/or sell off stock, with significant economic implications [26]. Droughts and drought-like conditions also exacerbate fire risk which threatens people, property, and livelihoods, such as during the 2017 Waimārama fire [27].

Flooding and storm events

Flooding and storms are the most frequently experienced hazard within Hawke's Bay [28]. Despite warnings, European settlers built on land known by Māori to be at high risk of flooding [29]. Prior to the arrival of pākehā, Māori in the Hawke's Bay used land seasonally and therefore were more able to move away from flood-prone areas during wetter periods. With the arrival of European settlement, land purchases and raupatu (land confiscation), Māori landholdings were often confined to low-lying areas next to rivers, putting them at a higher risk of flooding [30].

Notable historical events include major floods in 1867, 1893, 1897, and 1924 which led to multiple fatalities, substantial damage, and deposited large amounts of silt onto farmlands [29]. In February 1938, flash flooding at the Kōpuawhara Stream near Māhia, killed 21 at a Ministry of Works site north of Wairoa [31]. Just months later in April, prolonged heavy rainfall led to flooding in the Esk River with an estimated peak flow of 2,200 m^3/s [30]. The result was near total devastation in Tangoio and, along with flooding in 1963, caused many whānau and residents to permanently leave the area.

A spate of flood events also occurred throughout the 1940s-1960s. This included notable events in 1956 and 1963 which saw considerable rainfall and inundation in areas such as the Tangoio Valley that resulted in slips, damage to property, road closures, loss of power and communications, crop damage,

heavy livestock losses, and substantial silt deposits [30]. Cyclone Bola in 1988 produced considerable damage, particularly in the Wairoa area, where Wairoa's main bridge collapsed, causing the town to split in two [32]. The town's water supply was also destroyed, and two people were killed [32].

Landslide associated with storm events is also a frequently experienced hazard within Hawke's Bay. State Highway 2 north has a long history of closure due to slips and to a lesser degree State Highway 5.

Flood and storm events have continued to cause damage, livestock loss, and service disruptions throughout the 1990's and beyond. In 2011, Central Hawke's Bay experienced severe flooding that led to power outages, boil water notices, and extensive damage to roads, properties, and farms [33]. A flood event, initially estimated at one-in 250 year and later revised to about one-in-100 year event, in Napier in November 2020 affected 589 properties and coincided with COVID-related lockdowns, compounding challenges in emergency response and recovery [34] [35].

In January 2023 the region was impacted by numerous rainfall events, including ex-tropical Cyclone Hale. These collectively resulted in the region receiving between 400-500% of the January average, saturating soils, activating slips and setting many

Impacts of Cyclone Gabrielle Across the Region

The impacts of Cyclone Gabrielle throughout the region with data synthesised from the Hawke's Bay Regional Three-Year Plan 2024-2027, the Hawke's Bay Regional Land Transport Plan 2024-2034, the Report of the Hawke's Bay Independent Flood Review, and news reports:

- **546 mm of rain** with the storm, most of which came in intensive bursts of 56mm per hour
- **12 deaths** associated with the Cyclone in Hawke's Bay
- **300,000 landslides** along the East Coast of the North Island
- **300 million tonnes of sediment** deposited in floodplains with **5.7 million tonnes of silt** in the Esk Valley
- **100 million tonnes of silt** deposited in the Wairoa District
- **Agriculture sector losses estimated at $1.7 billion,** damage to crops and inability to plant/produce during 2023 as plantings, fencings, irrigation systems, stock, feed and crops destroyed
- **$4.918 billion in overall costs** of recovery for the region
- **12,000 tonnes of woody debris** on the beaches and reserves in the Wairoa District
- **Residents isolated as up to 30 roads closed** during the event, with the Wairoa District effectively cut off from the North, South and West. A full three months passed before roads fully reopened, with power and communications also inoperable.
- In Napier **70,000 people isolated without power, water, communications, health services and road connectivity for several days**
- **Boil water notice** in almost 20% of Central Hawke's Bay, lasting for 26 days in Ōtāne and Waipawa
- The Redclyffe, Brookfields, Waitangi Rail Bridge and Puketapu **bridges** (and many other) **damaged or destroyed** with rail links between the Napier Port and Hastings severed and repairs taking months
- **Napier Wastewater Treatment Plant in Awatoto and associated industrial area,** including the Ravensdown fertilizer plant, Bremworth textile mill and Ziwi factory were inundated, exposing the neighbouring communities to potential contaminants.

rivers and streams into flood state. The arrival of ex-tropical Cyclone Gabrielle in February 2023 generated extreme rainfall levels on top of saturated soils that resulted in the largest flood flows ever recorded for many of the region's rivers [30]. The resulting flooding caused widespread destruction, with almost 1,700 properties assessed for damage, nearly 6 km of stop banks breached, and a further 28km weakened, major roads and bridges washed away, multiple marae, papakāinga and urupā severely damaged, and power outages to 40,000 properties (Figure 4.2) [16], [17], [30]. Tragically, twelve[36]] people died in the region. Financial losses were estimated to exceed $5 billion [30]. More recently, June 2024 saw severe flooding in Wairoa resulting from a combination of heavy rainfall, rising river levels, spring tides, storm surges, and river mouth conditions through the bar. Over 400 properties were affected by flooding and damages were estimated at $40 million [37]. An independent review found "that the flood event was caused by a combination of factors" and "highlighted shortcomings around planning and management of the river mouth and bar" [38], [39].

The region contains a wide variety of active geological features, from mountain ranges in the west, to erodible coastal hills and plains in the east. The ranges intercept the predominant westerly winds, resulting in prolonged periods of dry weather while also confining occasional north-easterly flows of moisture, leading to highly variable rainfall and periodic flooding. Major rivers drain the catchments and their sediments from the hills to the fertile floodplains below. These floodplains are where the region's famous fruit growing takes place and where the largest population centres have been established, resulting in an ongoing need for flood protections. Measures to reduce flood risk in Hawke's Bay have been implemented over time, with river boards first established in the 1880s and several flood protection schemes undertaken, including significant modifications to the Ngaruroro and Tukituki Rivers in the 1930s-1980s [34]. More recently, Napier City Council set aside more than $40 million for remediation work following the 2020 flood [34]. However, this work was not able to be fully implemented before Cyclone Gabrielle in 2023. This highlights the challenge posed by increasingly frequent events, which undermine the ability of communities to recover and successfully implement hazard management strategies.

Community experiences with natural hazards and adaptation planning responses

Experience of such events and awareness of local natural hazard risk can be traumatic and unsettling for residents. Future weather events can trigger "flashbacks" and increase community anxiety, reducing people's sense of safety and comfort [40]. Feelings of powerlessness can sometimes result in community tension and loss of trust in authorities. Increased frequency of extreme weather events can compound these negative experiences, potentially undermining future resilience as social and governance risks can be barriers to adaptation progress. This risk will only be exacerbated as extreme weather events become more frequent and severe with climate change.

Understanding this context is important for several reasons:

1. **Risk perception:** a community's recent experiences will significantly influence how they perceive future risk information and adaptation strategies and their risk appetite.
2. **Trust and communication:** past events, and the response to them, will affect the community's trust in authorities and their receptiveness to future communications about climate risks
3. **Adaptation planning:** a community's lived experiences provide valuable insights into vulnerabilities and potential adaptation measures that may be more readily accepted
4. **Psychological impacts:** the ongoing stress and anxiety related to experiences with hazards and most recently flood risk need to be considered in any adaptation planning, as mental health and wellbeing are crucial components of community resilience.

As Hawke's Bay moves forward with adaptation planning, these historical experiences will continue to influence how future risk communication and adaptation efforts will be received by communities.

The need for proactive adaptation planning

It is also critical to consider the potential pitfalls of disaster-driven responses to natural hazards, rather than proactive adaptation planning. Disaster events often trigger management responses based on immediate demands for those affected. While these reactive responses may provide short-term relief, they have the potential to produce inefficient or even maladaptive outcomes over the longer term [41].

Recent reviews of responses to Cyclone Gabrielle have identified a series of recommendations to improve the region's long-term resilience to flood events. This includes an acknowledgment that measures such as stopbanks can be overtopped in major events and therefore need to be designed to produce predictable and manageable outcomes when their capacity is exceeded, supported by measures such as designated spillways [30]. Ignoring the limitations of hard engineering solutions can increase harm, for example, where the presence of stopbanks can create a false sense of security that encourages further development in flood-prone areas.

To maximise the effectiveness of both immediate and long-term adaptation responses, it is important for decision-makers and communities to ensure that work to minimise climate and natural hazard risks:

- integrates short-term interventions with long-term adaptation plans
- assesses potential unintended consequences of interventions
- considers flexibility in design solutions to include environmental solutions and accommodate future climate scenarios
- includes engagement with a diverse range of stakeholders to capture a range of perspectives and needs, including working collaboratively with communities to draw on their local knowledge and build trust
- allows for reviews and adjustment of strategies based on new climate data and adaptation research and evidence.

As Hawke's Bay proceeds with work programmes that reduce risks and build resilience to natural hazard events, it will be critical to balance the community's immediate needs and lived experiences with long-term solutions that consider the full range of risks posed by a changing climate. Figure 5.2 contextualises the type of actions that communities and councils may take when reducing risks identified in this and subsequent assessments.

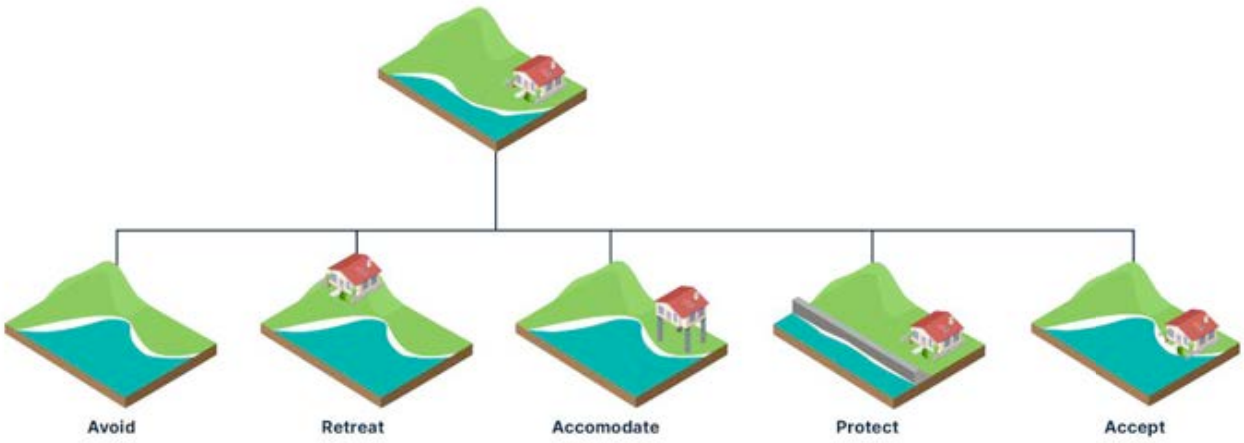


Figure 5.2. Adaptation options - avoid, retreat, accommodate, protect, and accept.

5.3 Overview of future climate and natural hazard projections and impacts for Hawke's Bay

The Hawke's Bay region is exposed to multiple natural hazards that are likely to intensify with climate change, including sea-level rise, shifting precipitation patterns, changing groundwater dynamics, and increased landslide risks.

The region's coastal, hydrological, and geological systems are highly susceptible to a changing climate. The most critical challenge lies in their interconnections and dependencies, where impacts in one system can cascade through others. Sea-level rise and groundwater changes, for example, can dramatically increase an area's susceptibility to liquefaction. These complex interactions underscore the importance of developing comprehensive multi-hazard adaptation strategies that consider a range of risks and actions to enhance community resilience to climate change.

This section provides a high-level overview of how various Hawke's Bay natural hazards may change under different climate scenarios. Consistent with the recommendations of the NAP [13] and updated MfE Coastal Hazards and Climate Change Guidance [2], this section of the assessment applies SSP2-4.5 and SSP5-8.5 scenarios, projected out to 2040 and 2090 (see Section 3.1 for a fuller description of climate scenarios). It's important to note the significant uncertainties inherent in these projections, particularly for long-term and high-emission scenarios. Local variations within the region and individual districts may also introduce considerable variability. Continuous monitoring and iterative modelling will be crucial for refining these projections over time.

Projections used in this assessment have been synthesised from:

- Victoria University and NZSeaRise, improved sea-level rise projections for New Zealand [42]
- The National Institute of Water and Atmospheric Research (NIWA) regional snapshot of projected climate changes and hazards, zone 3 [43]
- MfE, Climate Change Projections for New Zealand [44].

Climatic conditions

Climate change is projected to substantially alter meteorological patterns and environmental conditions in Hawke's Bay, with significant implications for the human, built and natural environments. Ex-tropical cyclones are likely to become more intense, bringing stronger winds and heavier rainfall. Fire seasons will get longer and more dangerous, with increased risks of wildfires. Droughts will become more common, putting additional stress on agriculture and water resources.

Compared to a historic baseline between 1995-2014, the region will see more hot days and fewer overnight frosts. This means warmer temperatures overall, which will affect everything from farming to local wildlife. A snapshot of the predicted climate changes and potential hazards is provided Appendix A3. These changes aren't just numbers on a chart – they represent real changes and associated challenges for the communities of Hawke's Bay.

Extreme Temperatures Both hot days and cold snaps can pose risks. Projections indicate an increase in hot days with up to 60 more hot days (>25°C) by 2090 with spring and autumn frost-free land expected to triple by 2080, under the high emissions scenario.

Wildfire The risk of wildfires is expected to increase with hotter, drier summer conditions, coinciding with longer fire seasons and an expected additional 48 days of fire risk.

Increased Storminess and Extreme Wind and Rainfall Events The intensity of ex-tropical cyclones is projected to increase with the most severe ex-tropical cyclones becoming even stronger. The region is also projected to experience a 10% increase in extreme wind speeds, with increased rainfall intensity and an increase in the number of very extreme daily precipitation events.

Marine Temperature Ocean temperatures are projected to increase, which can have significant impacts on marine ecosystems and coastal processes. Marine heatwaves are expected to increase with a sea surface temperature rise of 16 - 20% for most New Zealand marine waters.

Ocean Acidification As atmospheric CO2 levels rise, more CO2 is absorbed by the ocean, leading to increased acidity. This can have severe impacts on marine life, particularly organisms with calcium carbonate shells or skeletons. Additionally, a reduction in surface mixed layer depth with fewer micronutrients can be expected leading to a decrease in net primary production. An anticipated increase in dissolved iron will further alter phytoplankton compositions affecting coastal ecosystems.

Appendix A3 contains more detailed information on projected changes in temperature, hot days, frost days, wildfire risk, wind, hail, marine temperatures and ocean acidification.

Coastal hazard projections

Sea-level rise is a key driver of coastal hazards. In Hawke's Bay, relative sea level rise projections indicate a rise of 0.24-0.28m by 2040 and 0.55-0.79m by 2090 under high emissions scenarios (SSP5-8.5) (Figure 5.3) compared to 2005 [42]. These measures of relative sea-level rise factor in vertical land movement (VLM), for example, where landmass may be naturally sinking.

Coastal Flooding Coastal flooding occurs when sea levels rise above normal high tide levels due to weather events, flowing onto low-lying land. These events range from minor nuisances to widespread, costly inundation. With sea-level rise, the frequency, duration, and extent of coastal flooding is expected to increase, with the potential to overwhelm existing coastal infrastructure.

Coastal Erosion Coastal erosion occurs when waves erode land, causing shoreline retreat. While a natural process, it can be accelerated by human activities including climate change. Rising sea levels are likely to intensify erosion as high-energy waves reach further inland.

Appendix A3 contains more detailed information on projected changes in sea-level rise and coastal erosion.

Hydrological projections

Climate change is expected to alter precipitation patterns in the Hawke's Bay region, affecting various hydrological processes. Appendix A3 show the projected changes in rainfall and number of rainy days across the district.

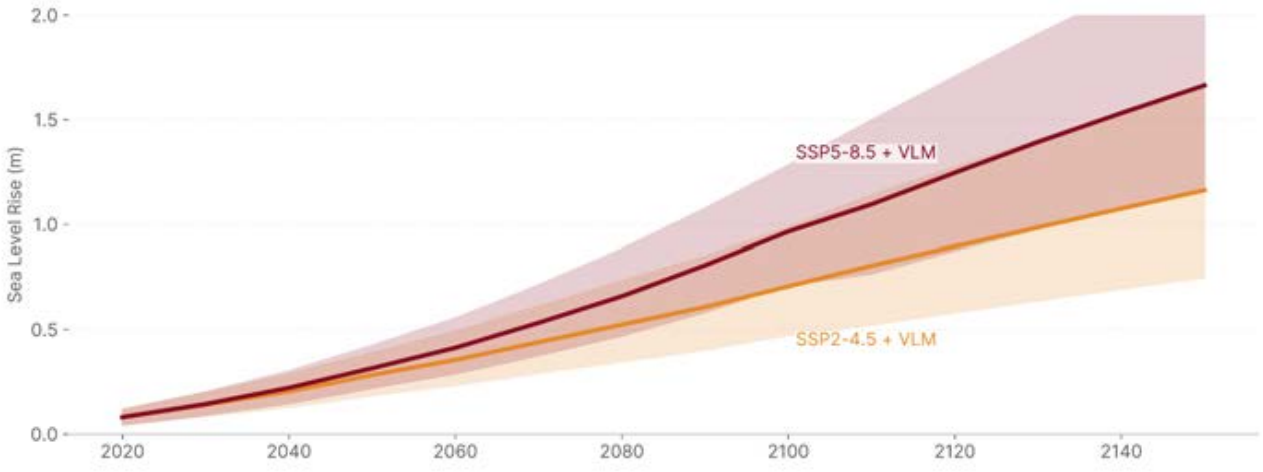


Figure 5.3. How sea level rise is projected to change across the region compared to 2005. Source: NZSeaRise [39].

River (fluvial) Flooding River flooding occurs when rivers overflow their banks, typically during heavy rainfall events. Climate change is expected to increase the frequency and intensity of extreme rainfall events, potentially overwhelming the designed capacity of existing flood protection measures.

Rainfall (pluvial) Flooding Rainfall flooding occurs when extreme rainfall overwhelms drainage systems. The intensity of extreme rainfall events is projected to increase with climate change, potentially exceeding the designed capacity of existing stormwater infrastructure more frequently.

Groundwater Changes Sea-level rise can lead to rising groundwater levels in some coastal areas and saltwater intrusion into coastal aquifers. Conversely, increased drought conditions can lead to falling groundwater levels inland.

Drought The region is projected to experience 5-8 more dry days per year by 2040 under both the SSP2-4.5 and SSP5-8.5 scenarios. By 2090, the region can expect 5-15 more dry days annually under the lower emissions scenario and 10-20 more dry days annually under the high emissions scenarios.

The intensity of future ex-tropical cyclones is also projected to increase by 2040 with the most severe ex-tropical cyclones expected to strengthen by 2090.

Appendix A3 contains more detailed information on projected changes in rainfall, dry days, storminess and extreme winds.

Geological projections

Geological hazards can be influenced by both tectonic activity and climate-related factors. Climate change is expected to exacerbate certain geological risks, particularly those sensitive to changes in rainfall and groundwater conditions.

Landslides Landslides involve the downward movement of rock, soil, and debris on slopes. While already common in New Zealand, landslide risk is expected to increase with more frequent, intense rainfall events predicted under climate change scenarios and fire occurrence that will exacerbate soil erosion.

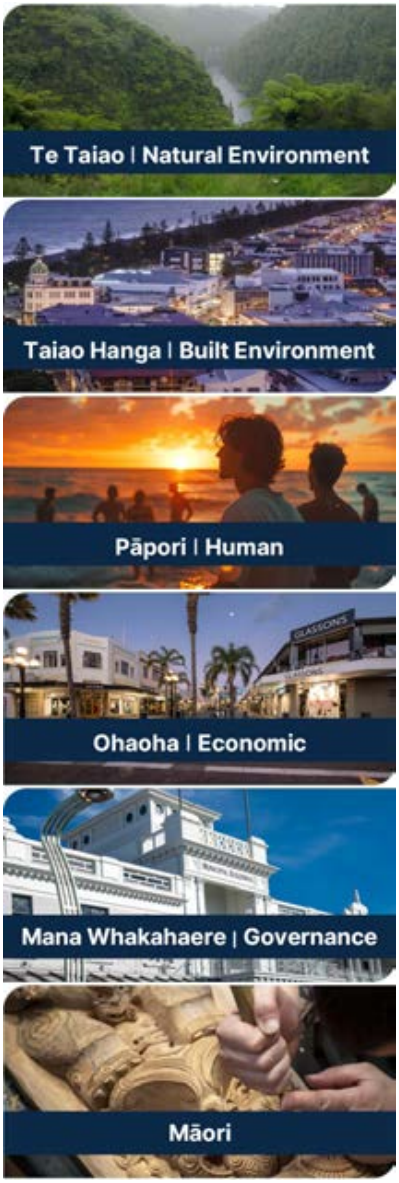


5.4 Risk Value Domains

This risk assessment has structured the regional-level assessment around value domains (Figure 5.4), consistent with MfE's guidance [45] and the approach taken to the first National Climate Change Risk Assessment [12].

These domains provide a framework for assessing our complex and interconnected world. The interdependencies between the domains highlights the critical need to understand not only the direct risks arising from climate change, but the indirect, cascading and compounding risks as well. Notably, risks in the natural environment domain in particular can have cascading impacts into the human, built environment, economic, governance, and iwi/Māori domains. See Section 2.1 for a more in-depth discussion of indirect, compounding and cascading impacts.

Refer to Appendix A1 for further detail on the methodology for assessing risks at a regional scale.



Natural Environment: All aspects of the natural environment that support the full range of our indigenous species, he kura taiao (living treasures), and the ecosystems in terrestrial, freshwater, and marine environments.

Built Environment: The set and configuration of physical infrastructure, transport, and buildings.

Human: People's skills, knowledge, and physical and mental health (human); the norms, rules, and institutions of society (social); and the knowledge, heritage, beliefs, arts, morals, laws, and customs that infuse society, including culturally significant buildings and structures (cultural).

Economic: The set and arrangement of inter-related production, distribution, trade, and consumption that allocate scarce resources.

Governance: The governance architecture and processes in and between governments, and economic and social institutions. Institutions hold the rules and norms that shape interactions and decisions, and the agents that act within their frameworks.

Iwi/Māori: The whānau, hapū, and iwi networks; Māori businesses and economic assets; and taonga (inherited treasures), including whenua, wai, and ecosystems, central to Māori identity, well-being, and kaitiakitanga.

Figure 5.4 Value domains used to categorise regional risk as used within the New Zealand National Climate Change Risk Assessment

6 Natural Environment Domain

The Natural Environment domain encompasses all aspects of the natural environment that support the full range of indigenous species, he kura taiao (living treasures), and the ecosystems in terrestrial, freshwater, estuary and marine environments. The natural environment holds immense cultural, recreational, and spiritual significance for the people of Hawke's Bay, fostering a deep sense of connection to the land and its unique biodiversity.

Hawke's Bay's natural landscape

The Hawke's Bay region boasts a rich and varied natural landscape. Its diverse environment includes coastal ecosystems such as estuaries, beaches, and rocky reefs. The terrain ranges from lowlands and rolling hill country to the dramatic Ruahine and Kaweka mountain ranges. Hydrological features are prominent, with numerous streams, lakes — including the nationally significant Lake Waikaremoana — and rivers threading through the landscape. The region's diversity is further enhanced by indigenous and exotic forests, complemented by the productive agricultural lands of the Heretaunga Plains.

These natural systems are already under significant stress from human activities. This will be further intensified by climate change, with anticipated increased temperatures, changes in rainfall patterns, reduced snow and ice cover, sea-level rise, coastal inundation, flooding, extreme weather events, storm surges, drought, ocean acidification, and marine heatwaves [46]. As meteorological conditions shift, anticipated challenges include increased plant and animal pest incursions, elevated sediment and nutrient loads, accelerated habitat loss, and declining water quality [46].

Sediment intrusion into waterways is already a key stressor in Hawke's Bay's waterways. Increased sedimentation from climate change will likely exacerbate the degradation of water quality, as ex-tropical cyclones become more severe, increasing the incidence of landslides leading to further degradation terrestrial, freshwater, and marine ecosystems [47].

Biodiversity is critical for adapting to a changing climate

This section is informed by the Hawke's Bay Biodiversity Strategy, with the vision "working together, Hawke's Bay's biodiversity is enhanced, healthy and functioning". The multi-agency Strategy recognises that declining biodiversity is something that affects us all and only by working together can we make a difference.

Before humans settled here, almost the entire lowlands and hill country of the Hawke's Bay region would have been covered in dense forests, rich in bird life [48].

Hawke's Bay's present day lowland ecosystems are largely reduced to small, fragmented remnants with poor connectivity, many of which are on private land. The Hawke's Bay Regional Council's Priority Ecosystem Programme provides support for landowners to protect these remnant ecosystems. The current focus is to 'secure from extinction' 675 sites selected across the region that represent the full range of indigenous ecosystems. Enduring management, including deer fencing and pest control will ensure these high value sites are protected into the future with multiple benefits including helping to address soil erosion and improve water quality

The success of this programme is threatened by an increasingly volatile climate, as climate change is expected to bring warmer and drier conditions, with stronger ex-tropical cyclones to the Bay. This will put these high value biodiversity sites under additional pressure. **"The most serious threats to biodiversity however will likely be caused by interactions between climate change and other pre-existing threats**" [47].

The following section examines the expected effects of a changing climate on Hawke's Bay's natural environment, with a focus on biodiversity and related risks to:

- freshwater systems
- wetlands
- coastal and marine systems
- terrestrial and forest ecosystems.

Risks to freshwater ecosystems

For freshwater ecosystems, including wetlands, the most significant climate risks arise from changing water temperatures, and variations in water availability particularly because habitats are already highly fragmented [46]. The Hawke's Bay Regional Council currently monitors 43 wetlands and results have shown all the monitored wetlands are under a range of different pressures, particularly from predation and exotic plant invasion. Hawke's Bay is home to 15 of the 54 native freshwater fish species found in New Zealand, with most species migrating between salt water and freshwater ecosystems [49]. Changing temperatures, increasing sedimentation and altered flow from shifting rainfall patterns will reduce distribution and impact reproductive cues of fish [46]. Freshwater invertebrates support stream ecosystems by processing organic material, contributing to nutrient cycling, and serving as an important food source for fish, birds, and other wildlife. These invertebrates are sensitive to changes in water quality and vulnerable to climate change, particularly if they are already impacted from stressors like sedimentation.

Regular bird surveys commissioned by the Hawke's Bay Regional Council illustrate how the potential for negative impacts is no longer purely hypothetical. This work has quantified bird populations, their density and distribution for river-bed nesting birds for the years 2019-2021.

The Regional Council commissioned a fourth survey after Cyclone Gabrielle to quantify its impacts on riverbed-nesting birds. Significant declines were observed for several shorebird species, including a 15% decline in pohowera/banded dotterels and 30% decline in black-fronted dotterels.

"This survey demonstrate[s] for the first time that extreme weather events exacerbated by human-induced climate change can lead to large scale, severe declines in regional, national and global populations of riverbed-nesting shorebirds in New Zealand. The severity of these declines indicate that as local and central government agencies develop climate change adaptation plans to safeguard New Zealand's communities, economies, property and infrastructure, measures will also need to be taken to mitigate adverse impacts on our natural ecosystems" [47].

Any increase in sedimentation and alterations to nutrient concentration, as is expected under climate change scenarios, pose real threats to the capacity of estuarine systems to function.

Risks to coastal and marine ecosystems

Estuaries play a critical role in protecting coastal marine waters from the effects of land-based activities by filtering and processing cumulative discharges from the land, particularly nitrogen [49]. Highly valued by tāngata whenua for mahinga kai, estuarine areas are also home to a number of bird species and fish [49]. Recognising the importance of these estuarine systems, Hawke's Bay Regional Council actively monitors the health of estuaries [50].

Marine and coastal ecosystems in the region face critical challenges from projected climate change, with primary risks emerging from sea-level rise, increasing water temperatures, and ocean acidification. Projected environmental shifts are expected to have profound and interconnected impacts on marine biodiversity and ecosystem functionality.

Sea-level rise poses a particular threat to all shallow coastal and intertidal species. Coastal structures created to reduce saltwater intrusion on land limit the ability for these species and communities to move inland. Other impacted species include migratory fish

like whitebait, which depend critically on the spring tide zone for spawning [46]. As these habitable areas are projected to shrink, the reproductive capabilities of such species could be severely compromised. The consequences extend beyond individual species, potentially disrupting entire marine food webs and ecological networks. The NCCRA lists, "risks to coastal ecosystems, including the intertidal zone, estuaries, dunes, coastal lakes and wetlands, due to ongoing sea-level rise and extreme weather events," as the **top natural environment risk** in New Zealand.

Ocean acidification has already demonstrated significant ecological impacts across marine organisms, including microbes, sponges, corals, molluscs, echinoderms, and fish [46]. Observed effects include decreased growth and survival rates, as well as lower reproductive success.



Marine heatwaves are expected to compound these pressures, further reducing survival and reproductive rates of key marine species. The cumulative effect of these environmental stressors threatens to destabilise marine ecosystems and their functions.

Rocky intertidal platforms, which are crucial marine habitats also vulnerable to a changing climate, provide essential ecosystem services. These dynamic environments offer critical shelter, serve as nursery grounds, and support feeding areas for marine life [49]. Beyond supporting biodiversity, they play a vital role in coastal protection — stabilising shorelines, buffering against wave action, and providing habitats for kai moana species [49].

Risks to terrestrial and forest ecosystems

Terrestrial and forest ecosystems host a wide variety of plant and animal species, a number of threatened species endemic to New Zealand. Climate change poses significant threats to these delicate ecosystems. Warming winters and increasing drought frequency are expected to have profound ecological consequences, potentially leading to declining species survival rates, alterations in plant and tree distributions, and the loss of critical habitat for indigenous fauna [46].

Climate change is also likely to exacerbate biodiversity challenges posed by invasive species. Hymenoptera wasps and Argentine ants are expected to expand their territories, while invasive flora will spread more readily into new areas [46]. These invasive species often possess adaptive advantages that outcompete indigenous species, resulting in further ecological disruption. The proliferation of existing weeds and the emergence of new weed species will likely intensify, compounding the environmental stress.

The NCCRA lists, "risks to indigenous ecosystems and species from the enhanced spread, survival and establishment of invasive species due to climate change," as the **second most important natural environment risk** in New Zealand.

Biosecurity risks will also increase with climate change [51]**.** For example, more frequent mast events—periods of abundant seed production—could trigger population explosions in rodent species [46]. Such increases would further undermine current biodiversity conservation and predator control efforts, creating a cascading effect of ecological imbalance in the Hawke's Bay region.



“The results of this survey demonstrate for the first time that extreme weather events exacerbated by human-induced climate change can lead to large scale, severe declines in regional, national and global populations of riverbed-nesting shorebirds in New Zealand.”

- Hawke's Bay Regional Council

7 Built Environment Domain

The Built Environment Domain encompasses the physical infrastructure that supports daily life in Hawke's Bay, including buildings, transport networks, and three waters assets. This infrastructure forms an interconnected system that is critical to the region's functionality and resilience.

This assessment focuses primarily on council-owned and managed infrastructure, drawing on datasets provided by the region's territorial authorities. While engagement with other infrastructure providers - including the Napier Port, Hawke's Bay Airport, telecommunications companies, and electricity distributors - has been ongoing throughout this process, the timing of data availability and commercial sensitivities have meant that detailed analysis of these assets is not included in this first pass regional climate risk assessment. These organisations are conducting their own detailed risk assessments, and ongoing collaboration will ensure alignment in understanding regional risks and adaptation approaches.

The following sections present risk findings related to residential property and council infrastructure exposed to regional hazards including coastal flooding, river and rainfall flooding, and landslides. The assessment also considers potential groundwater changes in Napier, though it is noted that significant data limitations exist for several of these hazards. Due to data limitations, particularly for river and rainfall flooding, the exposure numbers presented likely underestimate the overall risk. However, exposure also doesn't equate with damage as some exposed assets may be designed to withstand the level of exposure they experience.

An assessment of lifeline utilities and critical regional infrastructure remains a priority for future work, as outlined in Section 17 (Next Steps). This will build on the engagement and relationships established through this initial assessment process. This will involve collaboration with the Hawke's Bay Lifelines Group and their existing work programme, which includes an ongoing Lifelines Vulnerability study.

Hawke's Bay Airport:

- **Third busiest regional airport in the North Island**
- **Jointly owned by Hastings District Council, Napier City Council and the Crown.**

Napier Port (2024):

- **571 ships carrying 5 million tonnes of cargo, 230,000 TEU containers and 2.9 million tonnes of log exports**
- **Linked to 27,000 jobs across the region**
- **Critical for horticulture and forestry exports.**

Risk to physical infrastructure from coastal flooding

Coastal flooding poses a significant and increasing risk to buildings and infrastructure in Hawke's Bay. The analysis informing this assessment examined exposed to more than 10cm of coastal flooding in a 1% AEP event under different sea-level rise scenarios. Figure 7.1 provides a visual representation of how exposure increases with sea-level rise, while Table 7-1 presents the detailed numbers across different infrastructure types.

Risk to Residential Buildings

Of the approximately 56,500 residential buildings in Hawke's Bay, about 3,300 (5.9%) are currently exposed to more than 10cm of coastal flooding during a 1% AEP event. This exposure increases substantially with sea-level rise, reaching 5,379 buildings (9.5%) with 20cm of rise and 11,652 buildings (20.6%) with 1m of rise (see Figure 5.3 for potential timeframes for how sea levels may rise). It's important to note that exposure does not necessarily mean these buildings would be severely damaged or uninhabitable - the actual impact would depend on factors like floor height and construction type, and the specific flood depth at each location.

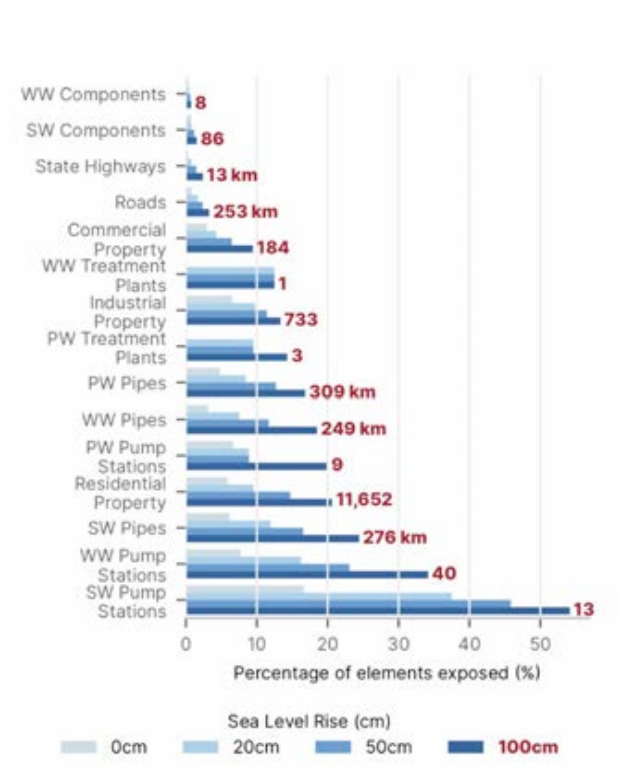


Figure 7.1. The number/length of each infrastructure type that would be flooded in a 1% coastal flood, given different amounts of sea level rise.

Risk to the Regional Transport System

The region's transport network includes 7,733 km of roads, as defined by Land Information New Zealand (LINZ) including "any form of all-weather route suitable for the passage of any vehicle". Currently, 62 km of roads are exposed to more than 10cm of coastal flooding, including 1.6 km of state highway. With 20cm of sea-level rise, exposure increases to 128 km of roads (including 4.1 km of state highway), and at 1m of sea-level rise, 253 km of roads (including 13 km of state highway) would be exposed. While these numbers may seem relatively small, even shallow flooding can make roads impassable - passenger vehicles can begin to float in just 15-30cm of water. This means that even limited flooding of transport routes can significantly impact connectivity and emergency response capabilities and isolate properties and communities.

Additionally, coastal flooding also presents risks to strategic transport system infrastructure, such as Napier Port and Hawke's Bay Airport. Flooding could inundate these strategic assets, significantly impacting the ability to get goods, services, and people in and out of the region. Essentially, it could sever two critical transport links for a period of time.

Risk to Water Infrastructure

Water infrastructure shows increasing exposure with sea-level rise across all three networks. Currently, 88 km (4.8%) of potable water pipes, 69 km (6.2%) of stormwater pipes, and 42 km (4.1%) of wastewater pipes are exposed to more than 10cm of coastal flooding. With 20cm of sea-level rise, these numbers increase significantly, particularly for stormwater infrastructure where exposure nearly doubles to 12% of the network.

The region's pump stations are particularly exposed, with 40% of stormwater pump stations, 16% of wastewater pump stations, and 9% of potable water pump stations exposed with just 20cm of sea-level rise. At 1m of rise, these percentages increase to over 50%, 33%, and 20% respectively. Of the region's treatment plants, two of the 21 potable water treatment plants and one of the eight wastewater treatment plants would be exposed to a 1% AEP coastal flooding event with 20cm of sea-level rise.

This assessment does not evaluate exposure of non-council-provided water supplies, stormwater infrastructure and wastewater systems (e.g. individual on-site and community-scale wastewater schemes).

Table 7-1. The length/number of each infrastructure exposed to a 1% AEP coastal flood event, with different amounts of sea level rise. Note that exposed does not necessarily mean "damaged." This is where the vulnerability (characteristics of the asset that makes it prone to damage) is important.

Built infrastructure	Baseline sea level (2005)	20cm of sea level rise (2025 – 2050)	1m of sea level rise (2070 – 2150)
Residential Buildings	3,323 (5.9%)	5,379 (9.5%)	11,652 (20.6%)
Roads	62 km (0.8%)	128 km (1.7%)	253 km (3.3%)
State Highway	1.6 km (0.3%)	4.1 km (0.8%)	13 km (2.4%)
Potable Water (PW) Pipes	88 km (4.8%)	154 km (8.4%)	309 km (16.8%)
Stormwater (SW) Pipes	69 km (6.2%)	135 km (12%)	276 km (24.4%)
Wastewater (WW) Pipes	42 km (4.1%)	101 km (7.5%)	249 km (18.5%)



Risk to physical infrastructure from river and rainfall flooding

River and rainfall flooding pose both immediate and long-term risks to Hawke's Bay's built environment. To analyse flood risk across the region, this assessment applies a consistent methodology to the best available, suitable flood modelling from each district, while acknowledging the variation between these models. This includes 1% AEP present-day modelling for Wairoa and Central Hawke's Bay, 1% AEP 2100 RCP8.5 (high emissions) modelling for Napier City, and 2% AEP present-day modelling for Hastings District (Table 3-3). For all models, exposure is defined as intersection with flood waters exceeding 10cm in depth (Table 7-2; Figure 7.2).

Buildings and structures show substantial exposure to flooding, with particularly high risk to commercial areas. Of the region's building stock, 918 commercial buildings (47.2%) show potential exposure to flooding, along with 9,781 residential buildings (17.3%) and 710 industrial buildings (12.9%). These numbers highlight the potential for significant economic disruption during flood events.

Three waters infrastructure shows substantial exposure across all networks. Approximately 386 km (21.0%) of potable water pipes, 261 km (23%) of stormwater pipes, and 211 km (16%) of wastewater pipes intersect with modelled flood areas. Critical facilities like pump stations also show significant exposure, with 25% of stormwater pump stations, 18% of wastewater pump stations, and 13% of potable water pump stations potentially affected. However, no treatment plants are within currently modelled flood zones.

These figures represent minimum exposure levels based on currently available data. The actual number of exposed assets is likely higher, particularly in areas where detailed flood modelling has not yet been completed. However, a granular risk assessment also requires evaluation of asset vulnerability and the severity of exposure to evaluate if and to what extent the assets could be damaged.

Table 7-2. Regional infrastructure exposure to river and surface (rainfall) flooding. Values combine flood modeling using different AEP scenarios across districts. Note that exposure indicates potential contact with floodwater exceeding 10cm depth but does not necessarily indicate damage.

Built infrastructure	Combined Flood Exposure (mixed scenarios)
Residential Buildings	9,781 (17.3%)
Commercial Buildings	918 (47.2%)
Industrial Buildings	710 (12.9%)
Roads	233 km (3.0%)
State Highway	11 km (2.0%)
Potable Water (PW) Pipes	386 km (21.0%)
Stormwater (SW) Pipes	261 km (23%)
Wastewater (WW) Pipes	211 km (16%)

Note: Regional totals combine 1% AEP flood modelling from Napier City (2100, RCP8.5), Wairoa (today's conditions), and Central Hawke's Bay (today's conditions) with 2% AEP modelling from Hastings District (today's conditions). Due to these different modelling approaches and limited spatial coverage, these numbers should be considered indicative only.



Figure 7.2. Regional infrastructure potentially exposed to more than 10cm of river and rainfall flooding across Hawke's Bay. Data uses the best estimate of today's flood risk, which requires combining different flood scenarios across districts (1% AEP for Wairoa, and Central Hawke's Bay; 2% AEP for Hastings District; and 1% AEP for Napier in 2100 under a high emission scenario).

Risk to physical infrastructure from landslides

Landslide risk assessment across Hawke's Bay shows that while most infrastructure has relatively low exposure at the regional scale (Table 7-3; Figure 7.3), the data may not capture all localised risks. For instance, while this assessment shows residential exposure at 1.2% (666 buildings), detailed GNS Science analysis of landslide risk for areas like Napier Hill was not able to be included in this assessment.

Industrial properties show notably higher exposure at 5.1% (280 buildings), while commercial buildings show minimal exposure (0.1%). The transport network has 152 km (2.0%) of local roads and 6 km (1.1%) of state highway in areas identified in region-wide modelling as being susceptible to landslides. This exposure is particularly concerning in hill country areas where landslides can sever critical access routes, leading to community isolation and delayed emergency response.

Three waters infrastructure shows relatively low direct exposure to landslides, with less than 1% of pipes affected across all networks. However, some critical facilities are located in landslide-prone areas, including one potable water treatment plant and two pump stations (one each for potable water and wastewater systems).

While the risk of landslides affecting the built environment is relatively low at a regional scale, this can mask the potential severity of cascading impacts such as isolation, as even localised landslides can have significant consequences for network connectivity and community access, particularly in inland and rural communities. This risk is explored in more detail in the district-level chapter.

Table 7-3. Regional infrastructure exposure to landslide risk.

Built infrastructure	Exposure
Residential Buildings	666 (1.2%)
Commercial Buildings	1 (0.1%)
Industrial Buildings	280 (5.1%)
Roads	152 km (2.0%)
State Highway	6 km (1.1%)
Potable Water (PW) Pipes	9.3 km (0.5%)
Stormwater (SW) Pipes	5.2 km (0.5%)
Wastewater (WW) Pipes	1.3 km (0.1%)

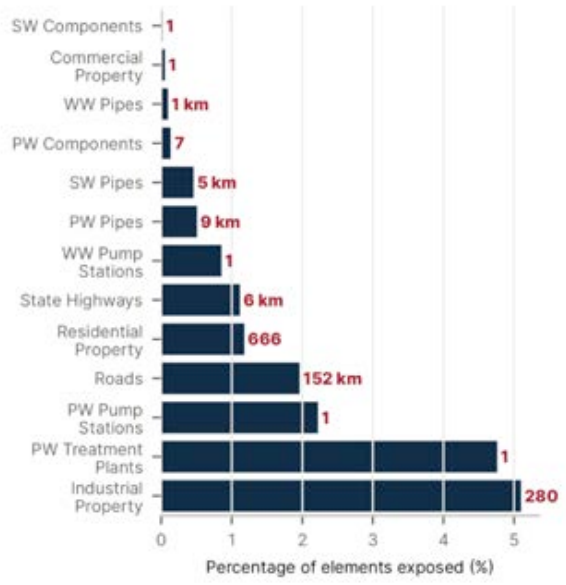


Figure 7.3. Regional infrastructure exposed to landslides across Hawke's Bay.

Risk to physical infrastructure from increasing temperatures

The built environment faces additional risks from projected temperature increases. Hawke's Bay is expected to experience between 5-25 more hot days (>25°) annually by 2040 (SSP2-4.5 and SSP5-8.5) and 5-40 more hot days annually by 2090. A summary of risks posed by increasing temperatures is shown in Table 7-4.

Risk to physical infrastructure from groundwater rise

While shallow groundwater data is currently only available for Napier, rising groundwater levels present an emerging risk to infrastructure across low-lying areas of Hawke's Bay. Potential risks include:

- **Building foundations:** rising groundwater can compromise structural integrity, leading to foundation damage and increased dampness
- **Underground infrastructure:** buried pipes and cables may face increased corrosion and buoyancy issues
- **Road substructures:** higher groundwater levels can weaken road bases, leading to more frequent maintenance needs
- **Wastewater systems:** elevated groundwater can infiltrate sewer systems, potentially causing system failures
- **Increased liquefaction risk**: higher groundwater levels can increase the risk of soil liquefaction during seismic events.

Table 7-4. Likely impacts of increased temperature on built infrastructure.

Built infrastructure type	Likely impacts from projected temperature increases
Transport network infrastructure	• Increased thermal expansion of bridge joints and rail tracks, potentially leading to buckling. • Accelerated degradation of road surfaces, particularly asphalt pavements. • Higher maintenance requirements and costs for transportation infrastructure.
Building systems	• Increased stress on cooling systems and potential overheating in buildings not designed for higher temperatures. • Higher energy demand for cooling, potentially straining electrical infrastructure. • Accelerated degradation of building materials, particularly those exposed to direct sunlight.
Urban heat island	• Amplification of temperature impacts in urban areas due to heat-absorbing surfaces. • Potential thermal stress on underground infrastructure, particularly in urban centres. • Increased risk of material fatigue in exposed infrastructure.
Water infrastructure	• Increased stress on water supply systems due to higher demand during hot periods. • Potential impacts on water quality in storage and distribution systems. • Higher maintenance requirements for exposed water infrastructure.



8 Human Domain

The Human Domain encompasses the social and cultural environments and elements that shape the region's identity and resilience. People's skills, knowledge, and physical and mental health are foundational aspects of the human domain, all of which contribute to the region's wellbeing. These aspects are complemented by the norms, rules, and institutions of society, which govern behaviour, facilitate cooperation, and promote social cohesion. Māori culture also enriches the human domain, with traditional practices, values, and knowledge systems providing the foundation for the region's identity and heritage.

Hawke's Bay's demographic profile contributes to the risk posed by natural hazards. Some groups may be more or less vulnerable during and following a hazard, due to physical, social and/or economic factors. For example, those who are older are more likely to have existing health conditions and mobility issues that increase their vulnerability. Conversely, those who are on higher household incomes are more likely to be financially resilient following an event.

Ageing Population: 19% of the region's population is aged 65 and older [46].

Children: 14.1% of the population is less than 14 years old, which is lower than the national average of 18.5% [46]

Ethnicity: 73.3% of the region's population identifies as European. A total of 28.6% identify as Māori, an increase of 11.5% since 2018 [46].

Summarising exposure of people to modelled hazards

This report highlights significant hazard across Hawke's Bay which poses both direct and indirect risk to the region's population (Table 8-1, Figure 8.1; Figure 8.2; Figure 8.3; and Figure 8.4. The complete set of results are presented in Appendix 3.5). Findings are based on current understanding and assumptions about land use and population data as per the methodology (Section 3).

Coastal flooding exposure is projected to increase substantially over time, with potential to exacerbate existing inequities. More than three-quarters of those exposed to more than 10cm of coastal flooding live in areas with greater than average deprivation (Deprivation index scores of more than 5), and this pattern intensifies over time (Figure 8.1). As shown in Table 8-1, by 2050, over 25% of those affected by coastal flooding live in highly deprived areas (Deprivation index scores of 9-10), increasing to more than one-third of affected populations by 2130 under a high emissions scenario.

River and rainfall flooding currently affects a significant portion of the population, with more than half the region at risk of isolation (Table 8-1). These risks disproportionally affect residents who are already considered deprived - of those directly exposed to more than 10cm of river and rainfall flooding, over half (54%) live in areas with higher-than-average deprivation scores (Figure 8.3).

Landslide risk shows a notably different pattern (Figure 8.4). While overall exposure is lower (Table 8-1), those affected are more likely to live in areas with low deprivation scores (Deprivation index scores of 1-2). This distinct pattern likely reflects historical development patterns, with more affluent neighbourhoods often located in hillside areas.

Table 8-1. Population Exposure to Natural Hazards. *Deprivation pattern indicates the relative proportion of a subpopulation group is over-represented in the impacted group (i.e. identifying which socio-economic groups are disproportionally impacted).

Hazard Type	Timeframe	Scenario	Direct Exposure	Isolation Risk	Deprivation Pattern*
Coastal Flooding	2050	SSP2-4.5	18,000 (10%)	21,200 (12%)	>25% highly deprived
Coastal Flooding	2130	SSP5-8.5	40,600 (23%)	43,200 (25%)	>33% highly deprived
River and Surface Flooding	Present	Current	16%	55%	54% in higher deprivation areas
Landslides	Present	Current	1.3%	8%	Greater proportion in least deprived areas

The risk to the human domain can be both direct and indirect

Although more difficult to quantify, the indirect risks may be significant as they cascade from risks to other domains, particularly the built environment. The elements at risk in the human domain are described in greater detail below. Each of the domains is interconnected, recognising how human health and wellbeing is influenced by factors that span physical, mental, emotional, cultural, spiritual and social aspects.

Risks to physical human health

Climate change can pose a risk to physical human health in a variety of direct and indirect ways.

Risk to life can occur through direct exposure to heatwaves and extreme events (e.g. river and rainfall flooding, wind and coastal inundation), while indirect exposure can occur through exposure to contaminated water, increased exposure to vector-borne and zoonotic diseases, and health-related risks associated with access to water and food driven by changes in temperature, rainfall patterns and extreme events [52].

Climate change hazards can also have significant cascading effects on physical health through changes in housing quality. For example, flooding and rising groundwater tables can contribute to cold, damp living conditions in affected homes [53]. This creates a reinforcing cycle where poor housing quality influences heating costs and heat retention, leading to persistent dampness, rot, and mould growth. These conditions can result in a wide range of physical health issues, particularly respiratory and cardiovascular illnesses [54], [55]. Given that residents of the Hawke's Bay region will be increasingly exposed to natural hazards and climate-related changes, risk to physical human health is expected to increase over time.

In general, older people, young children, those with existing health conditions and people of lower socio-economic means are more vulnerable to climate-related health risks than the general population [56]. Within Hawke's Bay, children and those aged 65 and over may be more vulnerable due to physiological factors and limited mobility, including higher reliance on others to access essential goods and services. Those living in areas exposed to hazards and classified as being highly deprived, such as parts of the Wairoa District and Napier City, may be more susceptible to negative health impacts arising from living in damaged and lower quality housing,

particularly if they do not have sufficient financial resources to repair their homes or find suitable alternative accommodation.

Cyclone Gabrielle highlighted the impacts of an extreme weather event on physical human health in Hawke's Bay, with extensive reports of cyclone-related injuries, contact with contaminated silt and water, physical exhaustion, challenges accessing healthcare services, and the deaths of 12 people in the region [57], [58]. Psychological impacts of that event continue to be experienced by some people in the community two-years on.

Risks to mental health, identity, connections to place and nature

A changing climate has a range of implications for the mental health and personal wellbeing of Hawke's Bay residents.

Implications include increased incidence of stress, anxiety and trauma associated with [12], [49]:

- experiencing an extreme event (e.g. flood, coastal storm)
- loss and damage to property or places of value
- disruption to everyday life and coping with change (e.g. isolation or loss of services)
- loss of livelihood
- displacement
- feelings of helplessness and loss of autonomy
- fear and uncertainty regarding the future as the climate continues to change [12], [49].

People with pre-existing mental health conditions are more likely to be impacted by an event than others [59]. However, stress and anxiety are likely to increase in general as more people experience trauma, loss, and disruption to daily life linked to climate change. Insights from the 2020 Napier flood and Cyclone Gabrielle events illustrate the mental toll of extreme events on the Hawke's Bay community, including stories of ongoing stress and anxiety, exacerbated over time by subsequent heavy rainfall events [59], [60].

Risks of exacerbating existing inequities

The impacts of climate change will be distributed in inequitable ways. In general, groups within society that are already marginalised or at an economic disadvantage are more vulnerable to climate hazards and risks. This is often due to inequitable access to the services and resources required to maintain and support wellbeing (e.g. stable employment, financial stability, insurance cover, reliable drinking water, warm and dry homes). All of these factors impact people and communities' adaptive capacity.

In some cases, more deprived households may already be located within known hazard areas because the property or rent is cheaper than in areas less exposed to known risk. An example of this in Hawke's Bay is several communities who will be most affected by future coastal inundation that are already classified as experiencing higher levels of deprivation.

New inequities may be created or existing inequities exacerbated through the response to a changing climate. Inaction (or maladaptation) that fails to reduce risk may create a trend of ongoing loss and damage which erodes access to the goods, services, places, economic opportunities and social networks that support wellbeing. It may also result in new areas experiencing climate hazards and/or associated isolation from essential services that have previously been considered low risk. Over time, those with greater access to resources will be more likely to leave at-risk areas, compared to those with less resources. This could exacerbate inequitable outcomes for those who remain in areas of higher risk.

Risks to social cohesion and community wellbeing

Wellbeing is experienced not only by the individual and household, but also at the community level.

Important aspects of community wellbeing include social cohesion and connection to place. Cohesion is described as the bonds that link communities and people together, including physical place-based, cultural or social connections.

Risks to social cohesion can arise due to changes over time or post-event when communities are stressed or experience a decline in their sense of safety. For example, the numerous reports of looting following Cyclone Gabrielle led to widespread concern within various communities across Hawke's Bay, and anger towards authorities who some perceived to be downplaying the prevalence of the issue [61], [62]. Risks to cohesion are indirect risks that are driven by physical changes to communities from a changing climate and/or severe weather events (e.g. to homes, property, businesses and facilities) that erode the desire or ability of people to remain in place. There are two components to this risk; first, the risk associated with those who experience displacement and second, the risk to those left behind [12].

Displacement can cause trauma linked to disruption and dislocation from familiar surroundings and breaking of social and cultural bonds, and the challenges of resettlement. Conflict may arise between existing residents and relocated households as disagreements about social norms and practices emerge. With less ties to support networks and opportunities, there is a risk of poorer health and wellbeing outcomes amongst those displaced.

Those remaining in affected communities may experience a decrease in local population as affected residents relocate or are relocated. Alternatively, at-risk properties may be increasingly occupied by those who can't afford to live anywhere else, exacerbating inequities. Those who remain within affected communities may experience feelings of loss and abandonment as the community diminishes. If there is a net reduction in the size of an affected community, essential services may be slowly withdrawn over time (e.g. health services, education facilities, job opportunities, community services). Investment in affected communities may also be reduced. Similar to displaced households, those who remain may experience trauma due to the breaking of family, social and cultural bonds, resulting in poorer health and wellbeing outcomes.

The breakdown of communities and associated social bonds and connections to place is an important risk to consider because fractured, less cohesive communities can result in conflict, loss of trust in government, feelings of isolation and loss, and negative health and equity outcomes.

Risks to social infrastructure and amenity

Social infrastructure and amenity in this context means:

- the infrastructure that keeps society functioning and supports daily patterns of life (e.g. shopping or travelling to work, education, engaging in recreation, community or cultural activities)
- social support structures (e.g. churches, supermarkets, community facilities, healthcare services, early childhood centres)
- the recreational spaces and facilities that afford visitors and residents the opportunity to enjoy and participate in exercise, organised sport and time spent outside
- the aesthetics and amenity of the places people live in and the spaces they utilise, and whether changes to these can be tolerated by those who live there.

Isolation caused by increasing frequency and severity of flooding and landslides is considered likely to negatively impact the wellbeing of Hawke's Bay communities by restricting access to the goods, services, and social networks that support residents' health and wellbeing.

Over time, repeated isolation from social infrastructure and a loss of amenity will begin to erode the liveability of communities because residents are not able to access the services they need for daily life. Frequent isolation in affluent communities may result in those residents leaving the community over time for less exposed locations and increasing inequities for those who remain in at-risk locations.

Risks of conflict, disruption and loss of trust in government

Disruptions to everyday life caused by exposure to hazards, changes in the value of assets, and difficulty accessing critical resources (e.g. clean water, emergency management services, insurance, safe land for homes) may generate conflict and competition between different social groups and erode trust in central and local government.

Disagreements about how (or not) to respond to climate change can further exacerbate these tensions.

Any competition for scarce resources that may arise will disadvantage already marginalised or deprived groups and individuals, exacerbating inequities. A full understanding of risks associated with a loss of trust in government is explored in Section 10: Risk to Governance.



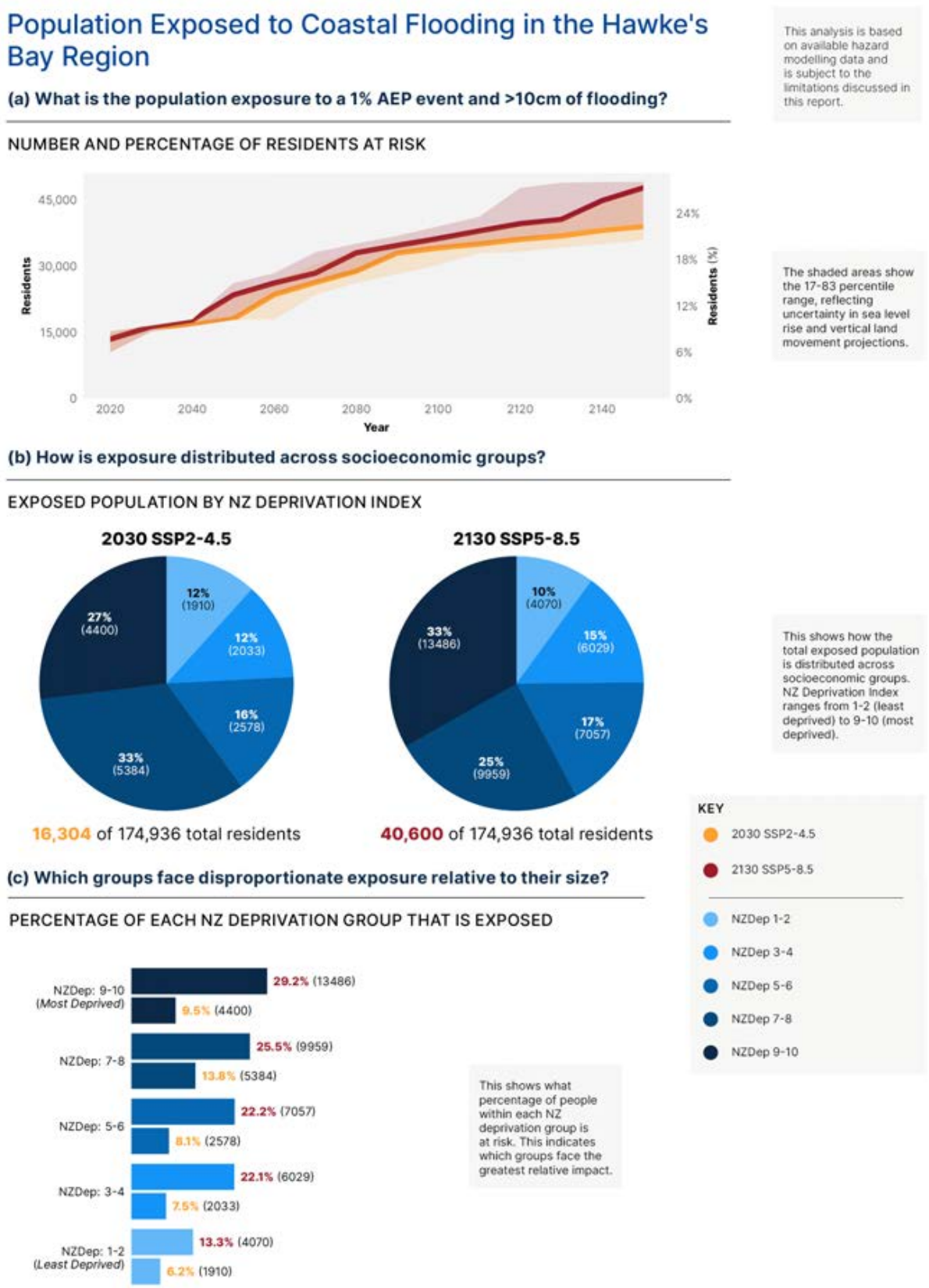


Figure 8.1. Risk to residents in the Hawke's Bay Region living in property directly exposed to coastal flooding and projections over time.

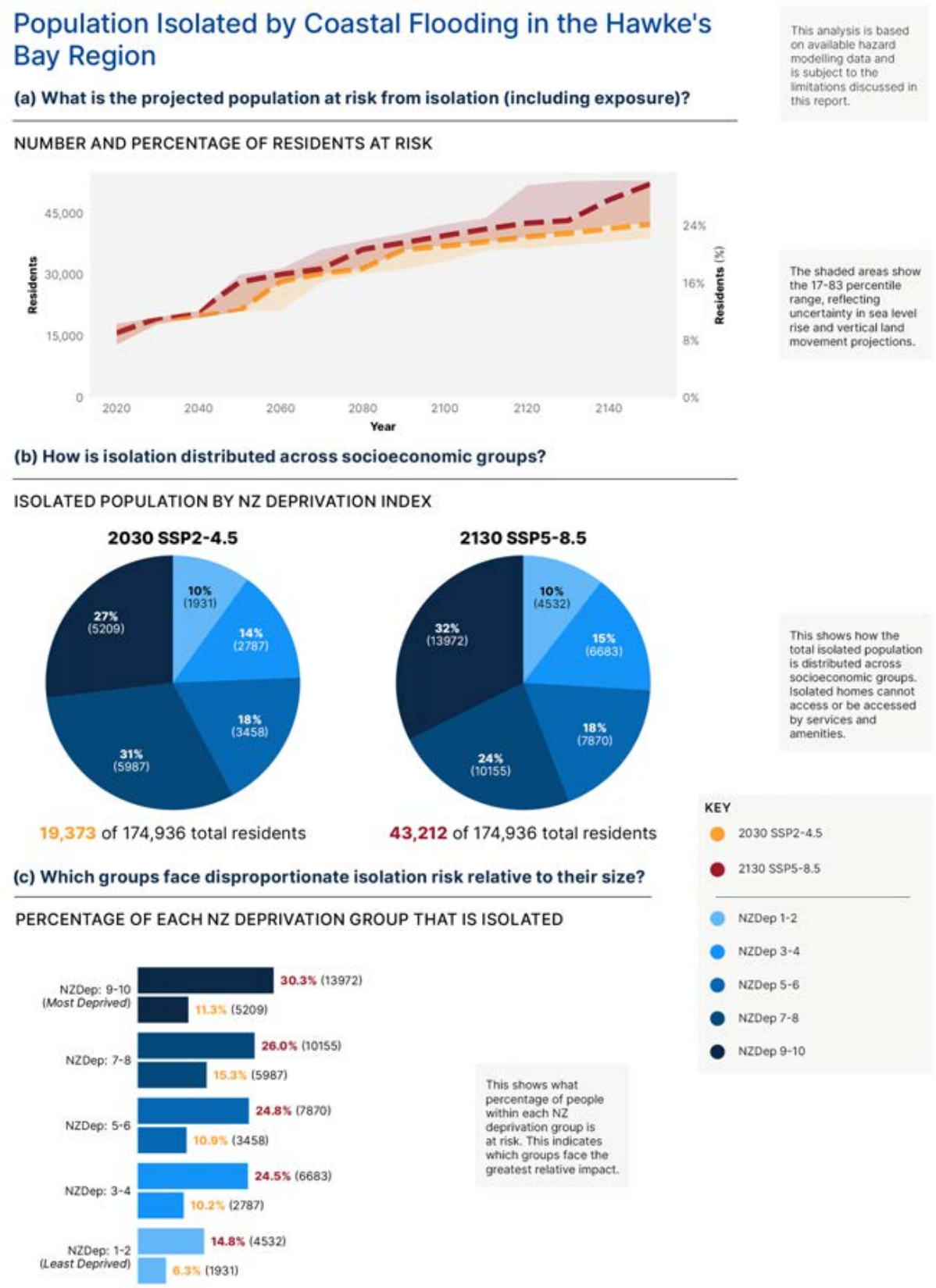


Figure 8.2. Isolation risk to residents in the Hawke's Bay Region from coastal flooding and projections over time.

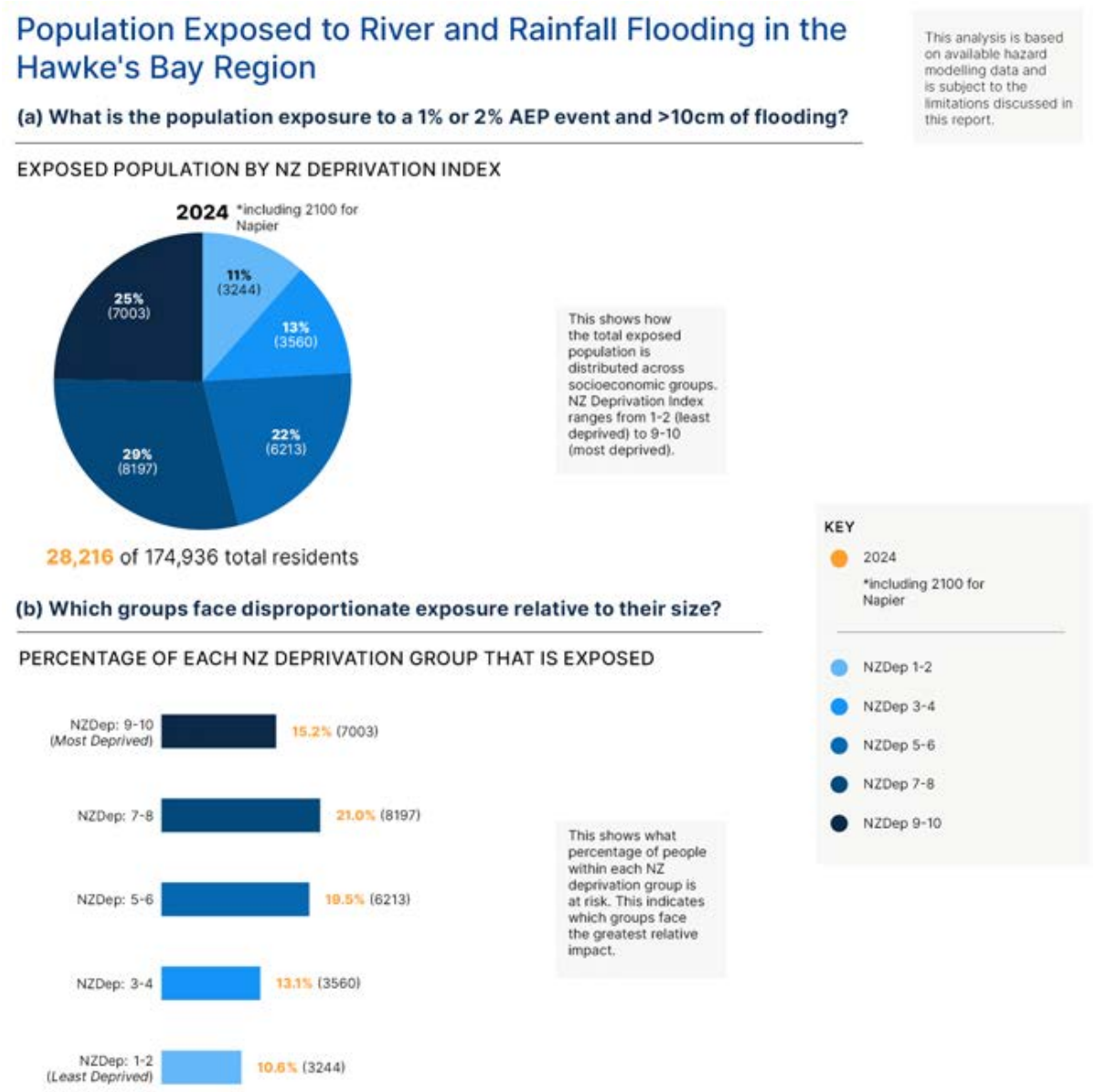


Figure 8.3. Risk to residents in the Hawke's Bay Region living in properties directly exposed to river and rainfall flooding.

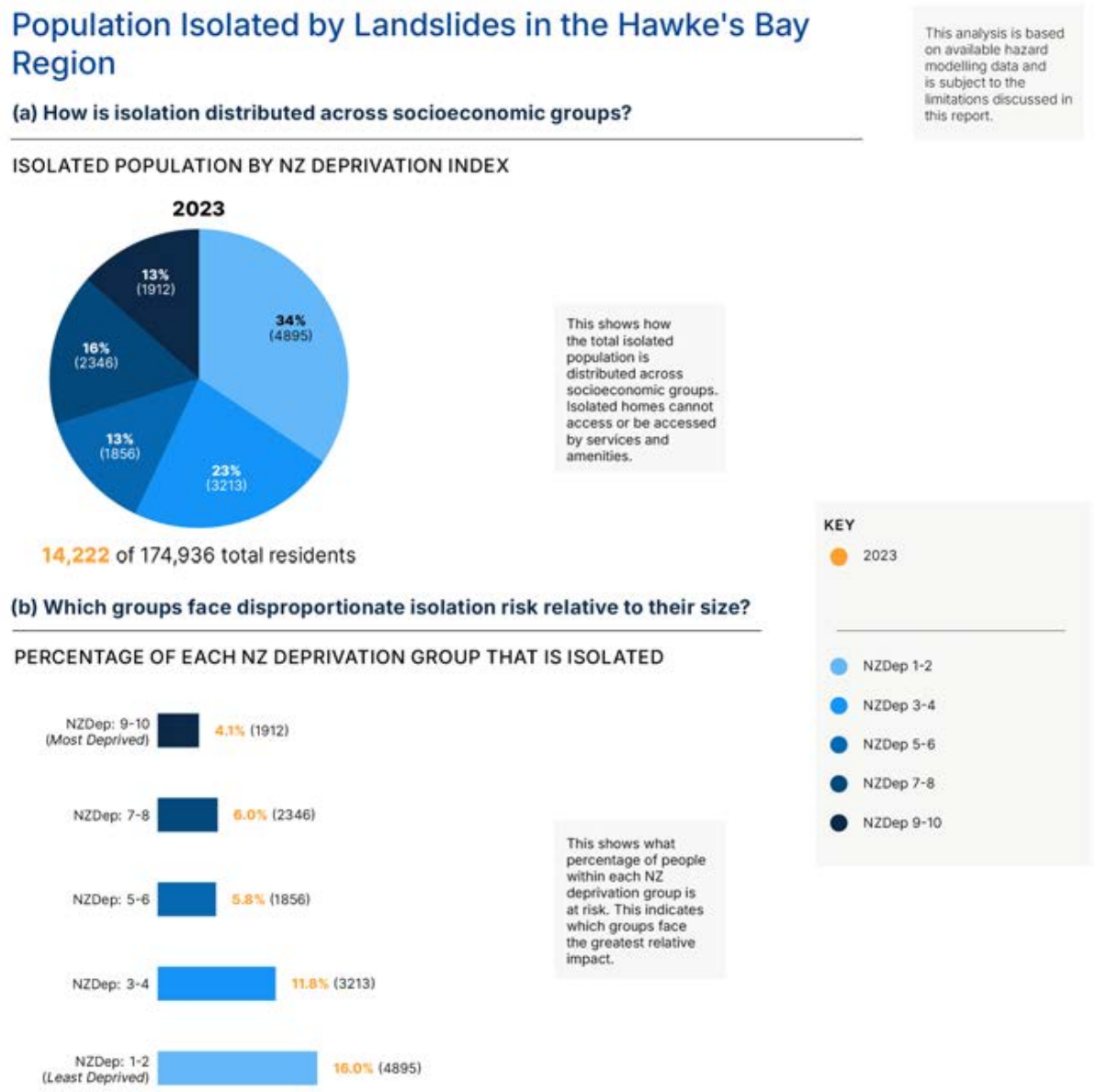
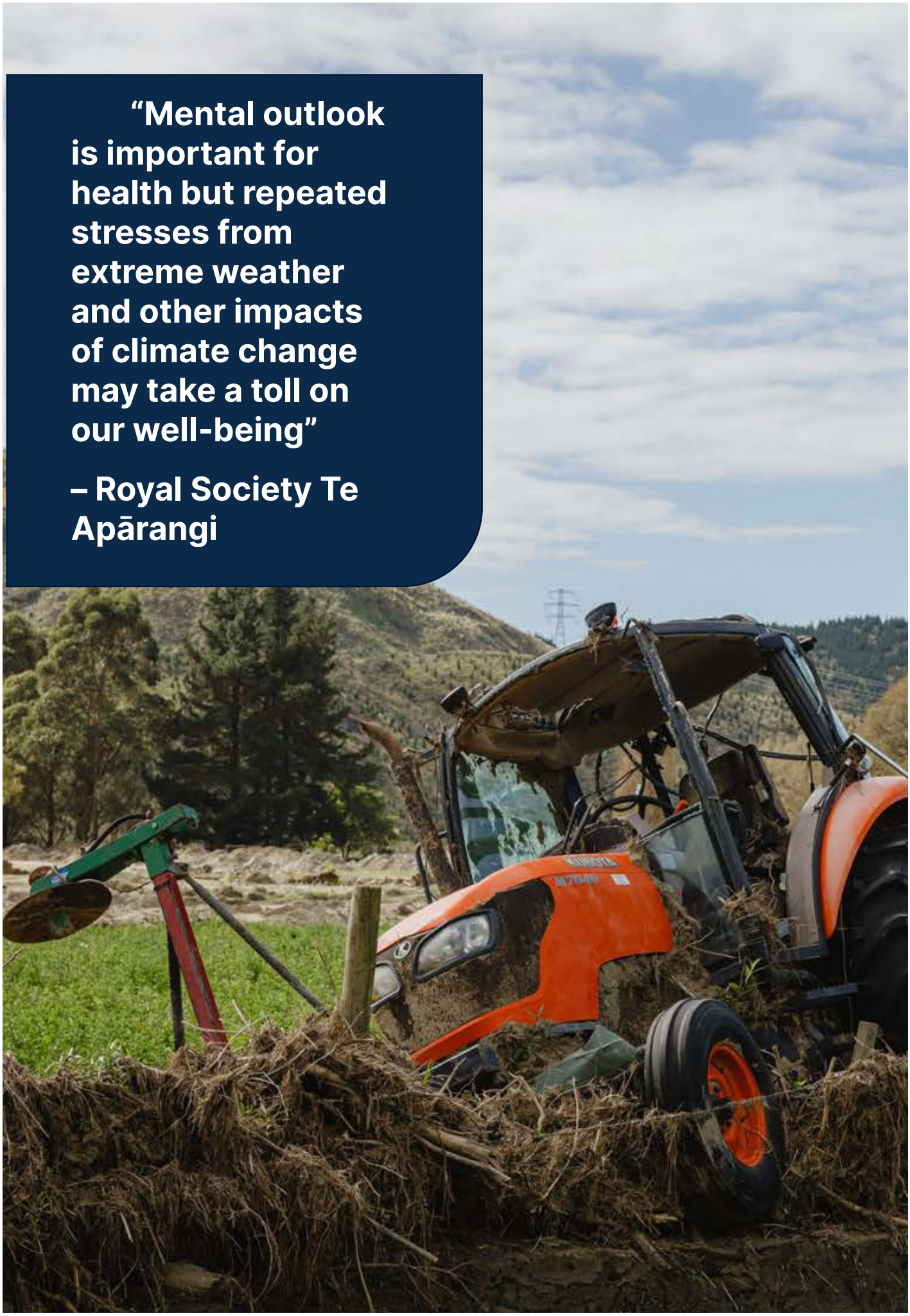


Figure 8.4. Isolation risk to residents in the Hawke's Bay Region from landslides.


"Mental outlook is important for health but repeated stresses from extreme weather and other impacts of climate change may take a toll on our well-being"
– Royal Society Te Apārangi

9 Economic Domain

This assessment uses the Australian and New Zealand Standard Industrial Classification (ANZSIC) to report economic risks. ANZSIC is the official framework used to classify economic activities across New Zealand. For instance, horticulture and viticulture is included within the broader category of "Agriculture, Forestry, and Fishing". This classification ensures consistency when reporting employment, GDP contribution, and sector-based exposure to climate-related hazards.

Manufacturing, Agriculture, Forestry & Fishing, and Health Care & Social Assistance have the greatest contributions to regional GDP. Construction, and Retail Trade are also significant employers (Table 9-1).

Climate change will impact the regional economy through direct, indirect and chronic impacts.

Direct impacts refer to physical damage to industrial or commercial properties and assets caused by a hazard such as flooding or landslides.

Indirect impacts are the loss of function experienced by a business or industry due to disruption to the things upon which it relies such as power, water, transport, goods supply or staffing.

Chronic impacts refer to the changes over time in key operating conditions such as temperature, soil

Table 9-1. Employment and Economic Contribution by Economic Sector in Hawke's Bay.

ANZSIC Division	Contribution to Regional GDP (%)	Percentage of total regional workforce employed (%)
Manufacturing	12	12
Agriculture, Forestry and Fishing	9	12
Health Care and Social Assistance	8	12
Rental, Hiring and Real Estate Services	7	2
Construction	7	10
Professional, Scientific and Technical Services	7	6
Retail Trade	6	9
Wholesale Trade	4	3
Transport, Postal and Warehousing	4	4
Public Administration and Safety	4	4
Education and Training	3	7
Administrative and Support Services	2	5
Financial and Insurance Services	2	1
Electricity, Gas, Water and Waste Services	2	1
Accommodation and Food Services	2	6
Other Services	1	4
Information Media and Telecommunications	1	1
Arts and Recreation Services	1	1
Mining	0	0

ANZSIC Division refers to classification system jointly developed by Statistics New Zealand and the Australian Bureau of Statistics to allow comparisons across industries between the two countries.

moisture, salinity etc. These have the most direct impact on primary industries.

In this assessment, GDP derived from exposure data for industrial and commercial property and associated sector employment data is used to indicate the relative level of direct exposure, and isolation as a proxy for indirect impacts. Chronic impacts are discussed based on qualitative assessments. Figures used are intended to enable comparison of the impacts of different hazards at different time periods, not as an indication of loss.

Overview of hazards with potential direct impacts on the regional economy

Coastal flooding poses a risk to industrial and commercial properties contributing to 10% ($830m) of the region's annual GDP in 2050, rising to 15% ($1242m) by 2130 (Figure 9.2). The greatest exposure across both time periods is to the Manufacturing and Wholesale Trade sectors. Isolation impacts 10% in 2050, rising to 16% by 2130 (Figure 9.3). Again, Manufacturing and Wholesale Trade are the most impacted sectors along with Transport, Postal and Warehousing.

Direct impacts from landslides are not significant economically, however isolation is a risk for commercial and industrial properties contributing to 6% of the region's GDP (Figure 9.4). The Agriculture, Forestry and Fishing sector is the most heavily affected with buildings contributing 49% of the sector's GDP at risk of isolation due to landslide susceptible land (Figure 9.4).

River and rainfall flooding poses a risk to industrial and commercial properties contributing to 32% ($2642m) of the region's annual GDP (Figure 9.5). The greatest exposure is to the Manufacturing, Health Care & Social Assistance and Retail Trade sectors. Isolation due to river and rainfall flooding impacts properties contributing 39% ($3260m) of the region's annual GDP. Again Manufacturing, Health Care and Social Assistance and Retail Trade are the sectors with the greatest exposure.

Coastal, river, and rainfall flooding can both have significant economic impacts beyond the direct damage and isolation impacts. Repeated events can undermine business confidence in the area and lead to capital flight.

All figures showing the results of the mapped natural hazard impact on property contributing to economic activity are presented in Appendix 3.5. Note that hazard model coverage is often focused on urban areas, limiting the sufficiency of exposure analysis for rural areas and rural-based sectors.

Risks to primary production

Hawke's Bay's primary sector faces significant climate-related risks and opportunities through mid-century, with varying impacts across the region's districts. Agriculture, Forestry and Fishing contributes 9% of the annual regional GDP and employs 12% of the total workforce. Impacts on viticulture specifically also flow on to tourism, given the significance of the wine and food sector in attracting visitors to the region. This sector will be affected by both acute (storms) and chronic climate change effects. Under SSP3-7.0 projections for 2041-2060, all districts will experience mean annual temperature increases of approximately 1.4°C, though with distinct local variations in associated impacts.

The Hastings District, currently the region's primary horticultural area, faces particular challenges. Projections indicate 23.8 additional hot days (>25°C) annually and a notable decrease in spring rainfall (14.9%). These changes, combined with increasing Potential Evapotranspiration Deficit (PED) of 57.9mm annually, suggest increasing water stress for fruit production. However, reduced frost risk (-9.9 days annually) may benefit some crop types. See Section 14 for more information on risk assessment findings for the Hastings District.

The Central Hawke's Bay District shows similar trends but with slightly more pronounced temperature effects, projecting 25.2 more hot days annually. The district's PED increase of 45.9mm annually, while significant, is less severe than Hastings. This could present opportunities for horticultural expansion, particularly for crops that benefit from warmer conditions and can manage periodic water stress. See Section 14 for more information on risk assessment findings for the Central Hawke's Bay District.

The Wairoa District's projections suggest potential opportunities for new horticultural development. The area is expected to experience a reduction in windy days and significant increase in growing degree days (406.7 GDD increase annually). While Wairoa faces similar challenges regarding spring rainfall reduction (-11.9%) and increased PED (51.7mm), its projected decrease in frost risk (-7.5 days annually) could open new areas for fruit production. See Section 17 for more information on risk assessment findings for the Wairoa District.

Biosecurity incursions are expected to increase with significant impacts on primary production. For example, Chilean needle grass, an invasive weed established in sheep and beef pastures throughout Hawke's Bay reduces the productivity and market value of sheep inhabiting pastures with needle grass present [63]. Climate change is expected to increase the potential habitat for this invasive species by 60%, leading to potential economic losses in the hundreds of millions [63].



Figure 9.1. Chilean needle grass - an invasive weed.

Key economic implications for the sector include:

- Increased irrigation infrastructure requirements and operating costs across all districts, along with potential conflict over water allocations
- potential shifts in variety selection and timing of key operations
- geographic diversification opportunities, particularly in Wairoa and Central Hawke's Bay
- rising importance of heat and water stress management in Hastings' existing orchards
- changes to fruit quality and yield affecting market returns
- changes in efficacy and cost of pest management resulting from increased biosecurity incursions.

These changes will require significant adaptation investment but may also present opportunities for regional diversification of horticultural production. Success will depend heavily on water availability, infrastructure development, and adoption of climate-resilient growing practices.

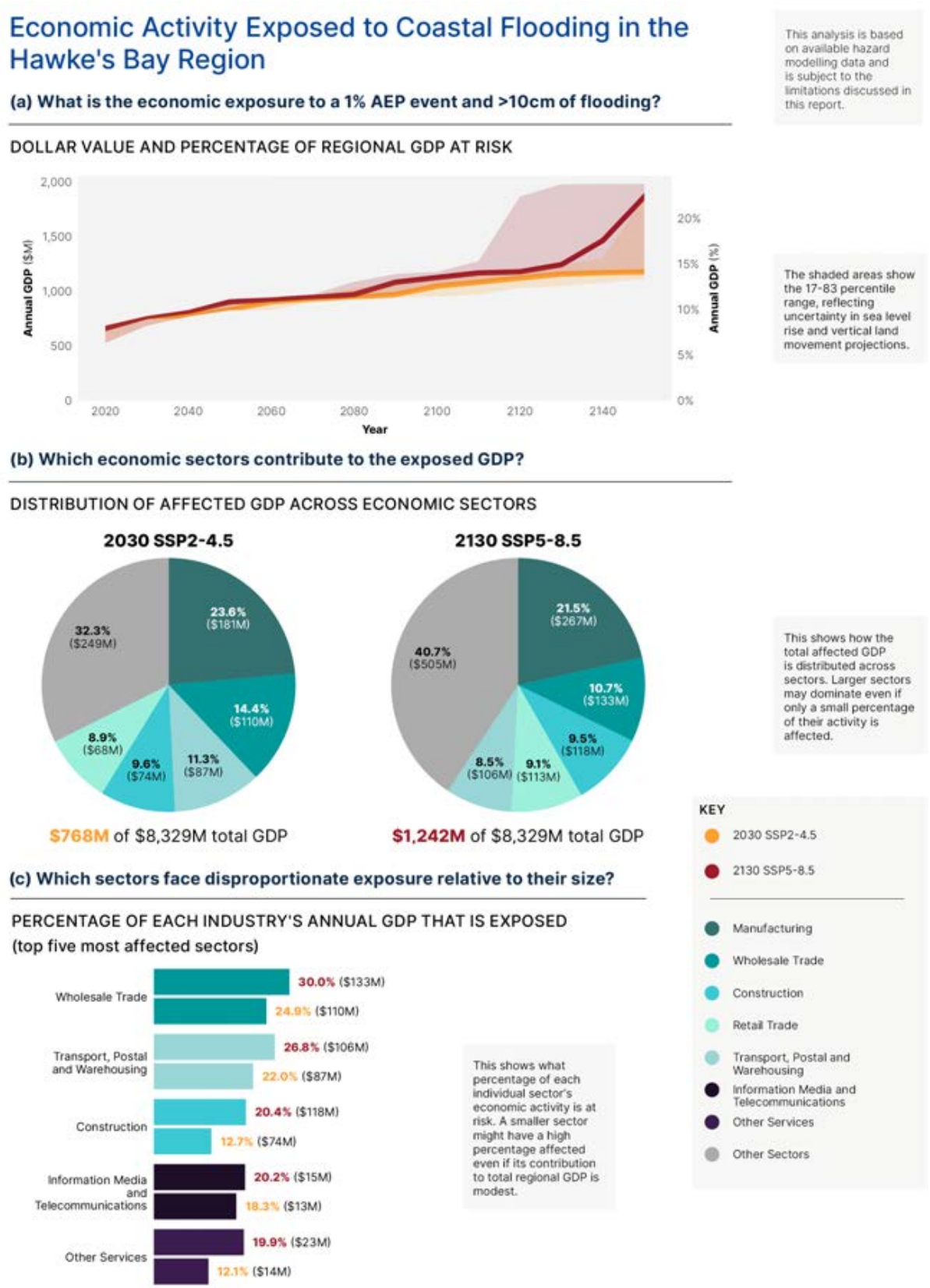


Figure 9.2. Risk to economic sectors in the Hawke's Bay Region from 1% AEP coastal flooding.

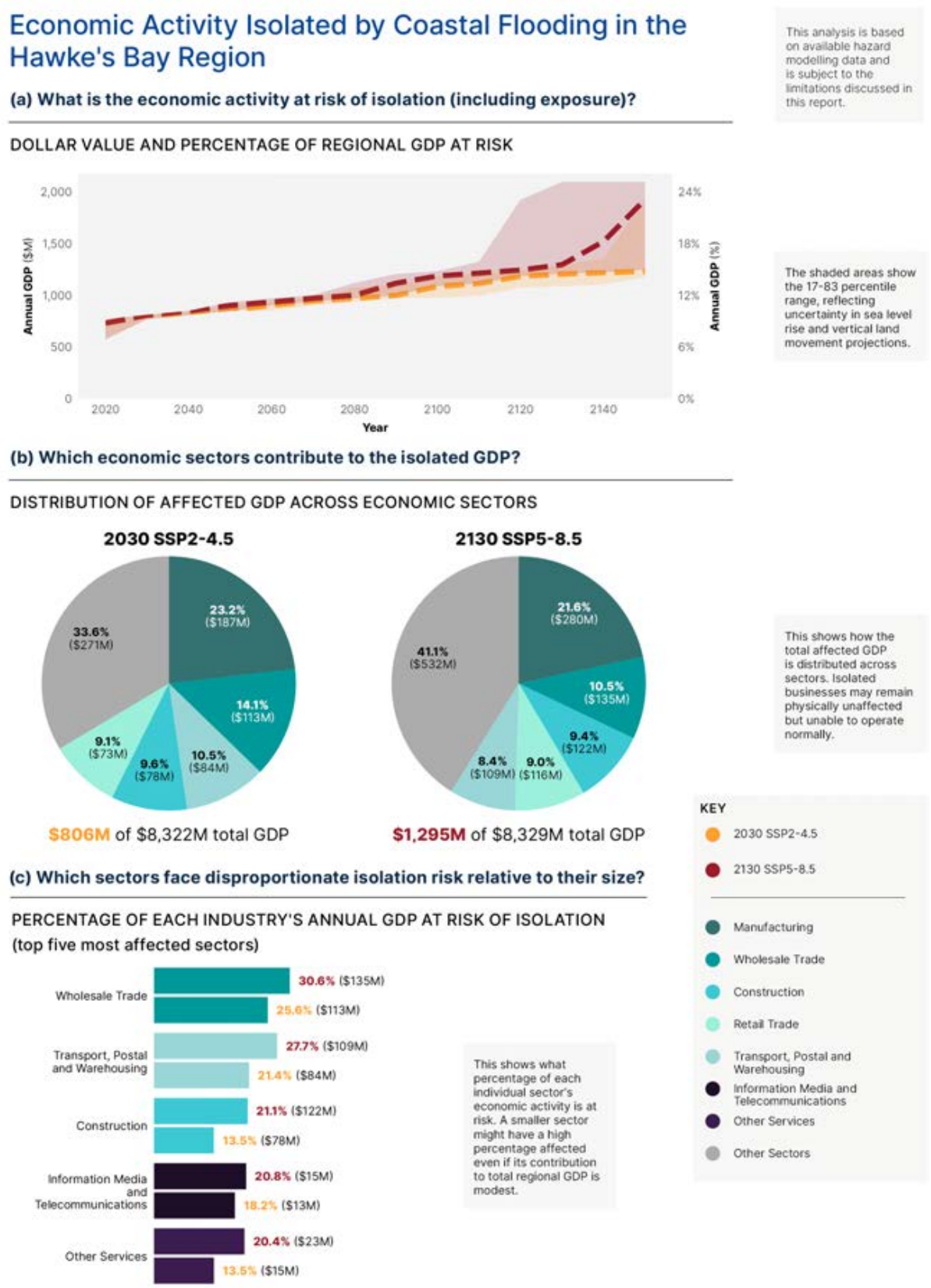


Figure 9.3. Risk to economic sectors in the Hawke's Bay Region from isolation caused by 1% AEP coastal flooding.

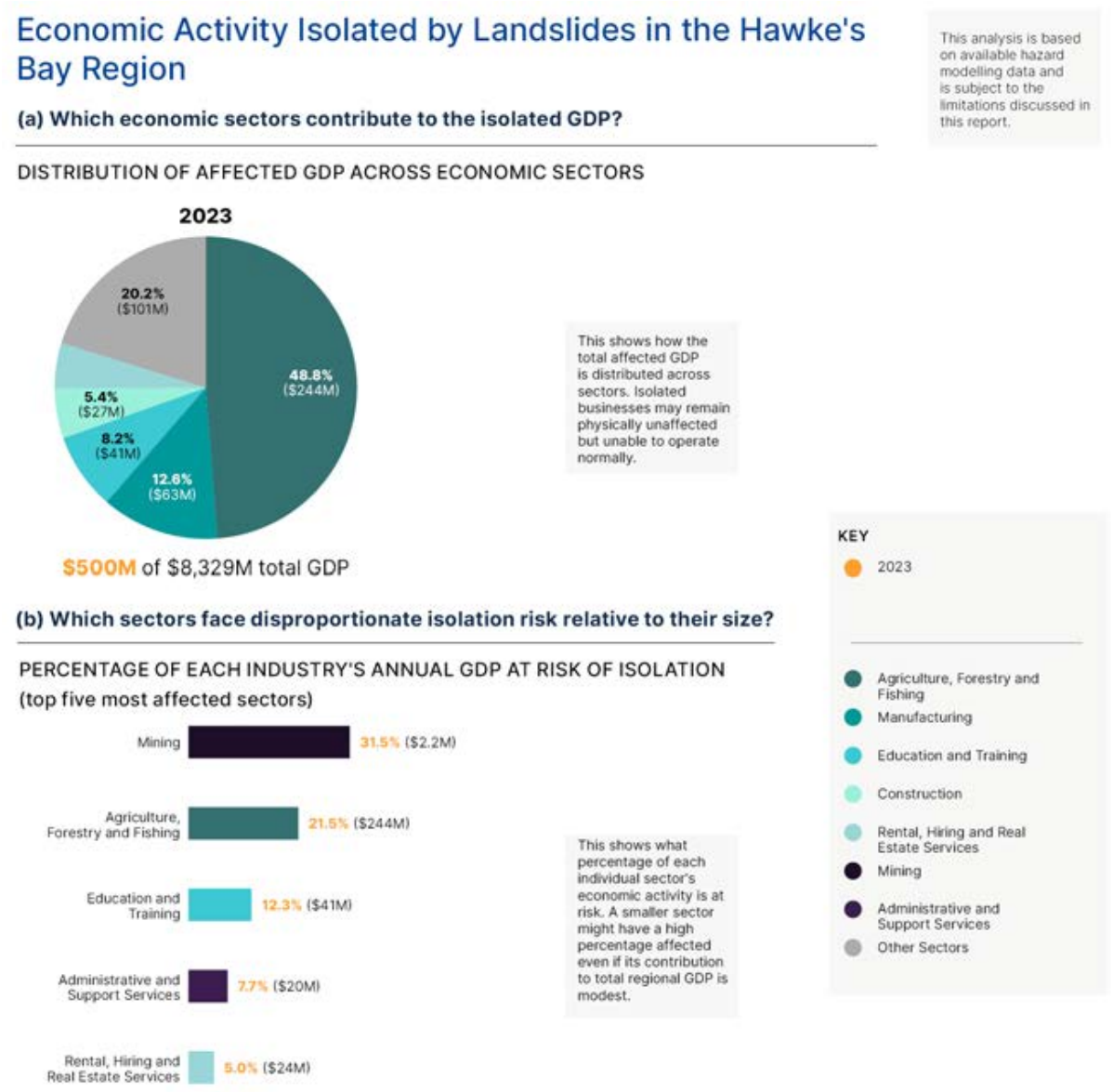


Figure 9.4. Isolation risk to economic sectors in the Hawke's Bay Region from landslides.

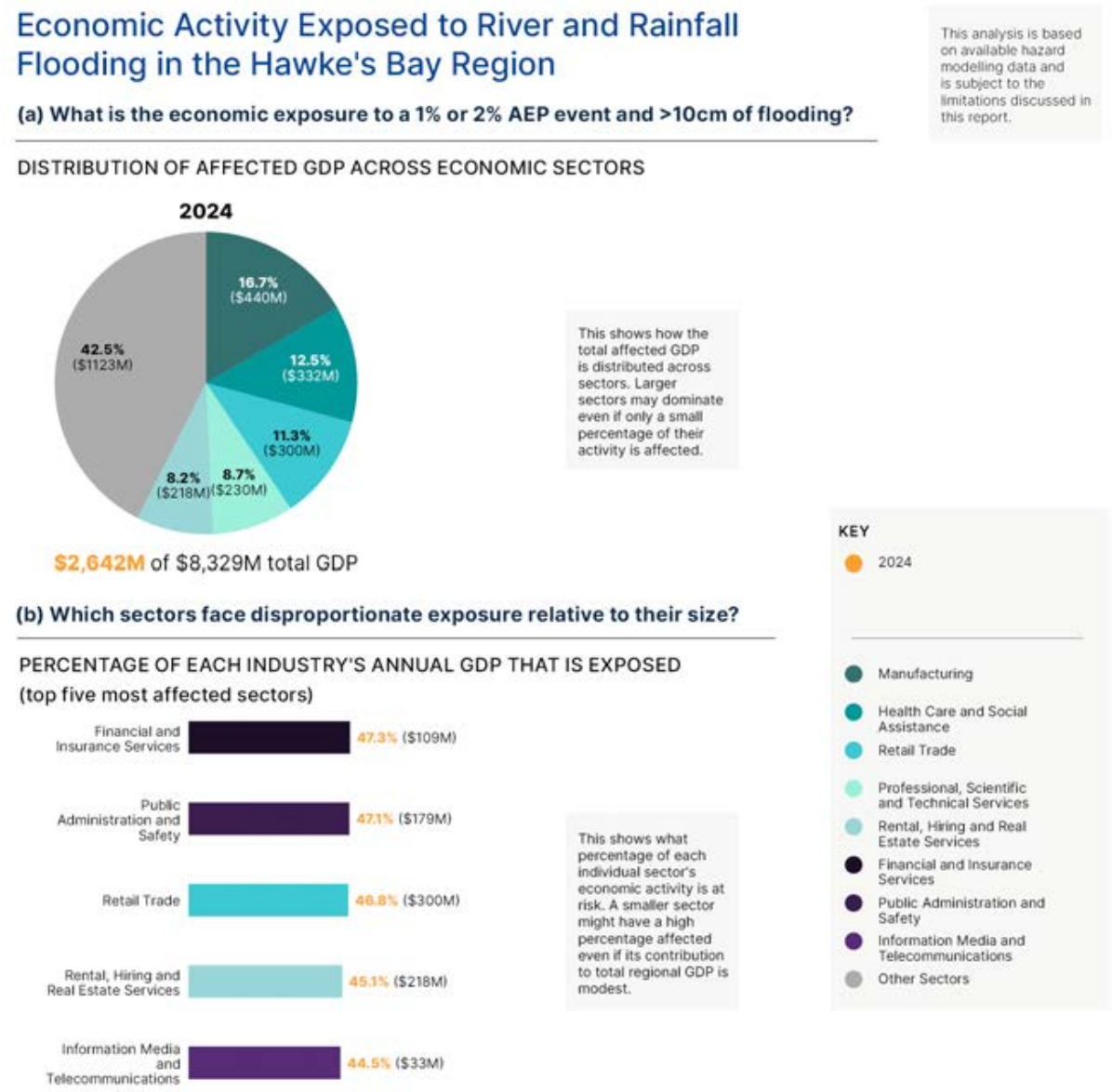


Figure 9.5. Risk to economic sectors in the Hawke's Bay Region from direct exposure to river and rainfall flooding.

10 Governance Domain

The capacity of the region to continue to govern effectively is both dependent on the effects of climate change (e.g. on rate payers, financial systems, institutional assets, businesses) and by what is done (by governing authorities) to reduce the effects of climate change in the first place. This circular causation makes it challenging and complex to evaluate.

In this analysis, governance risks have been evaluated using expert judgement. The governance domain is broken down into sub-sections that have been adapted from those used in the National Climate Risk Assessment [12]. These sections are grouped into 'risks to' governance and 'risks arising from' governance.

Regional governance risks exist within a broader national context. The Climate Change Commission's assessment of the National Adaptation Plan (NAP) has identified "Insufficient/Significant gaps" in governance progress nationally (Section 10). However, beyond these structural challenges, research indicates that all levels of government are likely to face challenges in addressing climate risks, particularly those that cascade across multiple domains or emerge over longer time horizons [64]. These challenges aren't unique to any specific council or region but rather reflect the inherent complexity of climate adaptation governance.

Common governance challenges include balancing immediate priorities with long-term planning, working across traditional disciplinary boundaries, and maintaining progress through political cycles [65]. Misalignment between national policy frameworks and local implementation capacity creates additional complexity, as councils must translate broad strategic direction into practical local actions with limited resources [66].

Addressing these governance challenges represents a significant opportunity for the Hawke's Bay region to strengthen its adaptation effectiveness through approaches to cross-sector collaboration, community engagement, and long-term planning frameworks.

Risks to governance

Loss of community trust and buy-in

There is a general sense that New Zealanders' trust in key institutions is declining, and the 2023 General Social Survey confirmed an overall downward trend [67], [68]. Unmitigated climate impacts may be perceived by communities as a failure of authorities to protect property and life. Loss of trust will be accelerated where the impacts of climate impacts exacerbate socio-economic inequities. This perception can erode trust in governing institutions.

Inadequate emergency management responses

The increasing frequency and scale of emergency events will challenge the region's small, specialised Civil Defence and Emergency Management workforce, which is currently rebuilding following Cyclone Gabrielle. While Hawke's Bay can utilise surge support from across the country, there is a high risk of insufficient resources if other councils are simultaneously responding to more frequent events. Cyclone Gabrielle's impacts across the upper North Island illustrated the limited capacity of emergency management both within the region and across New Zealand [59]. With more major events expected annually by 2030, and a potentially greater percent of the population and Emergency Management staff impacted, the current system could be overwhelmed, potentially further eroding community trust in governance processes. Steps to strengthen the current system such as those undertaken in the Hawke's Bay Civil Defence Emergency Management Transformation Strategy are important for supporting community resilience and trust in governance processes [12].

Failure of democratic process

Any increased frequency of disruption events will likely inhibit the community's ability to engage in the democratic process. Hawke's Bay currently has moderate civic engagement, with a voter turn-out on average across the region of 42% in local elections (national average 47%) and 80% in both electorates for central government elections (national average of

77%). The risk to the democratic process is likely to increase as a result.

Staff within local councils are also likely to be overloaded, particularly through periods of recovery from severe weather events. This may reduce their capacity to comprehensively engage with communities. Regular emergency responses may lead to an increase in non-consultative decision making under emergency powers.

Additionally, during recovery times after an event, there is often increased levels of engagement given the number of difficult decisions that need to be made. Sustained levels of increased engagement can result in engagement fatigue, draining the resources of the community. This fatigue can evolve into broader disengagement between events if prior consultation doesn't translate into visible action. Additionally, iwi representatives may not have sufficient resources to engage in council-led engagement processes while also supporting their communities through event recoveries.

Democratic processes are also likely to be more challenging as social cohesion reduces, undermining constructive civic debate about issues [69]. This is particularly relevant in climate adaptation contexts, where decisions often involve difficult trade-offs and long-term commitments that span political cycles. Increasing disruption events and associated pressure on housing and community services may accelerate this polarisation, making democratic consensus-building and decision-making more difficult.

Impacts on existing government work programmes

The need to respond to emergency events diverts council and central government attention and resources. This can lead to disruption and delays in completing existing work programmes, such as those relating to building and upgrading lifeline infrastructure, policy development and community development projects. These time delays can cause additional stress for council and government staff, and frustration within the communities they serve. There may also be financial implications, with delays leading to increased costs which are then borne by ratepayers. The need to undertake hazard-related repairs and recovery also increases councils' costs, which can lead to increased rates and reprioritisation of work programmes [12], [70].

Increased litigation

As more individuals and businesses are affected by climate impacts, the risk of litigation increases. Litigation proceedings (irrespective of any claims being upheld) will require significant resources and will divert resources away from mitigation and adaptation efforts. The consequence of litigation in the future will be dependent on how relevant legislation evolves, how liability is assigned and the merits of legal proceedings. Increased litigation from mana whenua for the Crown's breaches of Te Tiriti o Waitangi is also a possibility.

Litigation may also arise in response to Councils or other institutions' efforts to proactively manage risk. This may generate a fear of actions to reduce risk and lead to a reluctance to take steps that may lead to legal challenges and expose ratepayers to further burdens.

Breaching Te Tiriti/Treaty obligations

There are a number of culturally significant sites that will be affected under the climate change scenarios discussed in this report. Many of these important sites are under Crown ownership. A lack of action by the Crown or other agencies for protection of such sites could be perceived as a breach of Te Tiriti/Treaty obligations. There is also a risk that iwi do not have the resources for engagement and involvement in local adaptation projects led by the Crown.

Risks arising from governance

Maladaptation due to a failure to account for uncertainty and long-term climatic change

Current governance processes often fail to adequately account for uncertainty and long-term change, focusing instead on current and shorter-term conditions. Most approaches do not account for data uncertainty or future changes in critical assumptions, such as insurance availability.

A tendency towards predictive, rather than adaptive planning, heightens the risk of maladaptation as decisions are bound by current understanding. There

is a shortage of tools to assist council staff and elected members in incorporating futures thinking. The pace and scale of decision-making during ongoing recovery from disasters, such as the recent extreme weather events, further exacerbates the challenge of risk-informed long-term planning. Financial and other resource constraints, as well as a desire to rapidly restore services to what they were before an event, dominates decision making processes.

Lack of institutional support for climate adaptation

Collaboration across organisations and agencies to address climate change is in its infancy. Constrained finances, lack of clarity around climate change funding, slow regulatory processes, rigid procedures, unaligned priorities and siloed thinking across domains all present challenges. Collaboration between central government agencies, the regional council, all territorial authorities and critical lifelines is particularly crucial for the region's long term adaptation planning.

Maladaptation due to knowledge and capacity gaps

There is varying expertise across councils in regard to climate change risk, mitigation, and adaptation. This makes it challenging to integrate climate change risk thinking across all council areas and both district and regional level work programmes. Staff are stretched dealing with day-to-day roles and recovery from prior events, creating a challenging environment to advance complex and sometimes contested issues.

Institutions also have a role bridging knowledge gaps within communities. Disinformation and misinformation amongst community members is a challenge in climate adaptation. Greater transparency of and accessibility to climate data could support collective behaviour change. Accessibility is required in terms of both physical access but also communication of data. Skills in risk communication and engagement are essential to build community capacity and knowledge around risks and adaptation

Path dependency/sunk cost fallacy

A wide range of planning decisions and community and social investments, both historical and current, will impact how the region, and each district, adapts to climate change. The location of recent or planned housing developments, health facilities, stop banks, and river protection could lead to path dependency, where further investment is required to protect existing assets. Path dependency will increase as financial resources are further constrained.

Inaction due to political challenges

The benefits of climate change adaptation are often not immediately visible, making it politically challenging to prioritise. Many climate adaptation decisions require a long-term mindset which can conflict with present-day challenges and resource allocation discussions, further heightened by the three-year electoral cycle. Political cycles and changing institutional/community priorities significantly impact the scale and pace of action to address the long-term impacts and range of risks posed by a changing climate. This is especially heightened by the current focus on helping affected communities recover effectively from Cyclone Gabrielle.


"On top of inflation, the cost of cleaning up after Cyclone Gabrielle has left councils with a hefty bill."
– NZ Herald, 2025

11 Iwi/Māori Domain

Hawke's Bay has a long history of Māori settlement, dating back to approximately 1250–1300 CE [71]. The region is home to 91 hapū and 11 iwi groups, of which Ngāti Kahungunu is the largest [16]. Hawke's Bay has a high proportion of people who identify as Māori (28.6% of the total population) compared to the New Zealand average (17.8%) [16]. Many of the historical Te Tiriti/Treaty claims in Hawke's Bay have been settled and a growing number of post-settlement governance entities (PSGEs) have been established. The region's Māori population is growing, with 50,076 of the usually resident population identifying as Māori, compared to 44,931 in 2018 and 34,662 in 2013[72]. Across the region, 79 marae provide sites for Māori community and tūrangawaewae. Additionally, over 11% of Hawke's Bay's 1.42 million hectares of land area is Māori freehold land [16].

Although specific, in-depth engagement with iwi, hapū or whānau has not informed this first pass risk assessment, risks to Māori and Māori interests described in the NCCRA [12] and Māori-led research offer useful insights which are drawn on here[1] [73]. Furthermore, the recent Government Inquiry into the severe weather events of 2023 notes the impacts of these events on Māori (particularly in the Hawke's Bay region), the subsequent function Māori community served in the immediate event response, and the necessity for deeper inclusion of Māori with local and regional government in the preparation and planning for future hazard events. [74] Research from Te Puni Kōkiri highlights the necessity for more detailed risk assessments that reflect the place-based cultural practices, knowledge systems and behaviours of iwi, hapū and whānau, including the development of mana enhancing approaches that are situated and sensitive to the adaptive capacity of mana whenua.

Summary of exposure to hazards

Māori in the Hawke's Bay region face unique exposure, risks and sensitivities to climate change. Key hazards as identified in this assessment are river, rainfall, and coastal flooding (Figure 11.1). The harms associated with being exposed to these hazards can be exacerbated by the existing health and socioeconomic inequities that Māori experience. Further, such hazards can undermine Māori cultural wellbeing through the degradation of and/or loss of connection to the natural environment and damage and/or loss of important cultural sites and associated practices.

Table 11-1. Risk to Māori Population from Natural Hazards.

Hazard Type	Timeframe	Scenario	Direct Exposure (% of Māori residents)	Risk of Isolation (% of Māori residents)
River and Rainfall Flooding	Present	Current	15.4%	57%
Landslides	Present	Current	1%	7%
Coastal Flooding	2020	Current	8.5%	10%
Coastal Flooding	2050	SSP2-4.5	10.8%	12.6%
Coastal Flooding	2050	SSP5-8.5	15.5%	19.8%
Coastal Flooding	2100	SSP2-4.5	22%	23.5%
Coastal Flooding	2100	SSP5-8.5	23%	24.7%

Table 11-1 presents the findings regarding hazard exposure and isolation risk for Māori in Hawke's Bay.

It is noted that the data informing this first pass risk assessment does not necessarily express the true lived experience of mana whenua and their marae in previous recorded events. Several marae that were flooded during Cyclone Gabrielle are not showing as exposed based on available flood modelling. This gap between lived experience and available data highlights the need for investment in further modelling and ground-truthing with mana whenua to enable a fuller understanding of how climate impacts are expected to affect iwi, hapū and whanau in the region. It can also reveal that in some instances, lived experience is of an event that exceeds modelling parameters and/or design of mitigation works (e.g. recorded flood flows could be in excess of a 200-year event, whereas modelling may only be available at that location for a 50 or 100-year event).

Analysis shows varying levels of risk to Māori communities across different hazard types. While exposure to landslides is relatively low at 1%, flooding presents more significant challenges. Currently, 15.4% of the region's Māori population is exposed to more than 10cm of river and rainfall flooding, with 57% at risk of isolation during such events. This high isolation risk indicates that a significant portion of the region's Māori population could face challenges in accessing essential services and maintaining community connections.

Coastal flooding risk is projected to increase substantially over time. While current exposure affects 8.5% of the Māori population, this could more than double by 2100 under both moderate (SSP2-4.5) and high (SSP5-8.5) emissions scenarios. The risk of isolation follows a similar pattern of increase.

When compared to the overall regional population, Māori face similar levels of risk across most hazards. For river and rainfall flooding, Māori currently face slightly lower exposure risk (15.4%) compared to the regional average (16.1%), but slightly higher isolation risk (57% versus 54.5%).

Risks to social, cultural and spiritual wellbeing

Risks to Māori extend beyond exposure and isolation. Climate change impacts threaten not only physical safety and access to services but also pose a risk to interconnected aspects of social, cultural, spiritual and economic wellbeing.

Drawing on national evidence, these risks are expected to be particularly acute for Māori because of the reciprocal relationship and kinship connections between people and places at the centre of Te Ao Māori [75], [76]. As such, there is a risk to the spiritual and cultural attachment to place that is essential for maintaining lived connections to whenua and traditional practices that are fundamental for Māori wellbeing and Te Ao Māori. The National Climate Change Risk Assessment (NCCRA) also highlights the risk of exacerbating existing inequities and creating new ones due to the differential distribution of climate change impacts [12]. For Māori, this risk is particularly salient given historical and ongoing socioeconomic disparities [77].

From a cultural and spiritual wellbeing perspective, climate change is likely to negatively affect Māori via degradation of the natural environment, including loss of taonga species, as well as risks to wāhi tapu and other sites of cultural significance such as mahinga kai and kaimoana. These impacts have the potential to undermine the ability of Māori to physically connect with the whenua and their tūrangawaewae (place where one has the right to stand, where one feels strong and at home), as well as their ability to practice tikanga (correct procedures, lore, practices), undertake manaakitanga (care, give hospitality), engage in kaitiakitanga (environmental stewardship), and pass on mātauranga Māori to the next generation [75], [76]. These impacts may affect the ability of Māori to express their mana (authority, dignity, governance), with implications for cultural, spiritual, emotional, mental, and social wellbeing [75].

Moreover, the potential isolation of Māori communities due to climate change hazards could also have profound impacts on the ability to connect with one another and undertake cultural practices that are central to wellbeing. Access to cultural sites of significance, such as marae, urupā, and other wāhi

tapu could be compromised, affecting the community's ability to maintain traditional practices, gather for important events, and connect kanohi ki te kanohi (face-to-face).

Risks to economic wellbeing and the Māori economy

In terms of the economic impacts of climate change, potential disruptions to primary and outdoor-based industries could disproportionately affect Māori communities that are heavily employed or invested in them [75], [78]. For example, 9.4% of employed Māori who live in the Hawke's Bay Region work in the agriculture, forestry or fishing industries, compared with 5.7% of those who live in New Zealand [72]. As of 2020, the 303 Māori-owned businesses in the Hawke's Bay were heavily invested in sectors potentially directly exposed to the impacts of climate change and associated hazards: Transport, Postal and Warehousing (22% of Māori-owned businesses); Construction (14%); Agriculture, Forestry and Fisheries (13%) [79]. Additionally, and importantly, both slow onset climate changes and climate related hazards and/or significant events may threaten cultural practices of mahinga kai and mara kai.

To understand risks to Māori economic wellbeing, it's important to look beyond standard economic measures. We need to recognise a broader view of economic activity—one that includes the connections between people, land, water, and culture. This means considering how iwi, hapū and whānau care for and use natural resources, and how these relationships support wellbeing, livelihoods, and identity.

Risks to marae

Data used in this assessment shows six marae in the region are exposed to more than 10cm of river (fluvial) flooding, and one marae exposed to more than 10cm of coastal flooding.

Damage to marae may have significant implications for wellbeing, given the importance of marae as places where culture is practiced and connections with people, land, and ancestors are experienced and maintained. Disrupted access to marae may also negatively impact the ability of Māori to engage in cultural practices and to connect kanohi ki te kanohi, important for supporting social connections. Marae which rely on water tanks or groundwater may be negatively affected if there is damage to these systems or they become contaminated, compromising water quality. Where Māori-owned land is categorised as being unsafe to live on, as in areas of Tangoio that have been categorised as Category 3 following Cyclone Gabrielle [80], this may have implications for further development or re-development (e.g. for building papakāinga) to support Māori aspirations.

Minimising these risks will require the development of adaptation strategies and/or support for implementation of marae adaptation plans already developed by mana whenua. Led by mana whenua, local and regional authorities can also support work aimed at reducing risk to physical safety and improving access to services to preserve and strengthen Māori cultural practices and community resilience. Engagement and collaboration with iwi, hapū and whānau will be important for providing more nuanced, locally specific understandings of the impacts of climate change hazard exposure for Māori, which can then support the development and/or updating of mana whenua-led adaptation plans.

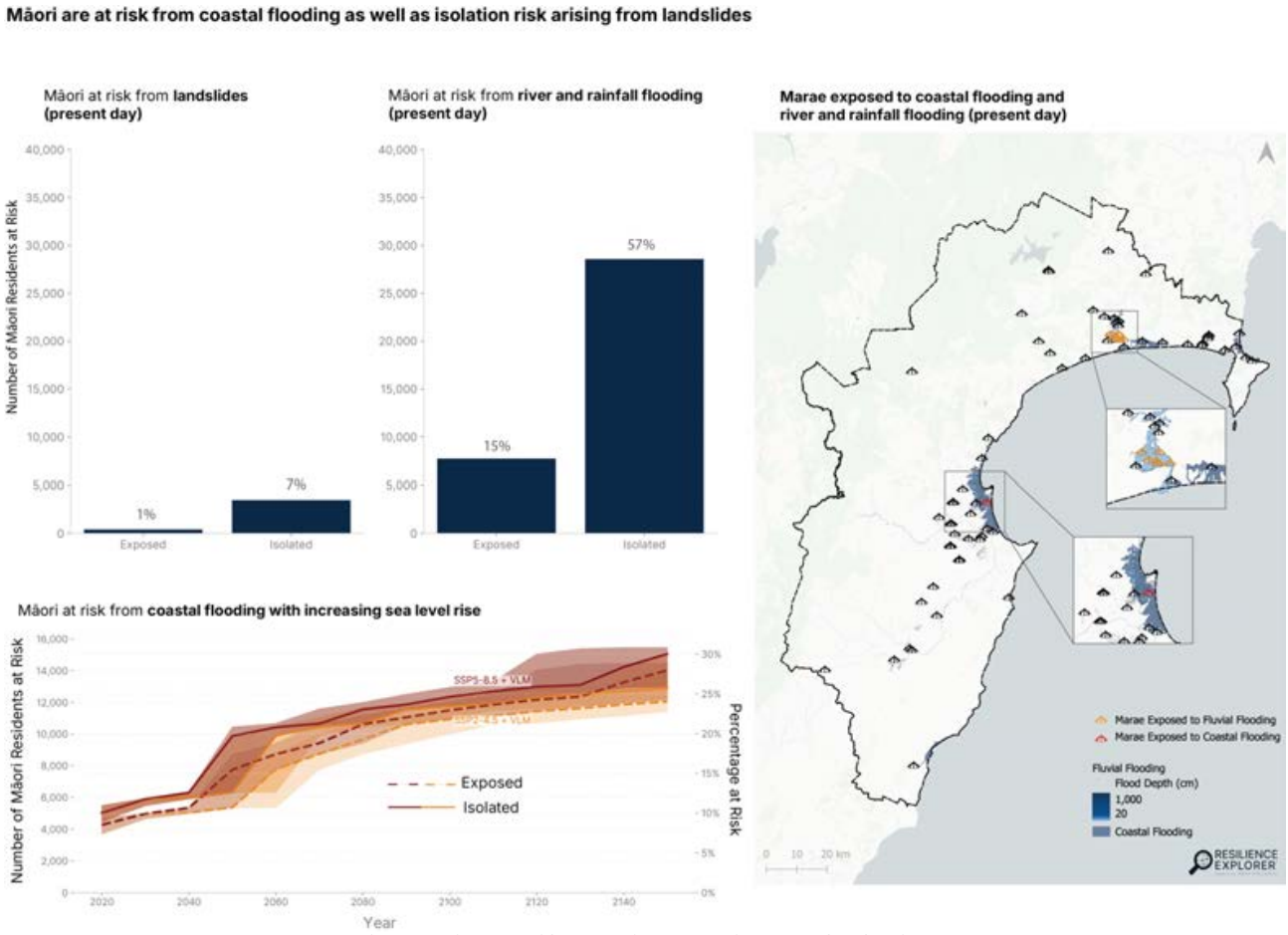


Figure 11.1. Risk to Māori from landslide, coastal, river and surface flooding.

AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI KI TE MATAU-A-MĀUI



12 The National Context

While this report focuses on climate change risks specific to the Hawke's Bay region, these risks do not exist in a vacuum. The region's vulnerability and resilience are interconnected with broader national and even global systems. Effective risk management and adaptation strategies must therefore consider factors beyond the region's borders.

Successfully addressing climate risks requires coordinated progress across multiple sectors and levels of government. The first National Adaptation Plan 2022-2028 (NAP) is a six year all-of-government plan focused on enabling better risk-informed decisions, ensuring climate-resilient development occurs in the right locations and embedding climate resilience across government.

However, recent assessments suggest that national-level adaptation planning in New Zealand has significant room for improvement. The Climate Change Commission's first review of the NAP found substantial gaps in addressing key risks across various domains [1]. Many critical actions have been delayed or discontinued, including essential reforms to resource management and water services. Other actions lack clear implementation pathways or dedicated funding (Table 12-1).

The Climate Change Commission's 2024 assessment identifies several critical areas where national progress is urgently needed to enable effective local adaptation:

- uncertain roles and responsibilities between different levels of government
- no clear framework for sharing adaptation costs
- limited support for iwi/Māori-led adaptation aligned with tikanga
- gaps in data and tools for decision-making
- insufficient consideration of equity impacts
- workforce capacity constraints.

The Commission found "limited evidence that the first national adaptation plan is driving adaptation at the scale or pace needed." These gaps in national progress create specific challenges for resilience planning in Hawke's Bay:

- infrastructure resilience depends in part on actions by central government agencies and crown entities
- access to data and decision-support tools relies on national research and science systems
- emergency response capability is tied to national emergency management reforms
- major adaptation funding decisions require central government frameworks.

Table 12-1 Climate Change Commission's assessment of how well the National Adaptation Plan is responding to climate change risks.

Domain	Progress on Most Significant Risks	Progress on Other Risks	Overall Progress Assessment
Natural Environment	Moderate gaps	Moderate gaps	Moderate gaps
Human	Insufficient	Insufficient	Insufficient
Economy	Significant gaps	Significant gaps	Significant gaps
Built Environment	Significant gaps	Significant gaps	Significant gaps
Governance	Insufficient/ Significant gaps	Significant gaps	Significant gaps

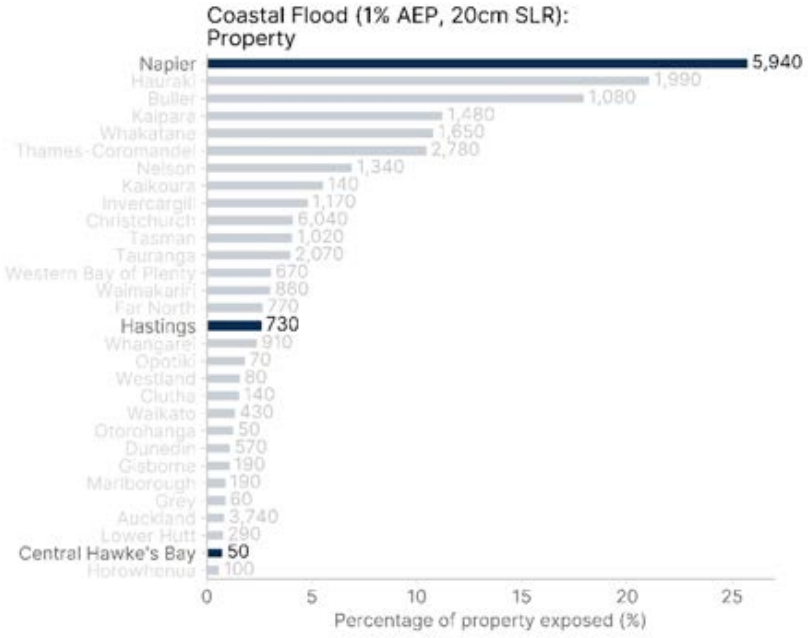
This underscores why regional adaptation planning must account for gaps in national progress while also identifying opportunities for local action. The Hawke's Bay region faces particular urgency in this regard. Napier City ranks first nationally for property exposure to coastal flooding, with over 25% of properties at risk under a 1% AEP event with 20cm of sea-level rise (Figure 12.1). In the same scenario, Napier City, Hastings and Central Hawke's Bay are amongst the 30 districts most at risk of isolation based on the number of properties potentially cut off from essential services [1].

Hawke's Bay's climate risks are also influenced by:

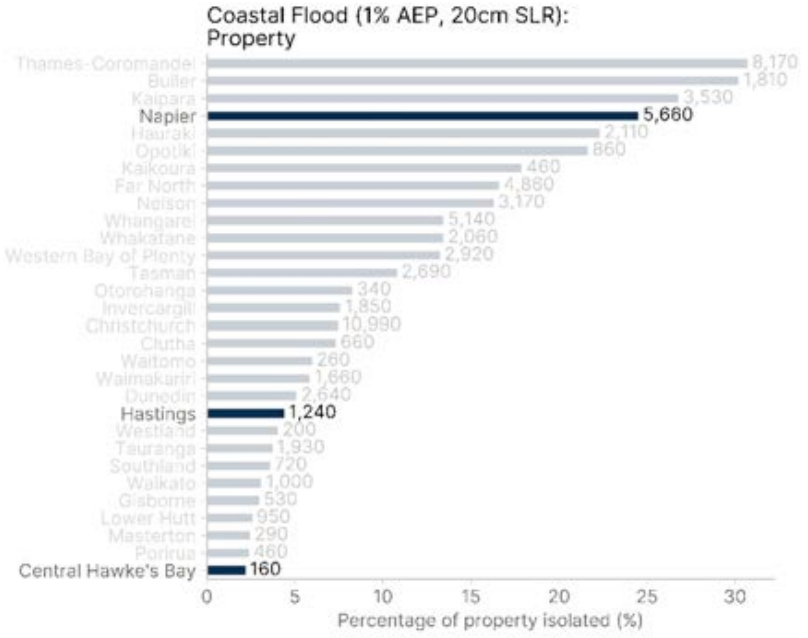
1. national policies and frameworks for climate adaptation
2. actions (or inaction) of central government and agencies operating within the region
3. neighbouring councils' risk management strategies and respective priorities
4. private sector resilience planning, particularly for critical infrastructure and services.

The following chapter examines how these regional climate risks manifest at the district level, recognising that while risks and challenges are shared across Hawke's Bay, each district faces unique combinations of hazards, vulnerabilities, and adaptation priorities.

> **"Communities have rallied together, often centred around marae, to help those affected and to develop plans for the future. Genuine collaboration and partnership is needed between local and central government and communities, mana whenua and businesses to evaluate and progress options for better managing flood risk in the future"**
>
> *- Hawke's Bay Independent Flood Review [28]*

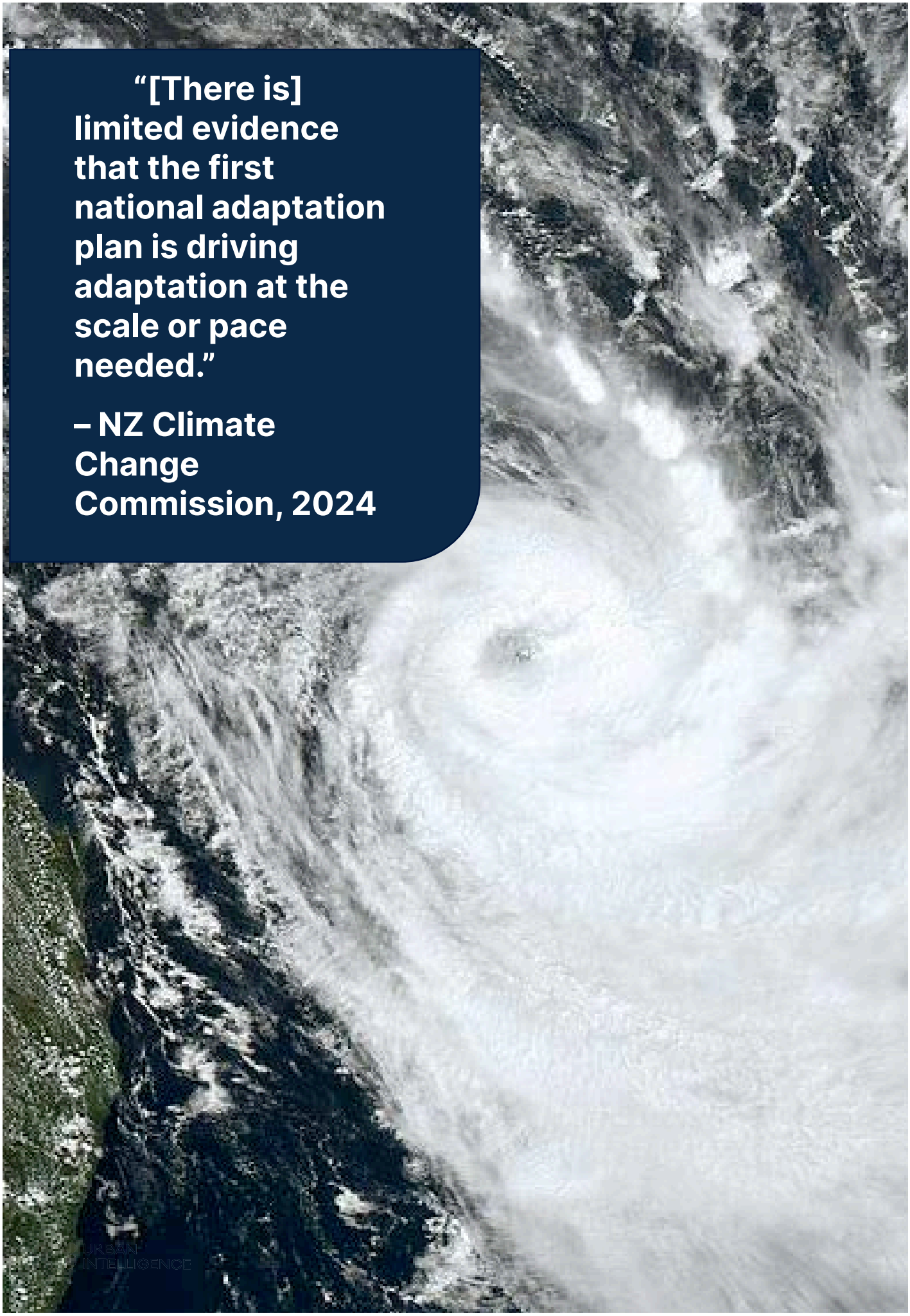


(a) Properties exposed to coastal flooding.



(b) Properties at risk from isolation due to coastal flooding.

Figure 12.1. The exposure and isolation of properties to coastal flooding in Aotearoa New Zealand, ranked by the percentage of property affected. The 30 most exposed or isolated districts, by percentage, are shown. Source: [1].


"[There is] limited evidence that the first national adaptation plan is driving adaptation at the scale or pace needed."
– NZ Climate Change Commission, 2024

AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI KI TE MATAU-A-MĀUI | HAWKE'S BAY REGIONAL CLIMATE CHANGE RISK ASSESSMENT

04

Ngā Arotakenga ā-Takiwā | District Assessments

URBAN INTELLIGENCE

13 District Assessments

13.1 Introduction to the district level assessments

Adaptation planning is inherently a localised process that demands robust, area-specific risk evidence. Spatial information is critical in prioritising adaptation efforts across different areas and identifying the specific hazards that adaptation planning must address. This approach enables decision-makers to allocate resources efficiently and develop targeted strategies that respond to the unique vulnerabilities of each district.

This section presents detailed risk assessment findings for each territorial authority area within the Hawke's Bay region: Central Hawke's Bay District, Hastings District, Napier City, and Wairoa District. Delineating local assessments by known geographical areas enables the use of employment and census demographic data (Figure 13.1; Table 13-1).

Using the district-level assessment findings

The district assessments and findings in this report can form the basis for localised risk assessments, community engagement, and adaptation planning and action. It can inform community conversations to better understand local views and risk tolerances, increase understanding of community vulnerabilities and risk perceptions, and enable risk prioritisation. Adaptation plans can then be developed that are tailored to the unique characteristics and challenges of each area while recognising the interconnections between neighbouring communities.



Figure 13.1. The districts within the Hawke's Bay region for which risk is reported and how adaptation planning could be managed.

Table 13-1. Cities, towns, and villages within each District.

District	Cities, Towns and Villages
Central Hawke's Bay District Council	Waipukurau, Waipawa, Ōtane
Hastings District Council	Hastings, Havelock North, Flaxmere, Clive
Napier City Council	Napier
Wairoa District Council	Wairoa, Mahia, Maungataniwha-Raupunga

These stages of the adaptation process help to build community confidence and demonstrate institutional commitment to transparency in hazard and risk management. By involving communities in adaptation planning and presenting a structured approach, uncertainty can be reduced and resilience built at both individual and community levels. This engagement builds a nuanced understanding of climate risks facing the Hawke's Bay region, enabling the development of targeted strategies that benefit both individuals and the wider community.

13.2 Approach to assessing district-level risks

This section outlines the approach for assessing the exposure of elements to mapped hazards at a district-level. The district-level assessments were undertaken based on existing hazard datasets available and suitable for this assessment (

Table 3-3). The following subsections present the findings of a detailed first-pass risk assessment for each district. These assessments focus on exposure of people and assets to these hazards.

Exposure analysis is the first step to understanding potential climate impacts on residents, businesses, and economic activity. It is important for identifying areas that need attention to determine the sensitivity and adaptive capacity to these hazards, before estimating the potential consequences [2].

An element is exposed if it intersects with the spatial extent of a hazard. Estimations of impact on residents and business/sectors include the following information:

- Property exposure.
- Property land use classification.
- Residential property information (including 2018 census data and the NZ Deprivation Index).
- Sector specific employment exposure information.
- GDP contribution estimations.
- Isolation and community isolation ("Island") assessment.

14 Central Hawke's Bay District

Snapshot of the Central Hawke's Bay District

Information on Central Hawke's Bay District taken from local plans and reports, the Central Hawke's Bay District Council, and Census 2023.

- **3,333km²** of land stretching from Pukehou in the north to Whangaehu in the south, and Ruahine ranges in the west to the eastern coast
- **Population 15,480** (2023)
- **25.2% of the population identify as Māori and 27.9% are of Māori descent**
- **21.2% of the population is aged 65 years or older**
- **$81,100 median household income**
- **$564,269 average house price**
- **$758 million GDP** in 2023, with the main industries being Agriculture, Forestry and Fishing (contributing 24% to the district's GDP) and Manufacturing (13%)
- **Nine marae** located across the district
- **Waipukurau and Waipawa** are the main urban centres (towns)

Central Hawke's Bay summary

Central Hawke's Bay geographic profile

Central Hawke's Bay District (Figure 14.1) sits in the southern end of the Hawke's Bay region and encompasses a diverse landscape from the Ruahine ranges in the west to the eastern coast. There are several recognised outstanding natural features and landscapes across the district [81].

The district is predominantly rural, with the main urban centres of Waipukurau and Waipawa serving as key service hubs. The District includes a number of smaller townships including Otāne, Takapau, Tikokino, Pōrangahau and Ongaonga; as well as several beach townships including Kairakau, Pourerere, Aramoana, Blackhead and Te Paerahi. The built environment of Central Hawke's Bay reflects its rural character, with infrastructure and development concentrated around the main towns while supporting extensive agricultural operations across the wider district.



Figure 14.1. Central Hawke's Bay District in Hawke's Bay.

Table 14-1 Employment and Economic Contribution by Economic Sector (greater than 5%) in Central Hawke's Bay.

ANZSIC06 Division	Contribution to District GDP (%)	Percentage of total District workforce employed (%)
Agriculture, Forestry and Fishing	24	29
Manufacturing	13	17
Construction	7	10
Rental, Hiring and Real Estate Services	6	2
Retail Trade	5	8
Professional, Scientific and Technical Services	5	5

Central Hawke's Bay population

The population of Central Hawke's Bay is 15,480 (2023). Those identifying as European make up 79% of the district's population, followed by 25% who identify as Māori. In total, 44% of the district's population is aged 30-64, followed by 21% aged 65 years or older. The district has a median household income of $81,100 and average house value of $564,269. The district's cultural landscape includes nine marae that form important focal points for local communities.

Central Hawke's Bay local economy

Central Hawke's Bay's GDP was $758 million in 2023 (7.3% of the regional GDP). Analysis of economic activity (Table 14-1) shows the district's strong dependence on primary industries, with Agriculture, Forestry, and Fishing contributing 24% to the district's GDP and employing 29% of the workforce. Manufacturing forms the second-largest sector, contributing 13% to GDP and employing 17% of workers. Other significant sectors include Construction (7% GDP, 10% employment), Rental and Real Estate Services (6% GDP), Retail Trade (5% GDP,

Table 14-2 Summary and suitability for adaptation planning of hazard information available in Central Hawke's Bay District

Hazard/Change	Suitability	Description
Coastal Flooding	Low	Nationwide dataset with extent only (no depth) for 1% AEP with 0-2m sea level rise in 10cm increments.
River & Rainfall Flooding	Moderate	Available for three towns for the purpose of stormwater modelling. Includes multiple return periods and a future climate change scenario.
Shallow Groundwater		No suitable mapped data available
Landslides	Moderate	Region-wide shallow landslide susceptibility mapping.
Coastal Erosion		No suitable mapped data available
Liquefaction		No suitable mapped data available
Tsunami	Low	Two regional models showing tsunami extents. No depth information or climate change scenarios available.
Wildfire		No suitable mapped data available

8% employment), and Professional Services (5% GDP, 5% employment)Overview of hazard data availability and suitability

The assessment of climate-related risks in Central Hawke's Bay is constrained by limited availability of hazard data appropriate for this level of assessment (Table 14-2). While some hazards like landslides have moderate data suitability, others including coastal erosion and shallow groundwater lack mapped data entirely. This data limitation affects the comprehensiveness of risk assessment and adaptation planning capabilities.

Risks from coastal flooding

Current data on coastal flooding in Central Hawke's Bay is limited to NIWA's nationwide coastal flooding assessment. This data shows flood extent for 1% AEP events under various sea-level rise scenarios but lacks information about flood depths necessary for a vulnerability assessment.

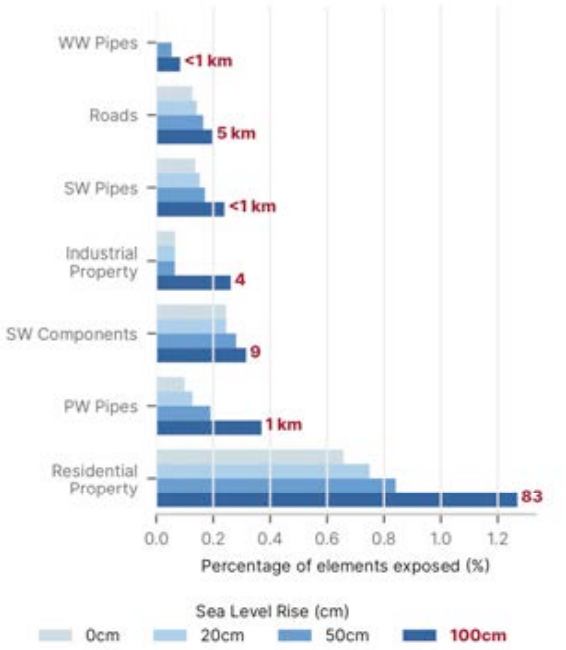


Figure 14.2. Infrastructure exposed to more than 10cm of coastal flooding with different amounts of sea level rise.

Table 14-3. The length/number of each infrastructure exposed in Central Hawke's Bay to 1% AEP coastal flood, with different amounts of sea level rise. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are vulnerable.

Built infrastructure	Baseline sea level (2005)	20cm of sea level rise (2025 – 2050)	1m of sea level rise (2070 – 2150)
Residential Buildings	43 (0.8%)	49 (0.9%)	83 (1.5%)
Commercial Buildings	0	0	0
Industrial Buildings	1 (0.1%)	1 (0.1%)	4 (0.3%)
Roads	3.1 km (0.2%)	3.4 km (0.2%)	4.8 (0.2%)
State Highway	0	0	0
Potable Water (PW) Pipes	0.3 km (0.1%)	0.4 km (0.2%)	1.1 km (0.5%)
Stormwater (SW) Pipes	0.2 km (0.2%)	0.2 km (0.2%)	0.3 km (0.3%)
Wastewater (WW) Pipes	0	0	0.3 km (0.1%)

Physical Infrastructure Exposure

Analysis shows low exposure to coastal flooding across all infrastructure types, both currently and with projected sea-level rise (Figure 14.2; Figure 14.3; Table 14-3). Under current conditions, exposure is limited to 43 residential buildings (0.8%) and 1 industrial building (0.1%), with no commercial buildings affected. With 1m of sea-level rise, residential exposure increases to 83 buildings (1.5%) and industrial exposure to 4 buildings (0.3%).

Infrastructure networks show minimal exposure across all scenarios. Roads show consistent exposure at 0.2% across all scenarios, though increasing in length from 3.1km to 4.8km with 1m sea-level rise. Three waters infrastructure shows very limited exposure, with all networks below 0.5% exposure even with 1m sea-level rise.

Cascading Impacts on Communities

By 2130, under the highest emissions scenario (SSP5-8.5), 0.9% of residents (142 people) could be directly exposed to flooding, while 2.1% (328 people) could face isolation risks (Figure A - 19; Figure A - 20).

Of all residents exposed to more than 10cm of coastal flooding by 2130, 79% are within areas of lower deprivation (NZDep3-4), compared to 8% in areas of high deprivation (NZDep9-10). For isolation risk, 60% are in areas of lower deprivation and 31% in areas of high deprivation. When examining exposure as a proportion of residents within each deprivation classification, 2.8% of those in NZDep3-4 areas are exposed to flooding, while 5.6% of residents in NZDep9-10 areas face isolation risk.

Of the 142 residents exposed to flooding, 86% identify as European, 18% as Māori, 3% as Asian, and 1% as Pacific peoples. Of the 328 residents at risk of isolation, 83% identify as European, 28% as Māori, 3% as Asian, and 2% as Pacific peoples.

Those aged 65 and over make up 20.5% of those exposed to flooding and 27.6% of those at risk of isolation. Of the district's population aged 65 years and over, less than 1% are directly exposed and 2.7% are at risk of isolation. This population may face additional challenges during flood events due to mobility issues or existing health conditions.

Economic Impacts

Given the minimal exposure of commercial and industrial buildings (no commercial buildings and only four industrial buildings affected even with 1m sea-level rise), the GDP impacts from coastal flooding are negligible in Central Hawke's Bay.



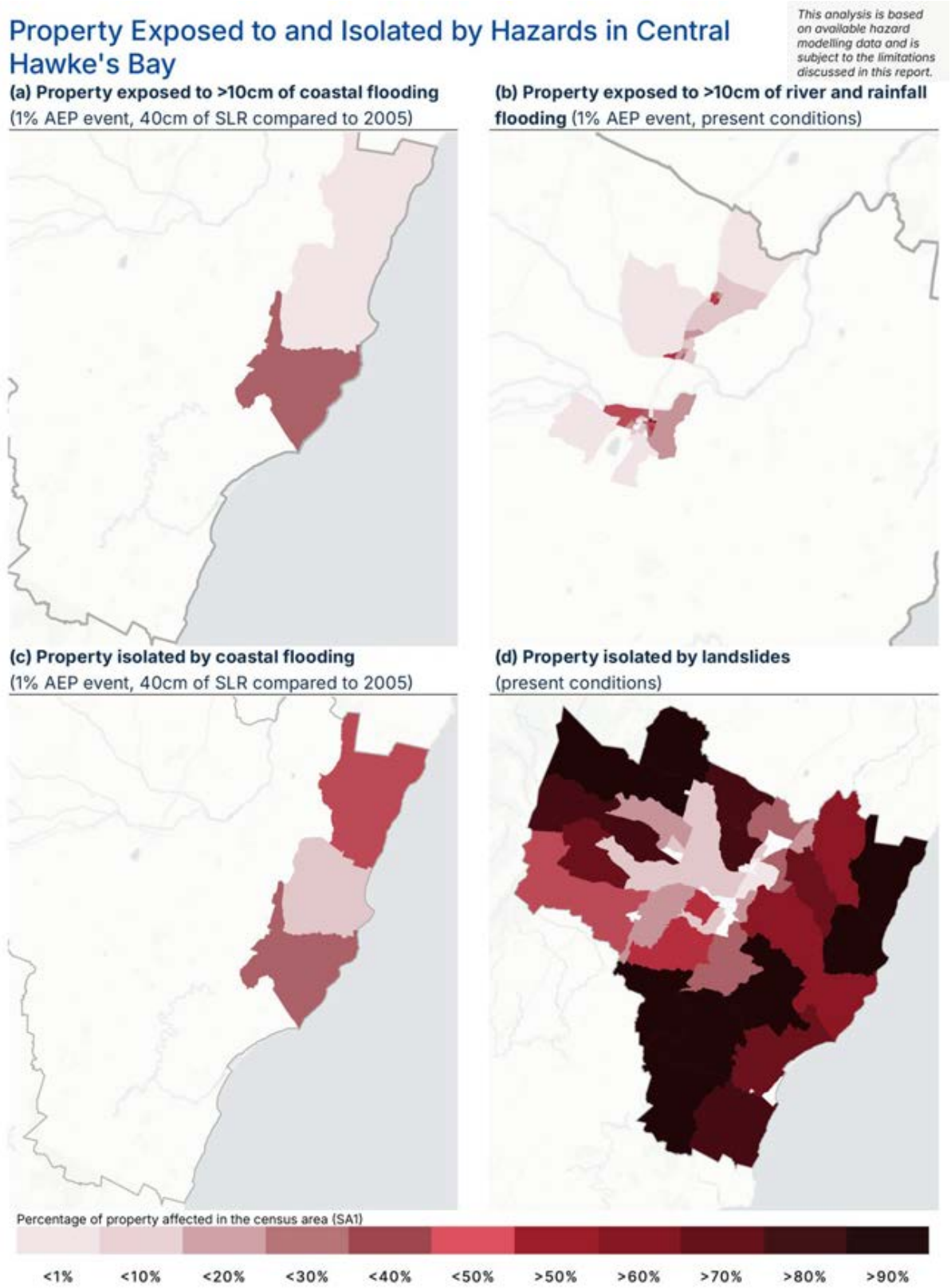


Figure 14.3. Areas with high percentage property risk in Central Hawke's Ba

Risks from river and rainfall flooding

River and rainfall flooding poses a significant risk in Central Hawke's Bay. This assessment examined two scenarios: present-day conditions and projected flooding under a high emissions scenario for 2100 (Figure 14.3; Figure 14.4; Table 14-4). Both scenarios consider flood events that have a 1% chance of occurring each year (1% AEP).

The extent to which flood protection infrastructure (such as stopbanks) is incorporated varies between models, and this assessment does not include detailed analysis of infrastructure vulnerability based on design standards or condition of flood mitigation measures. Currently, flood risk modelling is only available for urban areas.

Physical Infrastructure Exposure

The commercial sector faces substantial exposure to flooding, with 43.7% of commercial properties located in flood-prone areas. Residential property also shows significant exposure, with 12.6% of properties in flood hazard zones. Industrial property has lower but still notable exposure at 5.1%.

Three waters infrastructure shows varying levels of exposure. Currently, 23.7% of stormwater pipes are within flood hazard zones, while wastewater and drinking water networks show lower exposure at 9.6% and 7.5% respectively. Three wastewater pump stations (23%) are currently exposed to flooding, and under the 2100 high emissions scenario, one of the district's six wastewater treatment plants would be at risk.

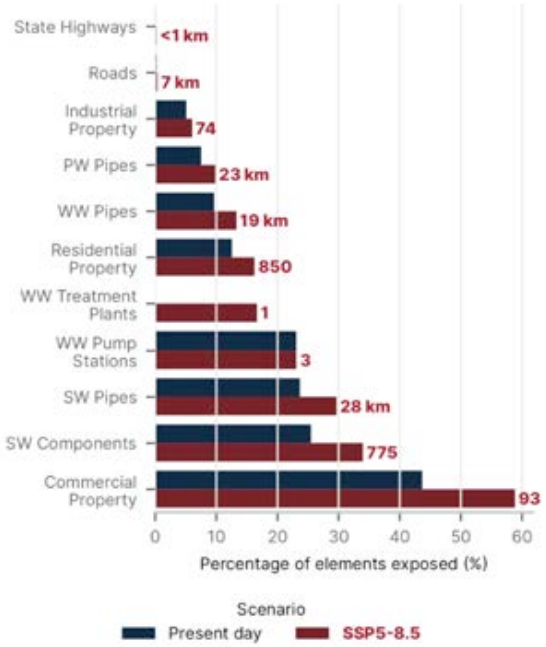


Figure 14.4. Infrastructure exposed to more than 10cm of river and rainfall flooding now and in 2100.

Table 14-4. The length/number of each infrastructure exposed in Central Hawke's Bay to 1% AEP river and rainfall flood. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are damage prone (vulnerable).

Built infrastructure	Today's conditions	2100 (High Emissions)
Residential Buildings	657 (12.6%)	850 (16.2%)
Commercial Buildings	69 (43.7%)	93 (58.8%)
Industrial Buildings	62 (5.0%)	74 (6.1%)
Roads	4.3 km (0.2%)	6.7 km (0.3%)
State Highway	0.0 km (0.0%)	0.2 km (0.2%)
Potable Water (PW) Pipes	17.3 km (7.5%)	22.7 km (9.9%)
Stormwater (SW) Pipes	22.3 km (23.7%)	27.9 km (30.0%)
Wastewater (WW) Pipes	13.9 km (9.6%)	19.3 km (13.3%)

Transportation networks show relatively low direct exposure in the modelled flood areas. However, this analysis does not capture the full risk to bridges, as this report focuses on exposure, whereas the Resilience Explorer® is provided at the asset level to provide consequence assessments based on vulnerability data (such as design standards and condition assessments). The experience of Cyclone Gabrielle demonstrated that bridges in Central Hawke's Bay are vulnerable not only to flood waters but also to damage from forestry slash and debris, highlighting risks that are not captured in standard flood exposure assessments.

Cascading Impacts on Communities

A 1% AEP river flood event under today's conditions could create widespread disruption through both direct exposure and isolation effects. Direct flood exposure affects 12.1% of the district's population (1,870 residents), while isolation impacts extend to 16.8% (2,599 residents) due to disrupted road access (Figure 14.5; Figure A - 22).

Of all residents exposed to flooding, 43% are in areas with deprivation scores of 7-8 and 30% are in areas with moderate deprivation (NZDep5-6). For those at risk of isolation, 32% are within areas of moderate-high deprivation (NZDep7-8), followed by 26% in areas with deprivation scores of 5-6.

Of the 1,870 residents exposed to flooding, 81% identify as European, 28% as Māori, 4% as Asian, and 4% as Pacific peoples. Of the 2,599 residents at risk of isolation, 82% identify as European, 27% as Māori, 4% as Asian, and 4% as Pacific peoples. When examining exposure by ethnicity, Asian residents face the highest relative exposure at 15.3% of their population, compared to European residents at 11.7%. Similarly, Asian residents show the highest relative isolation risk at 24.2%, compared to European residents at 16.4%.

Those aged 65 and over constitute 23.8% of all those exposed to flooding, and 24.5% of those at risk of isolation. Of the district's population aged 65 years and over, 13.4% are directly exposed and 19.2% are at risk of isolation. This population may face additional challenges during flood events due to mobility issues or existing health conditions.

Economic Impacts

The economic impacts of river and rainfall flooding (Figure 14.6; Figure A - 24) could be substantial for the Central Hawke's Bay District. Industrial and commercial properties contributing to 18% ($110M) of the district's annual GDP are currently exposed to the direct impacts of river and rainfall flooding. This rises to 24% ($142M) by 2130. Retail Trade is the most exposed sector (15%), followed by Construction (13%), Manufacturing (11%) and Electricity, Gas, Water and Waste Services (10%). By 2100, over 60% of several sectors are directly exposed, based on known flood risk. These sectors are Retail, Financial and Insurance, Electricity, Gas, Water and Waste Services.

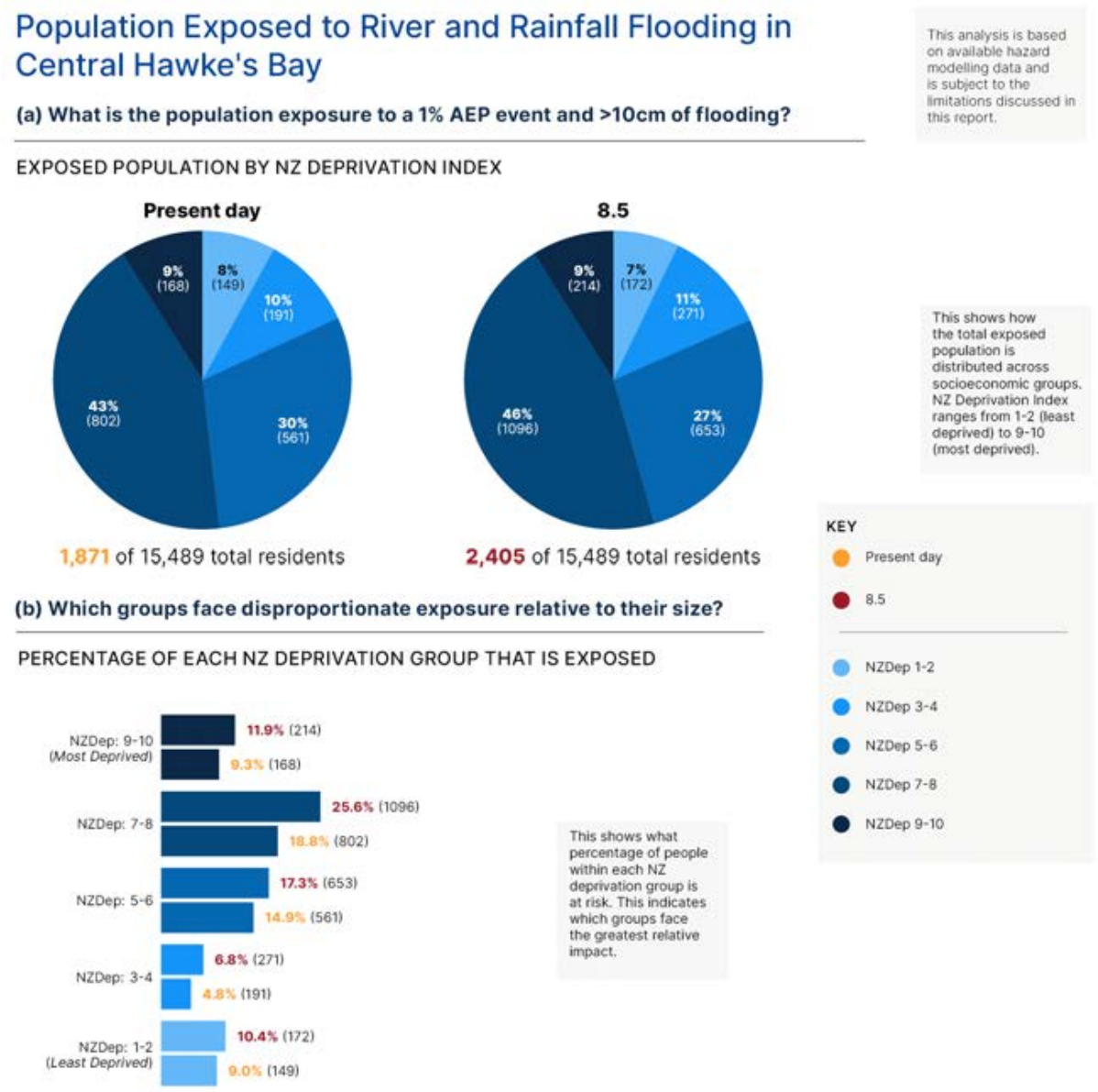


Figure 14.5. Risk to residents in Central Hawke's Bay from exposure to 1% AEP river and rainfall flooding.

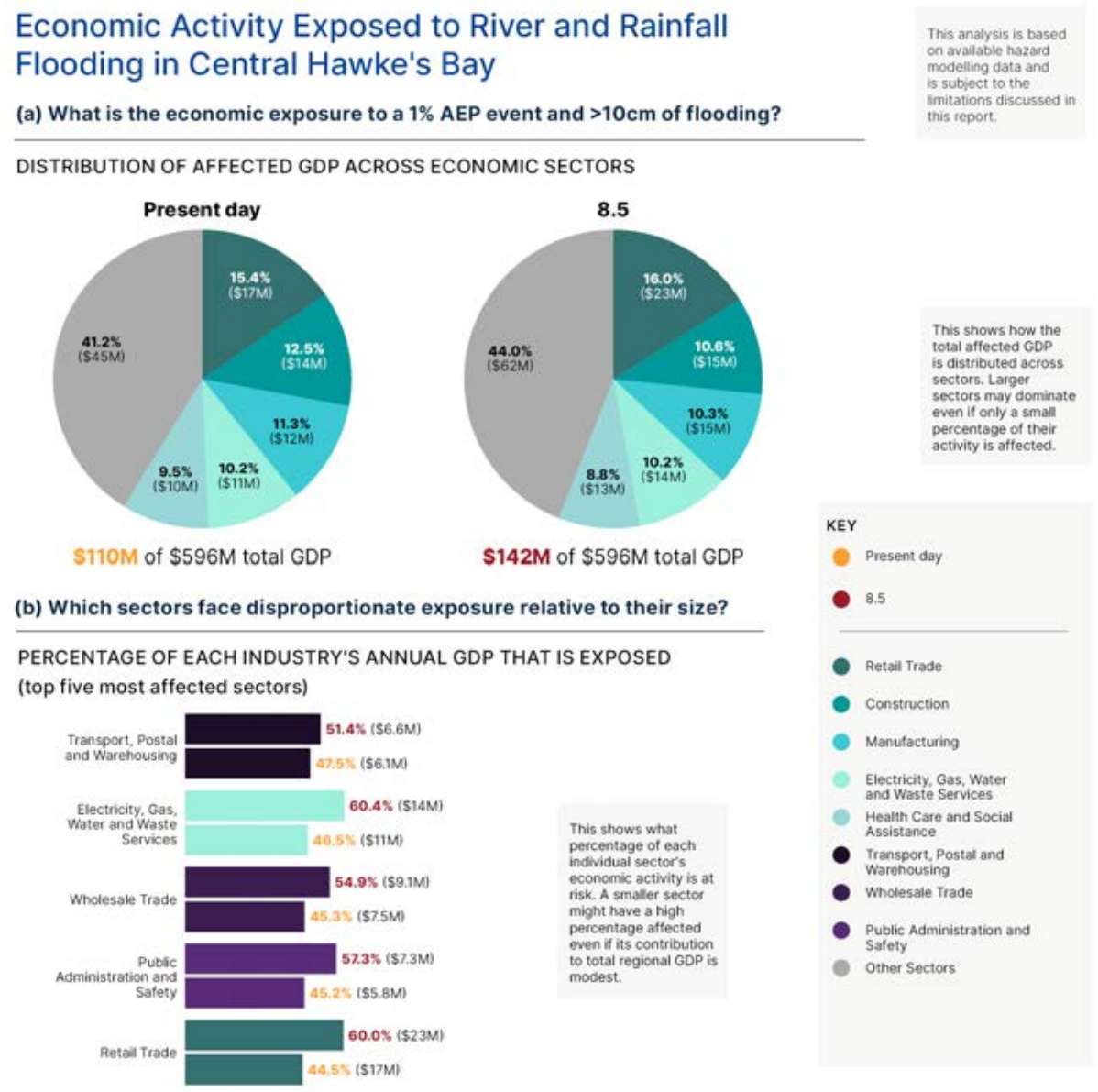


Figure 14.6. Risk to economic sectors in Central Hawke's Bay from 1% AEP river and rainfall flooding.

Risks from landslides

The analysis uses region-wide shallow landslide susceptibility mapping to assess exposure across the assets (Figure 14.3; Figure 14.7; Table 14-5) and the indirect impacts onto communities and sectors.

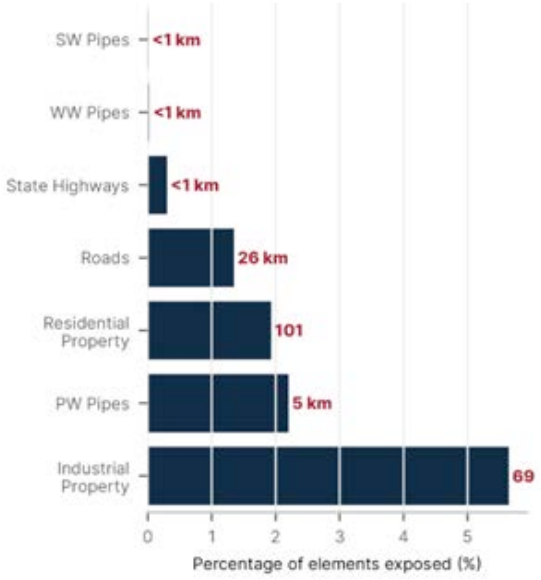


Figure 14.7. Infrastructure exposed to landslides.

Physical Infrastructure Exposure

Analysis shows varying exposure across different infrastructure types. In the building sector, 101 residential properties (1.9%) and 69 industrial buildings, including those on agricultural and horticultural properties, (5.6%) face direct landslide risk, while no commercial properties are exposed.

Infrastructure networks show limited direct exposure. Potable water systems are most affected with 5.1km (2.2%) of pipes at risk. Transportation networks face modest exposure with 0.3km (0.3%) of state highways and 26km (1.3%) of local roads susceptible to landslides. Stormwater and wastewater networks show negligible exposure.

Cascading Impacts on Communities

While 2.1% of the district's population (318 residents) faces direct exposure to landslides, isolation effects reach much further, affecting 20% (3,087 residents). This significant difference highlights how landslides can create widespread access challenges even for communities not directly affected (Figure 14.8; Figure A - 25).

Of all residents exposed to landslides, 47% are within areas of lower deprivation (NZDep3-4), followed by 27% in areas with low deprivation (NZDep1-2). For isolation risk, 42% are within areas of lower deprivation (NZDep3-4), followed by 26% in moderately deprived areas (NZDep5-6).

When examining exposure by deprivation level, those in areas of low deprivation (NZDep1-2) show the highest relative exposure at 5.2% and highest isolation risk at 34.7%. Those in moderately deprived areas (NZDep3-4) show 3.8% exposure and 32.6% isolation risk. By contrast, highly deprived areas (NZDep9-10) show lower rates, with 0.5% exposure and 6.3% isolation risk.

Table 14-5. The length/number of each infrastructure exposed to landslides in Central Hawke's Bay.

Built infrastructure	Length/number Exposed
Residential Buildings	101 (1.9%)
Commercial Buildings	0
Industrial Buildings	69 (5.6%)
Roads	26.0 km (1.3%)
State Highway	0.3 km (0.3%)
Potable Water (PW) Pipes	5.1 km (2.2%)
Stormwater (SW) Pipes	0.0 km (0.0%)
Wastewater (WW) Pipes	0.0 km (0.0%)

Of the 318 residents exposed to landslides, 89% identify as European, 19% as Māori, 2% as Asian, and 3% as Pacific peoples. Of the 3,087 residents at risk of isolation, 89% identify as European, 19% as Māori, 2% as Asian, and 2% as Pacific peoples. When examining exposure by ethnicity, European residents show slightly higher relative exposure at 2.2% compared to Pacific (1.7%), Asian (1.6%), and Māori (1.5%) residents. European residents also show the highest relative isolation risk at 21.2%, compared to Māori (14.9%), Asian (13.9%), and Pacific residents (10.7%).

Those aged 65 and over make up 18.7% of residents directly exposed to landslides and 17% of those at risk of isolation. Of all residents aged 65 and over in the district, 1.8% are directly exposed and 15.9% face isolation risk.

Economic Impacts

Economic impact analysis (Figure 14.9; Figure A - 27) reveals significant sectoral variations in both direct exposure and isolation effects. The primary sector faces the most substantial risks, with Agriculture, Forestry, and Fishing showing 6.10% direct exposure (affecting approx. $13 million in GDP) and approx. 45% isolation risk (putting $91.68 million GDP at risk). This high exposure reflects both the sector's spatial distribution and its dependence on vulnerable transport networks.

Industrial and commercial properties contributing to 4% ($22M) of the district's annual GDP are directly exposed to landslides. Isolation due to landslides is more significant with properties representing 23% ($135M) of annual GDP at risk of isolation. The most impacted sector is Agriculture, Forestry and Fishing (68%).

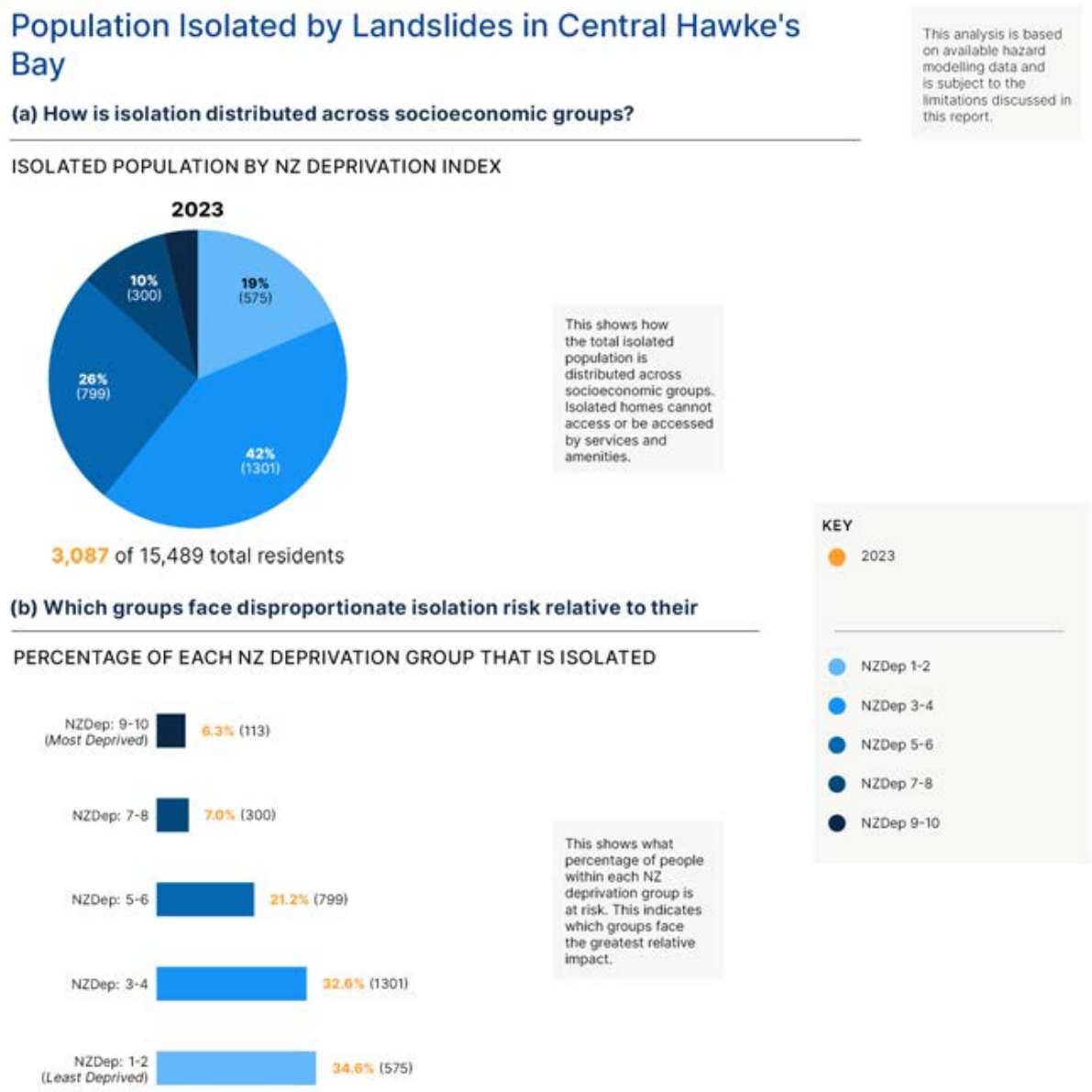


Figure 14.8. Risk of isolation to residents in Central Hawke's Bay from landslides.

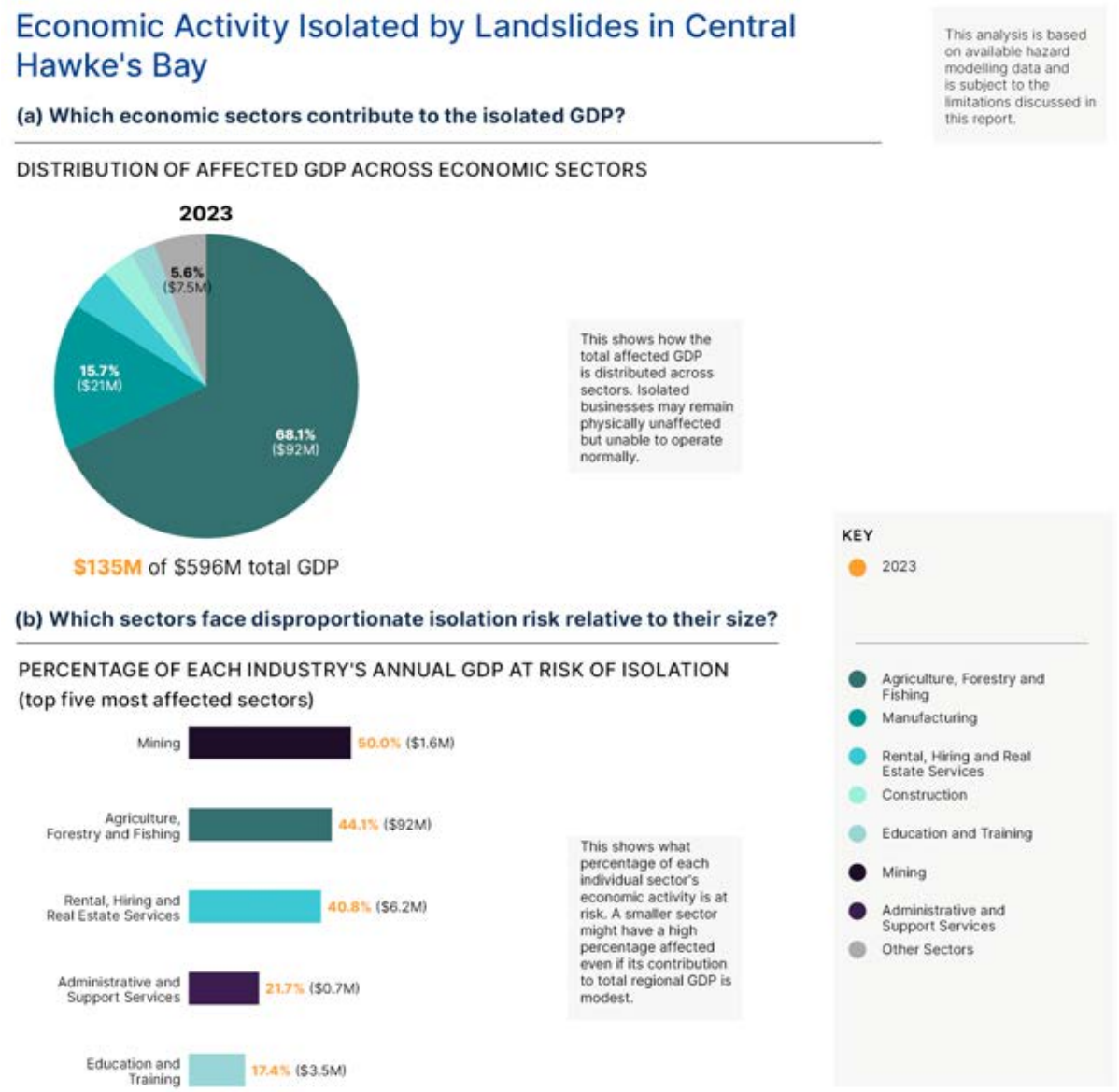


Figure 14.9. Risk by economic sector in Central Hawke's Bay from landslides.

Risks from climatic (temperature and seasonal) change

Climate projections for Central Hawke's Bay (Appendix A3) indicate significant changes that will affect infrastructure, communities, and economic activities across the district. Under a high emissions scenario (SSP3-7.0) by 2081-2100, temperature increases of 3.0–3.5°C coupled with more hot days (increasing from 18.6 to 56.5 days above 25°C annually), and changing rainfall patterns are expected to have the following impacts.

Infrastructure Impacts

- Increased stress on road surfaces and rail infrastructure from thermal expansion.
- Higher cooling demands on electrical infrastructure and telecommunications equipment.
- Accelerated deterioration of building materials and increased maintenance requirements.
- Greater pressure on water infrastructure due to increased demand during hot periods, particularly with PED increasing by 94.2mm.
- Reduced winter maintenance requirements with frost days decreasing by 13.9 days annually.
- Health risks from extreme heat, particularly with very hot days (>30°C) increasing from 2.3 to 12.2 days annually.
- Changed seasonal patterns affecting traditional activities and cultural practices.
- Reduced winter heating needs but increased summer cooling requirements.
- Growing water security concerns with annual rainfall decreasing by 6.5% overall, particularly in spring (-14.3%) and winter (-15.4%).
- Disproportionate impacts on vulnerable populations, particularly older residents and those in poorly adapted housing.

Economic Impacts

- Agriculture and horticulture face significant changes:
  - longer growing seasons with growing degree days increasing by 899 units annually
  - increased water stress with PED rising by 94.2mm
  - changed pest and disease pressures
  - potential opportunities from warmer conditions, though limited by water availability.
- Primary sector vulnerability to seasonal changes:
  - summer rainfall increasing by 6.3% while winter decreases by 15.4
  - more dry days annually (+8.2 days) affecting soil moisture and production timing
  - reduced frost risk benefiting some crops but potentially affecting others requiring winter chilling.
- Construction and outdoor work will need adaptation:
  - more very hot days affecting worker safety and productivity
  - reduced windy days (-12.0 annually) potentially benefiting some operations
  - changed seasonal rainfall patterns affecting work scheduling.

These climate changes will interact with and potentially amplify the coastal flooding, river and rainfall flooding, and landslide risks described in this district level assessment. Higher temperatures and changed rainfall patterns could increase erosion susceptibility in landslide-prone areas, while more intense summer rainfall combined with winter drying could exacerbate both flood and drought risks. The district's strong dependence on primary industries makes it particularly vulnerable to these compounding climate impacts.

Key findings for Central Hawke's Bay

- **River and rainfall flooding risk is the most severe hazard influenced by climate change for Central Hawke's Bay** with commercial properties and residential properties exposed.
- **Three waters infrastructure is susceptible to flooding,** with stormwater pipes exposed.
- **Limited direct exposure to landslides**, with the greatest risk being to industrial buildings. Isolation associated with landslides, however, is a risk for residents.
- **Multiple sectors face disruption and damage from climate-related events**
  - The agriculture sector faces isolation risk from landslides
  - The transport sector shows exposure to river and rainfall flooding
  - The manufacturing sector is vulnerable to multiple hazards, including landslide isolation risk.
- **Increasing risk of economic shocks and disruption from seasonal variability,** with a 3.0–3.5°C temperature increase by 2081-2100 under SSP3-7.0 and significant seasonal rainfall changes affecting primary industries.
- **Areas of high-moderate deprivation are more exposed to flooding and isolation risks**,. Areas of lower deprivation (NZDep1-4) are more exposed to landslides and isolation associated with landslides.

15 Hastings District

Snapshot of the Hastings District

Information on the Hastings District taken from local plans and reports, the Hastings District Council, and Census 2023.

- **5,229km²** land area
- **Population** 85,965 (2023)
- **28.4% of the population identify as Māori and 30.4% are of Māori descent**
- **17.9% of the population is aged 65 years or older**
- **$90,300 median household income**, the highest in Hawke's Bay region
- **$771,382 average house price**
- **$5,554 million GDP** in 2023, with the main industries being Manufacturing (contributing 13.29% to the district's GDP), Healthcare and Social Assistance (9.75%), and Agriculture, Forestry and Fishing (9%)
- **Twenty-three marae** located across the district
- Key connection between Heretaunga Plains (producers of apples, pears and stone fruit) and Napier City
- Hastings, Havelock North, Flaxmere and Clive are main urban centres

Hastings District summary

Hastings District geographic profile

Hastings District (Figure 15.1), positioned in the heart of Hawke's Bay, covers 5,229km² and serves as a crucial agricultural and economic centre for the region. The district has a diverse landscape, with a mix of urban and rural areas that span from the district's significant stretches of eastern coastline to the Heretaunga Plains and Te Mata Hills in the south-east, and Kaweka Forest Park in the north-west. With a population of 85,965 (2023) and an annual GDP of $5,554 million, the district plays a vital role in connecting the productive Heretaunga Plains—renowned for its apple, pear, and stone fruit production and viticulture—with Napier City. This strategic position makes the district's resilience to climate change and natural hazards particularly important for regional food security and economic stability.



Figure 15.1. Hastings District in Hawke's Bay.

Table 15-1 Employment and Economic Contribution by Economic Sector (greater than 5%) in Hastings

ANZSIC06 Division	Contribution to District GDP (%)	Percentage of total District workforce employed (%)
Manufacturing	13.29	13.11
Health Care and Social Assistance	9.75	14.24
Agriculture, Forestry and Fishing	9.00	13.62
Construction	6.74	9.20
Professional, Scientific and Technical Services	6.69	5.93
Rental, Hiring and Real Estate Services	5.84	1.87
Retail Trade	5.27	7.51
Manufacturing	13.29	13.11

The district faces multiple climate-related challenges that vary across its diverse landscape, from coastal hazards along its eastern margins to flooding risks across the Heretaunga Plains and landslide susceptibility in its hillier regions. Figure 5.15 and Figure 5.14 illustrate the spatial distribution of exposed properties and infrastructure across the district, highlighting areas of particular vulnerability that are examined in more detail in the following sections.

Hastings District population

The population of the Hastings District is 85,965 (2023). Those identifying as European make up 65.2% of the district's population, followed by 28.4% who identify as Māori. 30.4% of the population are of Māori descent. In total, 17.9% are aged 65 years or older, slightly higher than the national average (16.6%). 75% of the district's population lives within the urban areas of Hastings, Havelock North, Flaxmere, and Clive. The district's cultural landscape includes twenty-three marae that form important focal points for local communities. The district has a median household income of $90,300, the highest in Hawke's Bay region, and an average house value of $771,382, though these averages mask considerable socio-economic variation across different parts of the community.

Hastings District local economy

Hasting District's GDP in 2023 was $5,554 million. The district's economic profile is characterised by a strong Manufacturing sector, contributing 13.29% to the district's GDP and employing 13.11% of the workforce (Table 15-1). Healthcare and Social Assistance (9.75% GDP, 14.24% employment) and Agriculture, Forestry and Fishing (9% GDP, 13.62% employment) form the other major economic pillars.

Overview of hazard data availability and suitability

Table 15-2 below provides a summary of available hazards data for the Hastings District at the time of this assessment. The data is classified by suitability, relating to how much confidence there is in the modelling and its applicability for adaptation planning.

Hastings District has varying levels of hazard data quality and coverage. While coastal erosion and tsunami hazard data are considered highly suitable for adaptation planning, river and rainfall flooding data has significant limitations, with coverage restricted to four major towns (Clive, Flaxmere, Hastings, Havelock North). Notably, there is no suitable mapped data available for shallow groundwater, which represents a significant data gap. Variability in data quality and coverage needs to be considered when interpreting

risk assessments and developing adaptation strategies.

Risks from coastal flooding

Coastal flooding is an evolving risk to Hastings District, with exposure increasing with higher sea levels (Figure 15.2; Figure 15.3; Table 15-3).

Physical Infrastructure Exposure

Analysis of critical infrastructure exposure to a 1% AEP coastal flood event shows varying levels of vulnerability that increase substantially with sea-level rise. Under current conditions, exposure is relatively limited with less than 0.1% of most infrastructure affected. However, with 1m of sea-level rise, residential exposure increases to 4% (1,032 buildings), while commercial and industrial building exposure rises to 3.7% and 2.1% respectively.

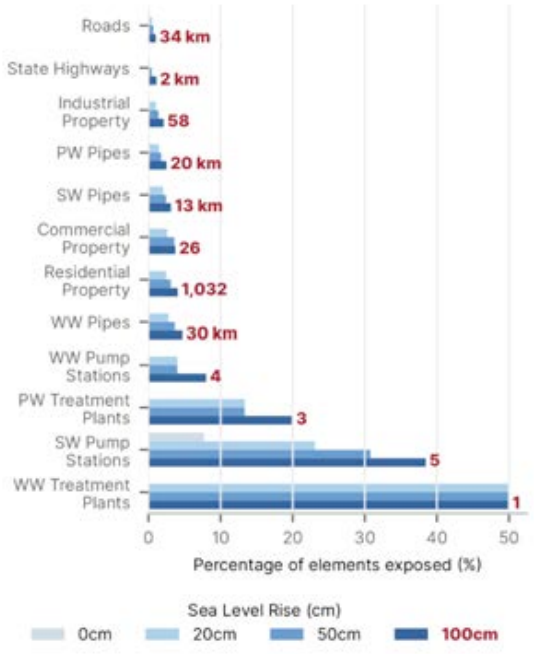


Figure 15.2. Infrastructure exposed to 1% AEP coastal flood event with different amounts of sea level rise.

Table 15-2 Summary and suitability for adaptation planning of hazard information available in Hastings.

Hazard/Change	Suitability	Description
Coastal Flooding	Moderate	Multiple datasets available: (1) Clifton-Tangoio modelling (2020) with 1% and 2% AEP for 2100; (2) T+T extent mapping (2015) for 1% AEP with 0m, 0.5m, and 1m SLR; (3) NIWA nationwide coastal flooding showing extent for 1% AEP with 0-2m SLR in 10cm increments.
River & Rainfall Flooding	Low	Limited coverage across four towns (Clive, Flaxmere, Hastings, Havelock North). Limited AEP and no climate change scenarios available. Stormwater capacity data supplied by HDC was never intended to be used for flood modelling and as such, should be considered with caution. Data intended for preliminary assessments and general planning purposes only.
Shallow Groundwater		No suitable mapped data available
Landslides	Moderate	Region-wide shallow landslide susceptibility mapping.
Coastal Erosion	High	District-wide mapping showing areas susceptible to coastal erosion for 2016, 2065, and 2100.
Liquefaction	Moderate	Susceptibility mapping for three earthquake scenarios (1%, 4%, and 0.2% AEP). Coverage extends to most, but not all, of district.
Tsunami	High	Multiple return periods (100, 500, 1000, 2500 ARI) modelled with various sea-level rise scenarios (0cm, 65cm, 1m, 2m).
Wildfire		No suitable mapped data available

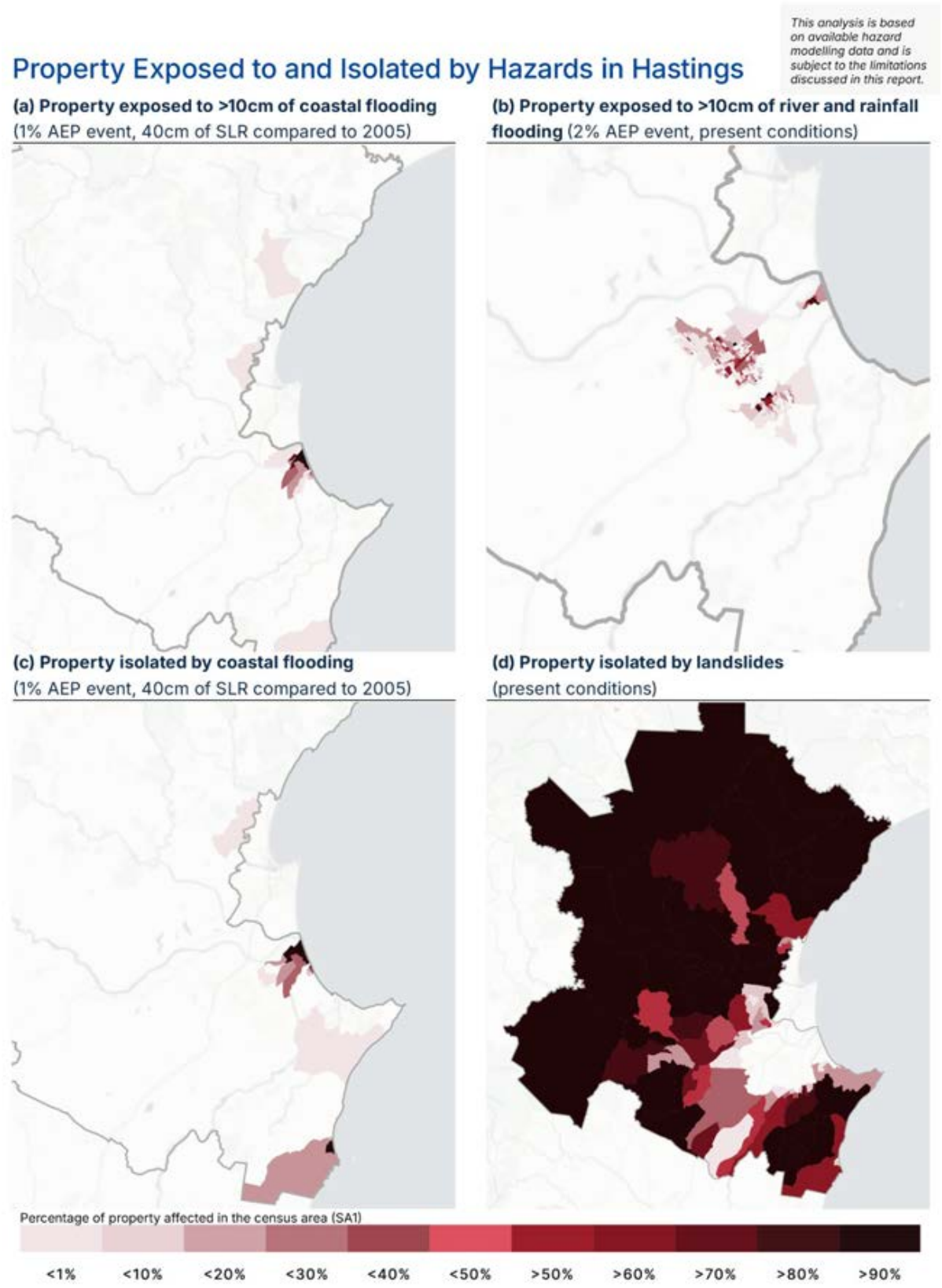


Figure 15.3. Areas with high percentage property risk in Hastings.

Infrastructure networks show similar patterns of increasing exposure. Wastewater infrastructure shows the highest relative exposure under 1m sea-level rise, with 4.7% of pipes affected and the primary

wastewater treatment plant at East Clive. Stormwater and potable water networks show moderate exposure at 3.1% and 2.5% of pipes respectively. Transportation networks face relatively limited direct exposure even with 1m sea-level rise, though 2.5km (1.1%) of state highways and 34.2km (1.0%) of local roads would be affected.

Cascading Impacts on Communities

By 2130 under a high emissions scenario (SSP5-8.5), coastal flooding is projected to have community impacts through both direct exposure and isolation effects. Approximately 4.24% of the total Hastings District population (3,650 residents) could be directly exposed to more than 10cm of coastal flooding, and up to 5.20% (4,470 residents) could face isolation risks due to road network disruption (Figure 15.4; Figure A - 30).

The impacts of exposure and isolation may be experienced more acutely by groups who are more vulnerable to harm, though in this scenario many experience similar, or lower, risk compared with the district's total population.

Those aged 65 and over make up 18.4% of all those exposed to more than 10cm of coastal flooding, and 19.0% of those at risk of isolation. Of all residents aged 65 and older in the district, 4.4% are directly exposed and 5.3% are at risk of isolation.

Of the 3,650 residents exposed to coastal flooding, 82% identify as European, 25% as Māori, 4% as Asian, and 3% as Pacific peoples. Similarly, of the 4,475 residents at risk of isolation, 82% identify as European, 26% as Māori, 4% as Asian, and 3% as Pacific peoples. When examining exposure as a proportion of each ethnic group's total population, European residents show the highest relative exposure at 5%, compared to 3.8% for Māori residents and 1.6% for Pacific peoples.

By 2130, of all residents exposed to coastal flooding, 37% are in areas of lower deprivation (NZDep3-4), 23% are in areas of moderate deprivation (NZDep5-6), and 18% are in areas of high-moderate deprivation. In terms of those at risk of isolation, 33% are in areas of lower deprivation (NZDep3-4), 27% are in areas of moderate deprivation (NZDep5-6), and 17% are in areas of low deprivation.

As a proportion of all residents within each deprivation classification, those living in areas of lower deprivation (NZDep3-4) show the highest

Table 15-3. The length/number of each infrastructure exposed in Hastings to 1% AEP coast flood event, with different amounts of sea level rise. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are damage prone (vulnerable).

Built infrastructure	Baseline sea level (2005)	20cm of sea level rise (2025 – 2050)	1m of sea level rise (2070 – 2150)
Residential Buildings	33 (0.1%)	633 (2.5%)	1032 (4%)
Commercial Buildings	1 (0.1%)	18 (2.5%)	26 (3.7%)
Industrial Buildings	1 (0.0%)	28 (1.0%)	58 (2.1%)
Roads	1.4 km (0.0%)	17.1 km (0.5%)	34.2 km (1.0%)
State Highway	0	0.4 km (0.2%)	2.5 km (1.1%)
Potable Water (PW) Pipes	0.8 km (0.1%)	11.9 km (1.5%)	20.5 km (2.5%)
Stormwater (SW) Pipes	0.4 km (0.1%)	8.4 km (2.0%)	12.8 km (3.1%)
Wastewater (WW) Pipes	0.4 km (0.1%)	17.9 km (2.8%)	30.5 (4.7%)

relative direct exposure (10.7%) and risk of isolation (11.8%), compared to 1.1% exposure and 1.5% risk of isolation of those most deprived (NZDep9-10).

Economic Impacts

Direct exposure of commercial and industrial property to coastal flooding is low, with exposed properties contributing to less than 2% of the district's annual GDP exposed or isolated in 2130 (Figure A - 31; Figure A - 32).



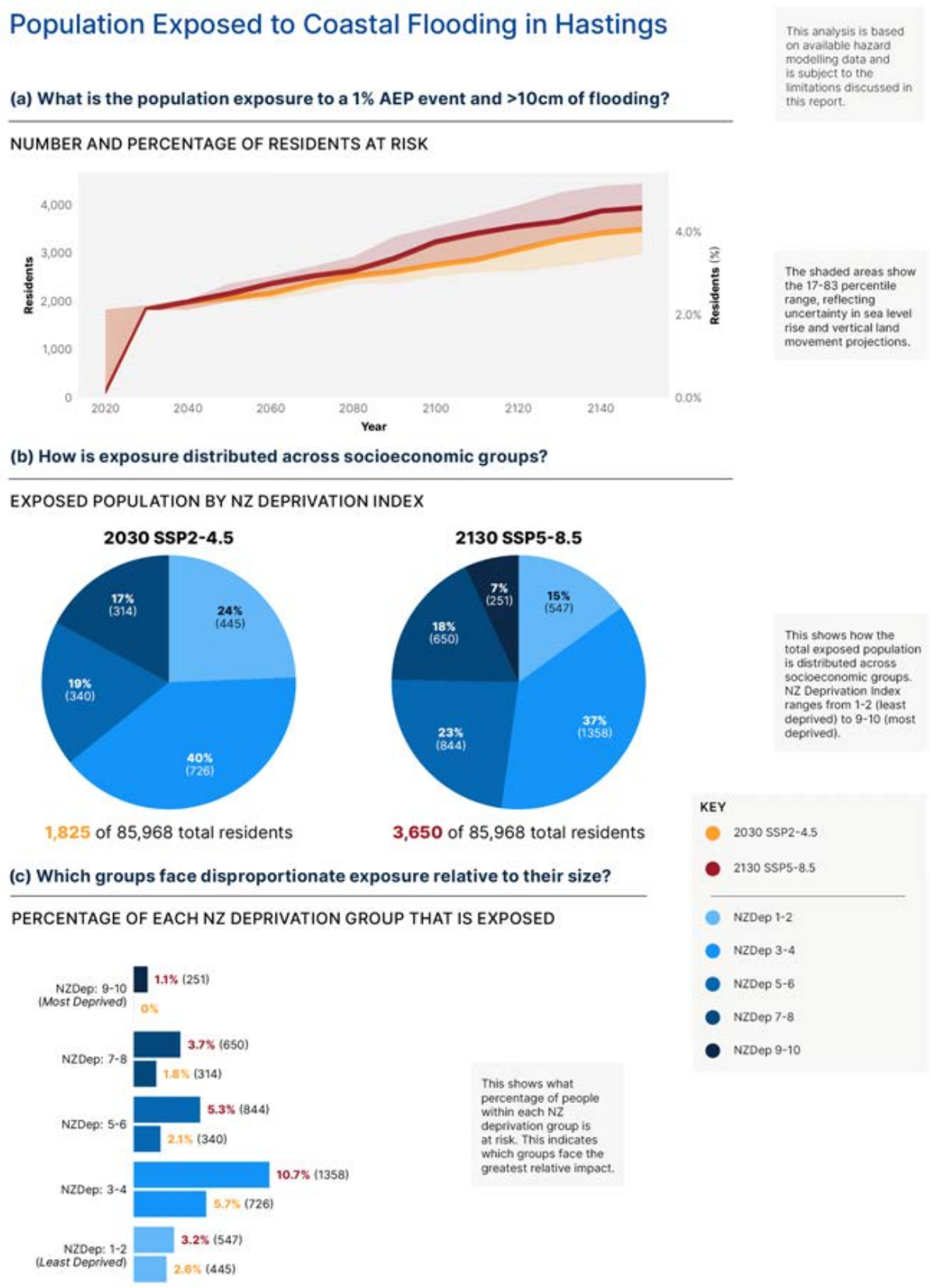


Figure 15.4. Risk to Hastings residents from direct exposure to coastal flooding.

Risks from river and rainfall flooding

River and rainfall flooding presents significant current risks to Hastings District, with analysis based on a 2% AEP flood event. Note that this is inconsistent with the return period analysed for the other districts, due to inconsistent regional hazard modelling. While data coverage is limited to four major centres (Clive, Flaxmere, Hastings, Havelock North), the available analysis indicates substantial exposure across the district (Figure 15.3; Figure 15.5; Table 15-4).

The extent to which flood protection infrastructure (such as stopbanks) is incorporated varies between models, and this assessment does not include detailed analysis of infrastructure vulnerability based on design standards or condition of flood mitigation measures.

Physical Infrastructure Exposure

The exposure analysis shows varying levels of risk across different infrastructure types. Commercial properties show the highest proportional exposure at 38.5%, affecting 269 buildings, while 2,841 residential properties (11.2%) and 183 industrial buildings (6.6%) are also at risk.

Three waters infrastructure shows notable levels of exposure, with stormwater systems particularly vulnerable - 19.4% of pipes and 30.8% of pump stations face exposure. Wastewater networks show similar vulnerability, with 12.5% of pipes and 16% of pump stations at risk, while 12.0% of potable water pipes are exposed, though treatment plants show no direct exposure.

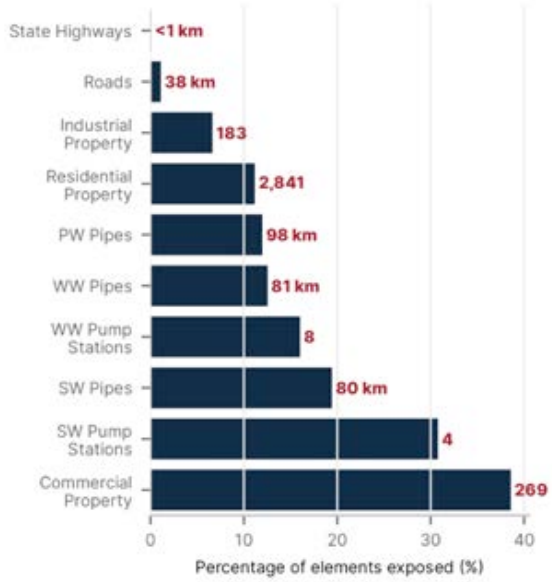


Figure 15.5. Infrastructure exposed to 2% AEP river and rainfall flooding.

Table 15-4. The length/number of each infrastructure exposed in Hastings to 2% AEP river and rainfall flooding. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are damage prone (vulnerable).

Built infrastructure	Exposure to 2% AEP flood
Residential Buildings	2,841 (11.2%)
Commercial Buildings	269 (38.5%)
Industrial Buildings	183 (6.6%)
Roads	37.5 km (1.1%)
State Highway	0.1 km (0.1%)
Potable Water (PW) Pipes	97.9 km (12.0%)
Stormwater (SW) Pipes	79.5 km (19.4%)
Wastewater (WW) Pipes	81.1 km (12.5%)

Transportation network exposure varies significantly by classification. Local roads show modest exposure at 1.1%, while state highways have minimal risk with only 0.06% exposed. This pattern suggests greater potential resilience in major transport corridors compared to local access routes.

Cascading Impacts on Communities

Flooding impacts could create widespread disruption through both direct exposure and isolation effects (Figure 15.6; Figure A - 33). While 9.8% of the population (8,447 residents) faces direct exposure to flooding, a much larger proportion—48.6% (41,765 residents)—could face isolation due to disrupted road access.

The impacts of exposure and isolation may be experienced more acutely by groups who are more susceptible to harm, though many experience similar risk compared with the district's total population.

Older residents may face additional challenges evacuating or be more susceptible to harm arising from direct exposure to flooding. Within Hastings, 10.3% of those aged 65 and older are at risk of direct exposure and 43.8% are at risk of isolation. Of all exposed residents, 18.7% are aged 65 or older, and this age group represents 16.1% of all isolated residents.

Of the 8,447 residents exposed to flooding, 69% identify as European, 26% as Māori, 11% as Asian, and 8% as Pacific peoples. Of the 41,759 residents at risk of isolation, 64% identify as European, 33% as Māori, 9% as Asian, and 11% as Pacific peoples. When examining exposure as a proportion of each ethnic group's total population, Asian residents show the highest direct exposure at 14.5% and 56.6% at risk of isolation. Pacific residents show a different pattern, with lower direct exposure (9%) but the highest isolation risk at 63.1%.

The flood exposure varies across areas with different levels of socioeconomic deprivation. Of all residents exposed to flooding, 49% are within areas of high deprivation (NZDep7-10) and 24% are in areas with Deprivation scores of 5-6. In terms of all those at risk of isolation, 57% are within areas of high deprivation (NZDep7-10) and 17% are in areas classified as least deprived (NZDep1-2).

As a proportion of all residents within each deprivation classification, those living in areas of moderate-high deprivation (NZDep7-8) show the highest direct exposure at 13.1%, while the most deprived areas (NZDep9-10) face the highest isolation risk at 70.6%. Those living in less deprived areas (NZDep1-2) generally show lower vulnerability, with 7.4% facing exposure and 40.3% facing isolation risk.

Economic Impacts

Currently, commercial and industrial property contributing 25% ($1133M) of the area's annual GDP are exposed to modelled river and rainfall flooding with a 2% AEP (Figure 15.7). Businesses contributing 32% of the GDP can be expected to be isolated with a 2% AEP modelled river and rainfall flooding event. The Manufacturing, Health Care and Social Assistance and Retail Trade sectors are most exposed to both direct damage and isolation. Over 50% of the Retail Trade and the Financial and Insurance Services sector are at risk of isolation which may have significant implications for the pace of recovery following any flooding (Figure A - 36).

These exposure patterns indicate vulnerability in the district's commercial and service sectors, with isolation effects substantially amplifying the economic impacts beyond directly flooded areas. However, hazard data coverage limits the assessment of rural-based sectors such as horticulture. The high isolation risks across multiple sectors suggest potential for significant disruption to Hastings' economic function, even in areas not directly flooded.

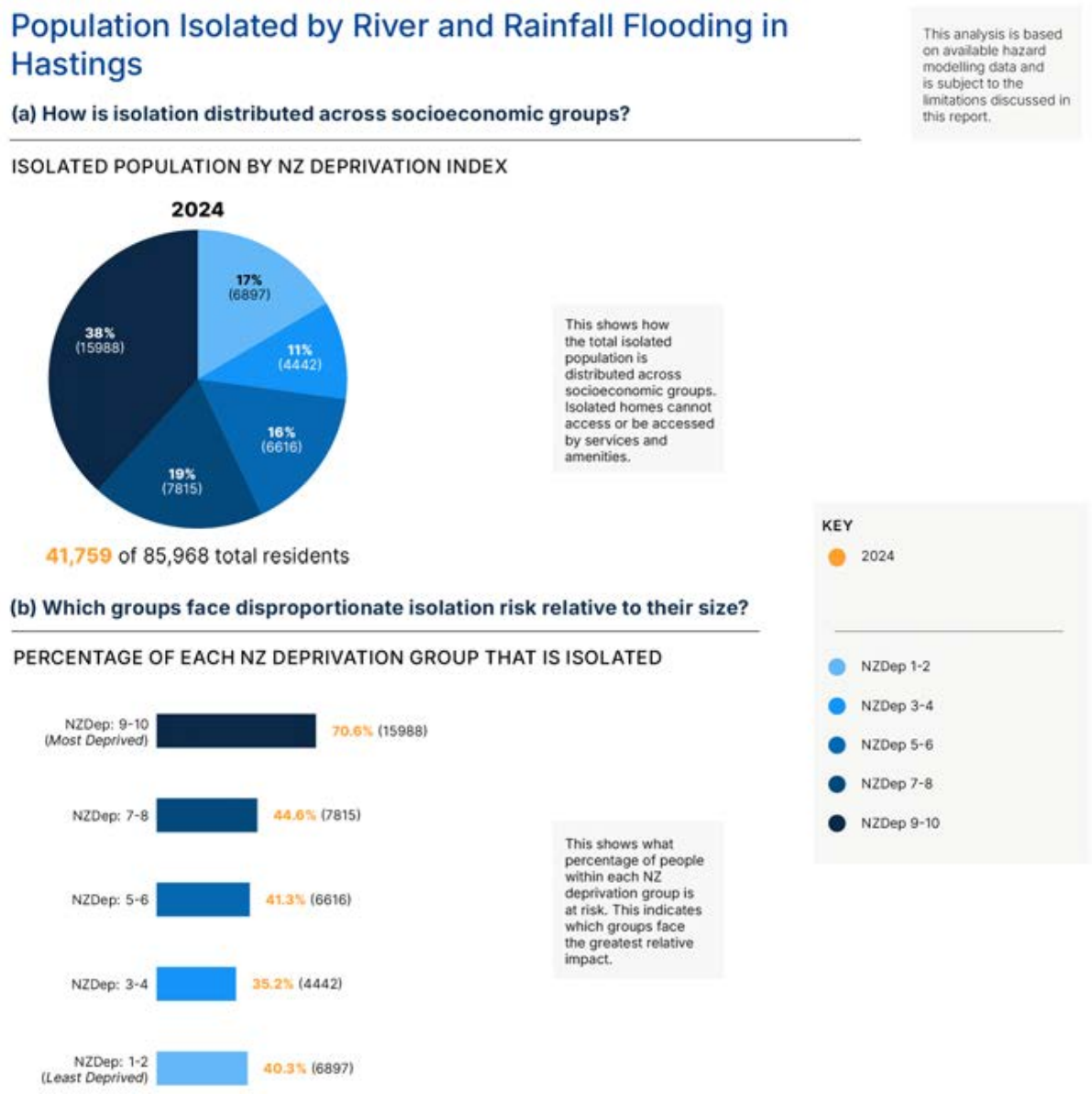


Figure 15.6. Risk of isolation to residents in Hastings due to a 2% AEP river and rainfall flood event.

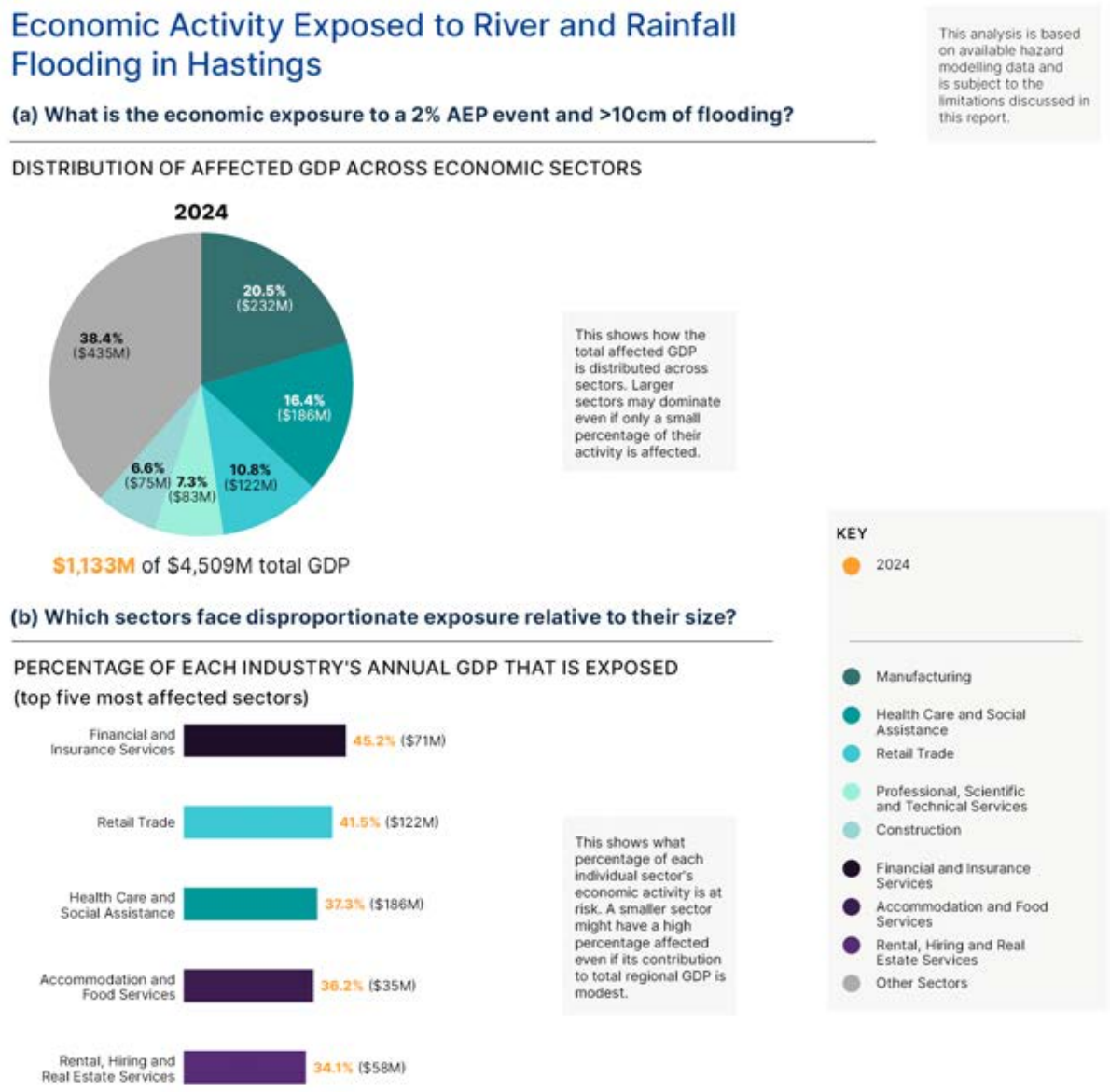


Figure 15.7. Risk to economic sectors in Hastings from 2% AEP river and rainfall flooding.

Risks from landslides

Landslide susceptibility in Hastings District shows concentrated risk areas affecting both infrastructure and communities (Figure 15.3; Figure 15.8; Table 15-5).

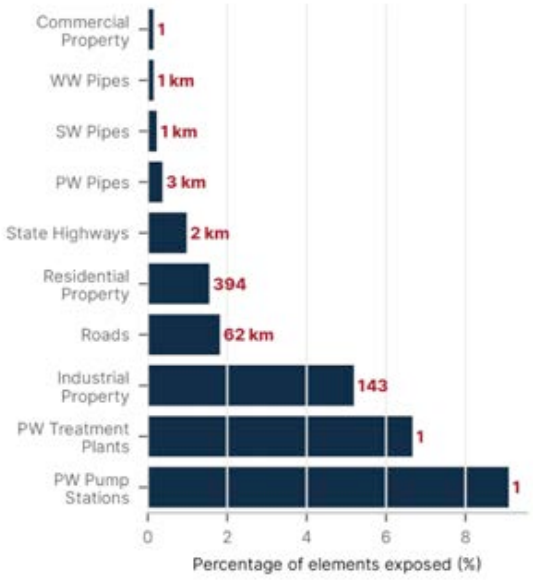


Figure 15.8. Infrastructure exposed to landslides.

Physical Infrastructure Exposure

Infrastructure exposure to landslides varies across asset types. Industrial properties show the highest building exposure at 5.2%, with 143 buildings at risk, while residential exposure is more limited at 1.6% (394 properties). Commercial properties show minimal exposure at 0.1% (1 building).

Infrastructure networks show limited direct exposure, with the exception of a water supply treatment plant and pumpstation being exposed. For the transportation network, 1.0% of state highways and 1.8% of local roads are exposed.

Cascading Impacts on Communities

While direct exposure to landslides affects 1.6% of the population (1,360 residents; Figure A - 37), isolation effects could impact 9.2% (7,910 residents) through disrupted access routes (Figure 15.9).

Landslide risk has different impacts across socioeconomic groups. Of all residents exposed to landslides, 55% are within areas of lower deprivation (NZDep1-2) and 24% are in areas with Deprivation scores of 3-4. In terms of those at risk of isolation, 46% are within areas of lower deprivation (NZDep1-2) and 22% are in areas classified as NZDep3-4.

As a proportion of all residents within each deprivation classification, those living in areas of lower deprivation (NZDep1-2) show the highest

Table 15-5. The length/number of each infrastructure exposed to landslides in Hastings.

Built infrastructure	Length/number Exposed
Residential Buildings	394 (1.6%)
Commercial Buildings	1 (0.1%)
Industrial Buildings	143 (5.2%)
Roads	61.8 km (1.8%)
State Highway	2.2 km (1.0%)
Potable Water (PW) Pipes	3.0 km (0.4%)
Stormwater (SW) Pipes	0.9 km (0.2%)
Wastewater (WW) Pipes	1.0 km (0.1%)

relative direct exposure at 4.4% and isolation risk at 21.1%. This contrasts sharply with the most deprived areas (NZDep9-10) which show much lower relative exposure (0.1%) and isolation risk (1.6%).

Of the 1,364 residents exposed to landslides, 91% identify as European, 15% as Māori, 2% as Asian, and 1% as Pacific peoples. Of the 7,912 residents at risk of isolation, 90% identify as European, 17% as Māori, 1% as Asian, and 1% as Pacific peoples.

Those aged 65 and over make up 17.6% of all those exposed to landslides, and 16% of those at risk of isolation. Of the 15,351 residents aged 65 and older in Hastings District, 1.6% are directly exposed to landslides, and 8.2% could face isolation issues.

Economic Impacts

The economic impacts of landslides (Figure 15.10; Figure A - 39) are likely to be primarily felt through the effects of isolation rather than direct exposure.

Direct exposure of commercial and industrial property to landslides is low (>1%). Property contributing 4% of the area's GDP may be impacted by isolation. Sectors most at risk of isolation are Agriculture, Forestry and Fishing and Manufacturing, potentially affecting $68.6 million in economic activity.

The analysis suggests that while physical damage from landslides may be limited, access disruption could create significant operational challenges across multiple sectors, particularly affecting the district's agricultural and transport activities. More detailed analysis of indirect economic impacts of road closures (such as costs of route detours) is not included in this assessment.

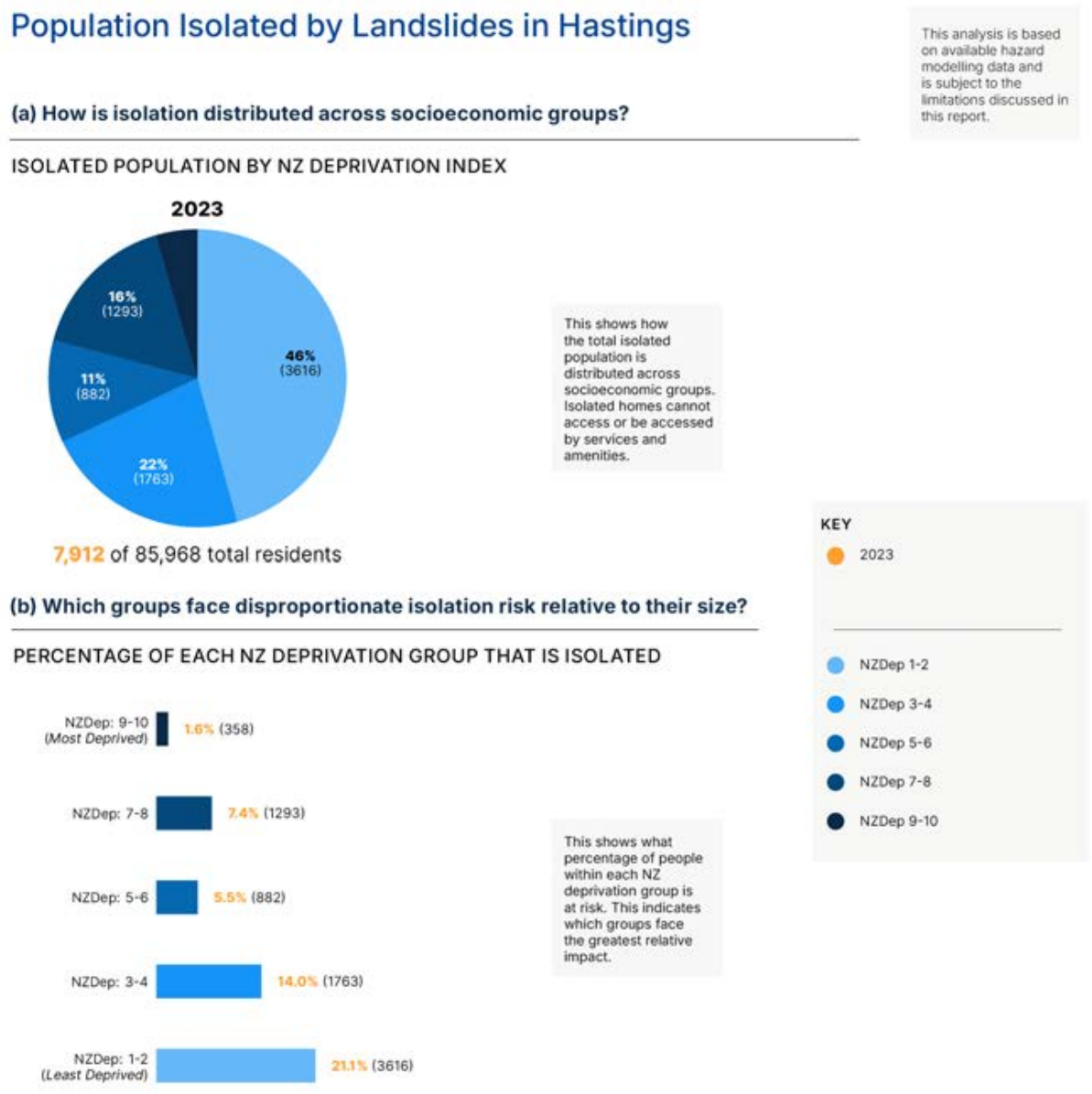


Figure 15.9. Risk of isolation for residents in Hastings due to landslides.

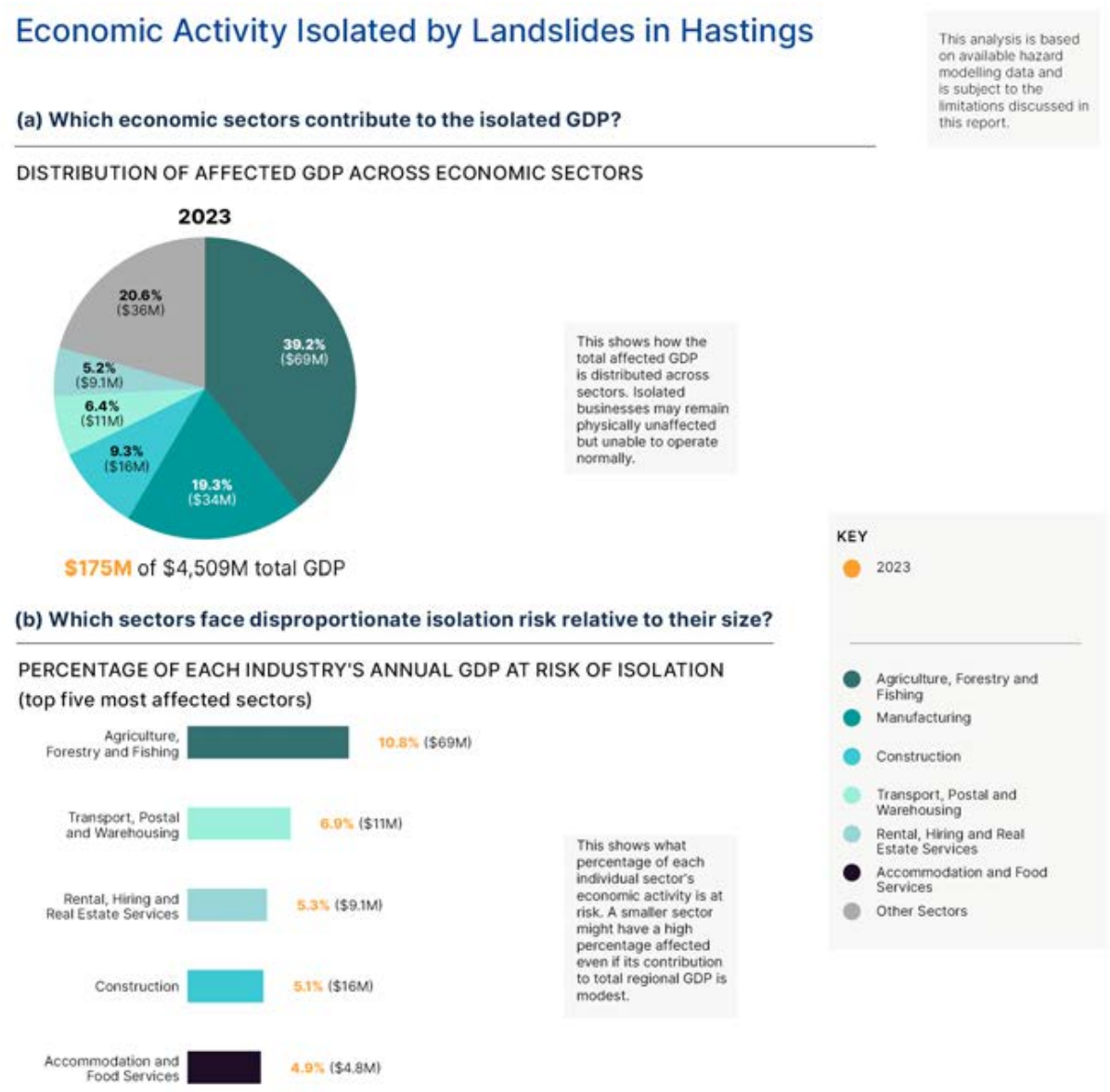


Figure 15.10. Risk to economic sectors in Hastings from landslides.

Risks from climatic (temperature and seasonal) change

Climate projections for Hastings District indicate substantial changes by 2081-2100, particularly under the high emissions scenario (SSP3-7.0), which will affect infrastructure, communities, and economic activities across the district. Temperature increases of 3.1°C (range 2.9-3.2°C) annually, with summer increases of 3.6°C (range 3.4-3.8°C) and projected changes in rainfall patterns create multiple adaptation challenges. The impacts of these projected climatic changes are outlined below.

Infrastructure Impacts

- Increased thermal stress on road surfaces, rail infrastructure and building materials, requiring more frequent maintenance and potential design adaptations.
- Higher cooling demands on electrical systems and telecommunications equipment, particularly with hot days (>25°C) increasing by 55.1 days annually.
- Greater pressure on water infrastructure due to increased PED (96.0mm increase) and reduced winter rainfall.
- Need for upgraded stormwater systems to handle changing rainfall patterns, with more intense summer rainfall (+6.9%) despite overall annual decrease (-7.7%).

Community Impacts

- Increased heat stress risks, particularly with very hot days (>30°C) increasing by 10.4 days annually.
- Reduced winter heating needs (frost days decreasing by 17.8 days) but substantially increased summer cooling requirements.
- Growing water security concerns with significant seasonal rainfall changes (winter rainfall decreasing by 17.0%, while summer rainfall increases by 6.9%).
- Increased vulnerability for agricultural workers and outdoor labourers due to increased number of hot days.
- Potential health impacts from changing disease patterns and extreme weather events.

Economic Impacts

- Agricultural and horticultural sectors face complex changes:
  - extended growing seasons (significant increase in growing degree days)
  - increased water stress from higher PED and reduced winter rainfall
  - potential impacts on fruit production from reduced winter chilling
  - changed pest and disease pressures affecting crop management.
- Manufacturing sector (13.29% of GDP) may face increased cooling costs and potential disruption from extreme weather.
- Construction sector (6.74% of GDP) will need to adapt work practices for more very hot days.

Healthcare sector (9.75% of GDP) may face increased demand from climate-related health impacts These climate changes will interact with the district's existing hazard exposure, potentially amplifying risks from flooding, landslides, and coastal inundation. The combined effects of higher temperatures and changing rainfall patterns may particularly affect the district's agricultural productivity and water security, while creating new challenges for infrastructure resilience and community adaptation.

Refer to Appendix A3 for detailed climate projections for the Hastings District.

Key findings for the Hastings District

- **River and rainfall flooding risk is the most severe hazard for Hastings**, with commercial properties, and residential properties exposed and a high proportion of the population at risk of isolation.
- **Notable exposure of three waters infrastructure**, with the wastewater treatment plant, stormwater infrastructure and wastewater infrastructure directly exposed to more than 10cm of flooding from river and rainfall events.
- **Coastal flooding exposure is increasing** with climate change, affecting residential properties
- **Landslides** are a significant source of isolation risk, with the potential to isolate residents, largely in rural areas. Landslide exposure is concentrated in less deprived areas, with the majority of exposed properties located in NZDep1-2 areas.
- **River and rainfall flooding poses the greatest risk to local economic activity**, with commercial and service sectors facing the greatest risk of direct exposure and isolation.
- **Areas of high deprivation are more exposed to flooding and isolation risks,** with those living in areas of high deprivation (NZDep7-10) the most directly exposed to more than 10cm of river and rainfall flooding, and at greatest risk of isolation.
- **Increasing risks to communities and primary sector industry from an increase in temperatures,** with a projected **3.1°C temperature increase** by 2100 under SSP3-7.0, leading to more hot days (>25°C) annually and a decrease in winter rainfall.

16 Napier City

Snapshot of Napier City

Information on Napier City taken from local plans and reports, the Napier City Council, and Census 2023.

- **105 km²** land area, surrounded by Hastings District
- **Population** 64,695 (2023)
- **24.2% of the population identify as Māori and 26.2% are of Māori descent**
- **21.1% of the population is aged 65 or older**
- **$82,900 median household income** (Dec 2024)
- **$753,155 average house price** (Jan 2025)
- **$3.6B GDP**, with the main industries being Manufacturing (contributing 10% to the district's GDP), Rental, Hiring & Real Estate Services (9%), and Professional, Scientific & Technical Services (8%)
- **Six traditional marae** affiliate to Ahuriri but sit within the Hastings District Council boundary. One marae (Pukemokimoki) sits within Napier City for community and tangata whenua of Ahuriri
- Extensive coastal frontage including beaches and Te Whanganui ā Orotu (Ahuriri Estuary), bounded by rivers to the north and south

Napier City summary

Napier City geographic profile

Napier City, situated on the eastern coast of New Zealand's North Island, covers 105 km² of land area and is a significant urban centre within Hawke's Bay. The city's urban footprint covers about one-third of its land area, with the remaining two-thirds being rural or semi-rural. Napier is surrounded by Hastings District, with its strategic location providing vital connections between the productive Heretaunga Plains — renowned for its apple, pear and stone fruit production and viticulture — and the coast. The city is characterised by long stretches of beach front, a river network, and Te Whanganui ā Orotu (the Ahuriri Estuary), which holds significant cultural value for tangata whenua and supports diverse ecological systems.



Figure 16.1. Napier City in Hawke's Bay.

Table 16-1 Employment and Economic Contribution by Economic Sector (greater than 5%) in Napier.

ANZSIC06 Division	Contribution to District GDP (%)	Percentage of total District workforce employed (%)
Manufacturing	10	10
Rental, Hiring and Real Estate Services	9	3
Professional, Scientific and Technical Services	8	7
Retail Trade	7	11
Construction	7	10
Health Care and Social Assistance	6	10
Transport, Postal and Warehousing	6	5
Public Administration and Safety	5	6
Agriculture, Forestry and Fishing	5	4

The city faces multiple climate-related challenges that vary across its diverse landscape. These range from coastal hazards along its eastern boundary to flooding risks in its low-lying areas, particularly those reclaimed from the 1931 earthquake. Figure 16.2 illustrates the spatial distribution of properties exposed to various climate hazards across Napier City.

The built environment of Napier includes significant infrastructure and 27,200 rating units concentrated in areas that face increasing climate risks. The Hawke's Bay Airport and Napier Port are important critical infrastructure also at risk of climate hazards, connecting the central and lower North Island to both national and international markets. As shown in Figure 16.3 physical infrastructure across the city has varying degrees of exposure to multiple hazards influenced by climate change, particularly flooding and coastal inundation.

Napier City population

Based on Census 2023 data, the city has a population of 64,695, making it the tenth most populous city in the country. Those identifying as European make up 79% of the city's population (higher than the national average of 67.8%), followed by 24.2% who identify as Māori (higher than the national average of 17.8%). In total, 43.3% of the city's population is aged 30-64, followed by 21.1% aged 65 or older. The district has a median household income of $82,900 and average house value of $753,155. Given the size of its population, Napier City serves as a crucial economic and social hub for the region.

Napier City local economy

Napier City's GDP in 2023 was $3,605 million. The city's economy is relatively diverse (Table 15.1). Manufacturing, Rental, Hiring & Real Estate Services, and Professional, Scientific & Technical Services are the main industries, collectively contributing 27% to the district's GDP. In terms of the percentage of workforce employed, Retail Trade, Construction, Manufacturing, and Health Care & Social Assistance are the biggest employers, collectively providing 41% of employment.

Table 16-2 Summary and suitability for adaptation planning of hazard information available in Napier.

Hazard/Change	Suitability	Description
Coastal Flooding	Moderate	Multiple datasets available: (1) Clifton-Tangoio modelling (2020) with 1% and 2% AEP for 2100; (2) T+T extent mapping (2015) for 1% AEP with 0m, 0.5m, and 1m SLR; (3) NIWA nationwide coastal flooding showing extent for 1% AEP with 0-2m SLR in 10cm increments.
River & Rainfall Flooding	Moderate	Modelling of 10%, 2%, 1% AEP flood depths. Only a single time period (e.g. the modelling is not incorporating sea level rise or other changes).
Shallow Groundwater	Moderate	Current day groundwater levels mapped. No future scenarios incorporating sea-level rise or rainfall changes.
Landslides	Moderate	Region-wide shallow landslide susceptibility mapping.
Coastal Erosion	High	District-wide mapping showing areas susceptible to coastal erosion for 2016, 2065, and 2100.
Liquefaction	High	Susceptibility mapping for three earthquake scenarios (1%, 4%, and 0.2% AEP).
Tsunami	High	Multiple return periods (100, 500, 1000, 2500 ARI) modelled with various sea-level rise scenarios (0cm, 65cm, 1m, 2m).
Wildfire		No suitable mapped data available

Overview of hazard data availability and suitability

Napier City faces multiple climate-related hazards, with varying levels of data quality and availability to support risk assessment and adaptation planning. Table 15.2 provides a summary of the suitable hazard data for the Napier District. The data is classified by suitability, relating to how much confidence there is in the modelling and its applicability for adaptation planning.

Risks from coastal flooding

Coastal flooding presents a significant and increasing risk to Napier City. The exposure analysis considers multiple sea-level rise scenarios from present day to 2150, with flooding potential extending inland through connections to estuaries and other water sources (Figure 16.2; Figure 16.3; Table 16-3)

Physical Infrastructure Exposure

Current coastal flooding exposure is already substantial, with 14.4% of residential buildings (3,242), 5.6% of commercial buildings (56), and 40% of industrial buildings (356) at risk. With 1m of sea-level rise, this exposure increases dramatically to 46.6% of residential, 15.9% of commercial, and 74.9% of industrial buildings.

Infrastructure networks show similarly high exposure levels. Under current conditions, three waters infrastructure exposure ranges from 8.4-13% of pipes and 13-27% of pump stations, increasing to 43-47% of pipes and 40-72% of pump stations with 1m of sea-level rise. Transportation networks show 10.2% of local roads and 3.5% of state highways currently exposed, rising to 37.8% and 22.6% respectively with 1m of sea-level rise.

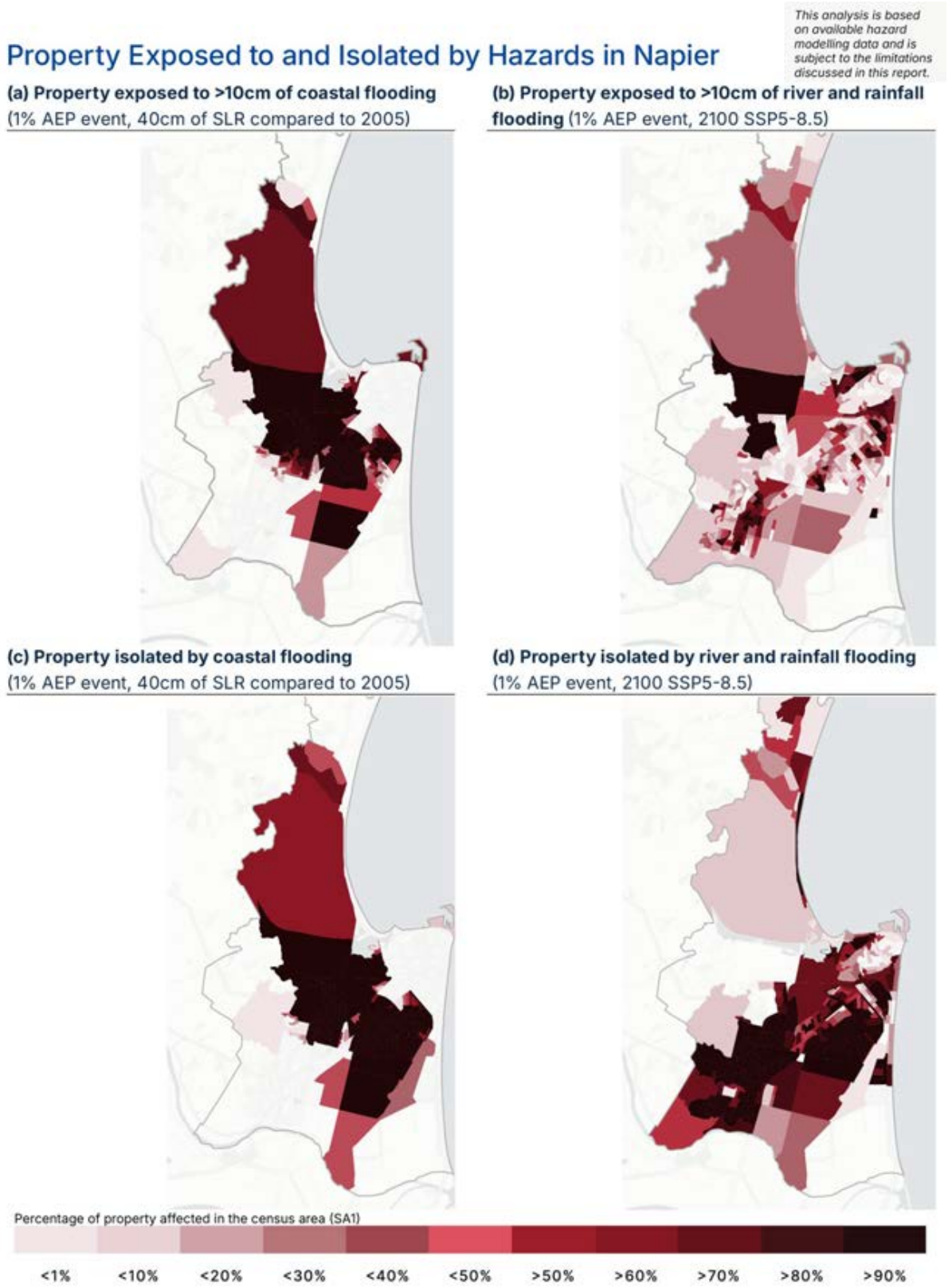


Figure 16.2. Areas with high percentage property risk in Napier.

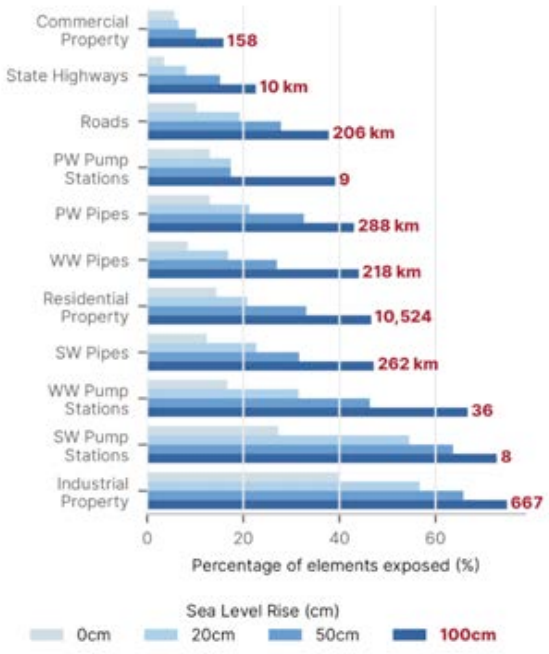


Figure 16.3. Infrastructure exposed to a 1% AEP coastal flood with different amounts of sea level rise.

Cascading Impacts on Communities

By 2130, under a high emissions scenario (SSP5-8.5), 57% of the total population (36,729 residents) could be directly exposed to flooding (Figure 16.4), and up to 59% (38,019 residents) could face isolation risks due to road network disruption (Figure A - 42).

Of all residents exposed to more than 10cm of coastal flooding, 61% are within areas of high deprivation (NZDep7-10). Similarly, 60% of those at risk of isolation are in areas of high deprivation. As a proportion of residents within each deprivation classification, those in areas of high deprivation face the most severe impacts, with 86.8% of residents in NZDep9-10 areas exposed and 87% at risk of isolation.

Of the 36,729 residents exposed to flooding, 73% identify as European, 31% as Māori, 7% as Asian, and 6% as Pacific peoples. Of the 38,019 residents at risk of isolation, 74% identify as European, 30% as Māori, 7% as Asian, and 6% as Pacific peoples. When examining exposure by ethnicity, Pacific and Māori residents show the highest relative exposure at 78% and 73% respectively of their populations, with similar proportions at risk of isolation (79% and 74%).

Over 48% of residents aged 65 and older could face isolation issues. Of all residents directly exposed to flooding, 16.7% are aged 65 and older. Similarly, 17.4% of all residents isolated are aged 65 and older.

Economic Impacts

The combination of direct flooding and isolation creates cascading effects throughout Napier's economy (Figure 16.5; Figure A - 44). By 2050, industrial and commercial properties contributing to 29% ($829M) of the city's annual GDP are directly

Table 16-3. The length/number of each infrastructure exposed in Napier to 1% AEP coastal flood, with different amounts of sea level rise. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are damage prone (vulnerable).

Built infrastructure	Baseline sea level (2005)	20cm of sea level rise (2025 – 2050)	1m of sea level rise (2070 – 2150)
Residential Buildings	3,242 (14.4%)	4,692 (20.8%)	10,524 (46.6%)
Commercial Buildings	56 (5.6%)	65 (6.5%)	158 (15.9%)
Industrial Buildings	356 (40.0%)	505 (56.7%)	667 (74.9%)
Roads	55.6 km (10.2%)	104.6 (19.2%)	205.5 (37.8%)
State Highway	1.6 km (3.5%)	3.7 km (8.1%)	10.3 km (22.6%)
Potable Water (PW) Pipes	86.9 km (13%)	141.9 km (21.2%)	287.5 km (43.0%)
Stormwater (SW) Pipes	68.6 km (12.4%)	126.1 km (22.7%)	261.6 (47.1%)
Wastewater (WW) Pipes	41.7 km (8.4%)	83.2 km (16.8%)	218.0 km (44.0%)

exposed to more than 10cm of coastal flooding. Sectors most at risk are Manufacturing, Wholesale Trade and Transport, Postal and Warehousing. Over 70% of the Wholesale Trade sector is at risk indicating potential for significant flow on impacts on other sectors reliant on wholesale products.

By 2130, properties contributing to 43% ($1229M) of the city's annual GDP are directly exposed. Retail Trade joins Manufacturing, Wholesale and Transport, Postal and Warehousing in the most at risk sectors. Over 80% of the Manufacturing and Wholesale Trade sectors are exposed to direct impact.

The spatial concentration of economic activity, particularly around coastal and low-lying industrial areas, means that flood impacts could simultaneously affect multiple sectors and their supporting infrastructure, creating compound effects that amplify beyond direct losses. This interconnected vulnerability highlights the need for adaptation strategies that consider both direct exposure and the complex web of dependencies that characterize Napier's community and economic systems. More detailed analysis of indirect economic impacts of road closures (such as costs of route detours) is not included in this assessment.

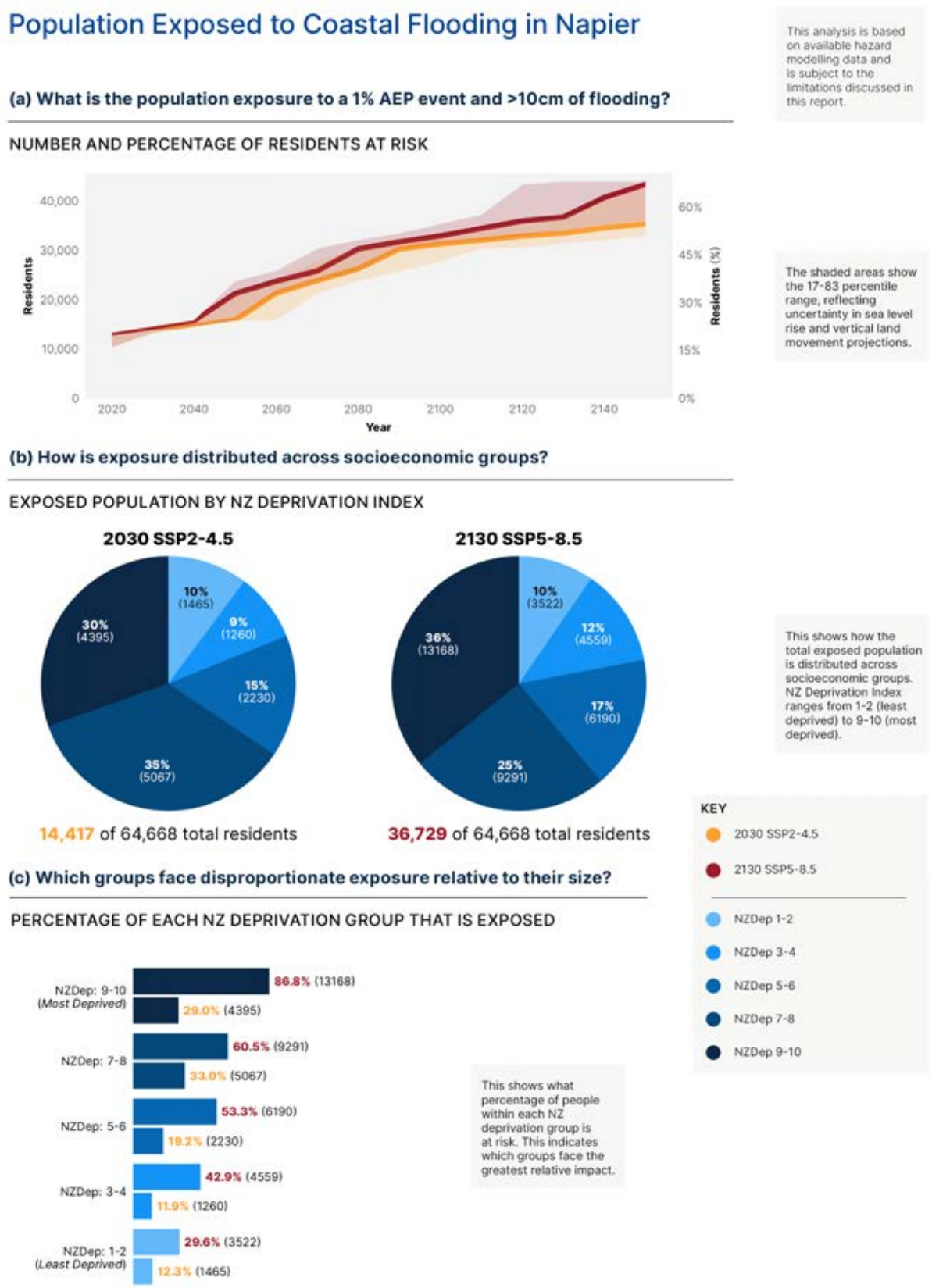


Figure 16.4. Risk to residents in Napier from 1% AEP coastal flooding.

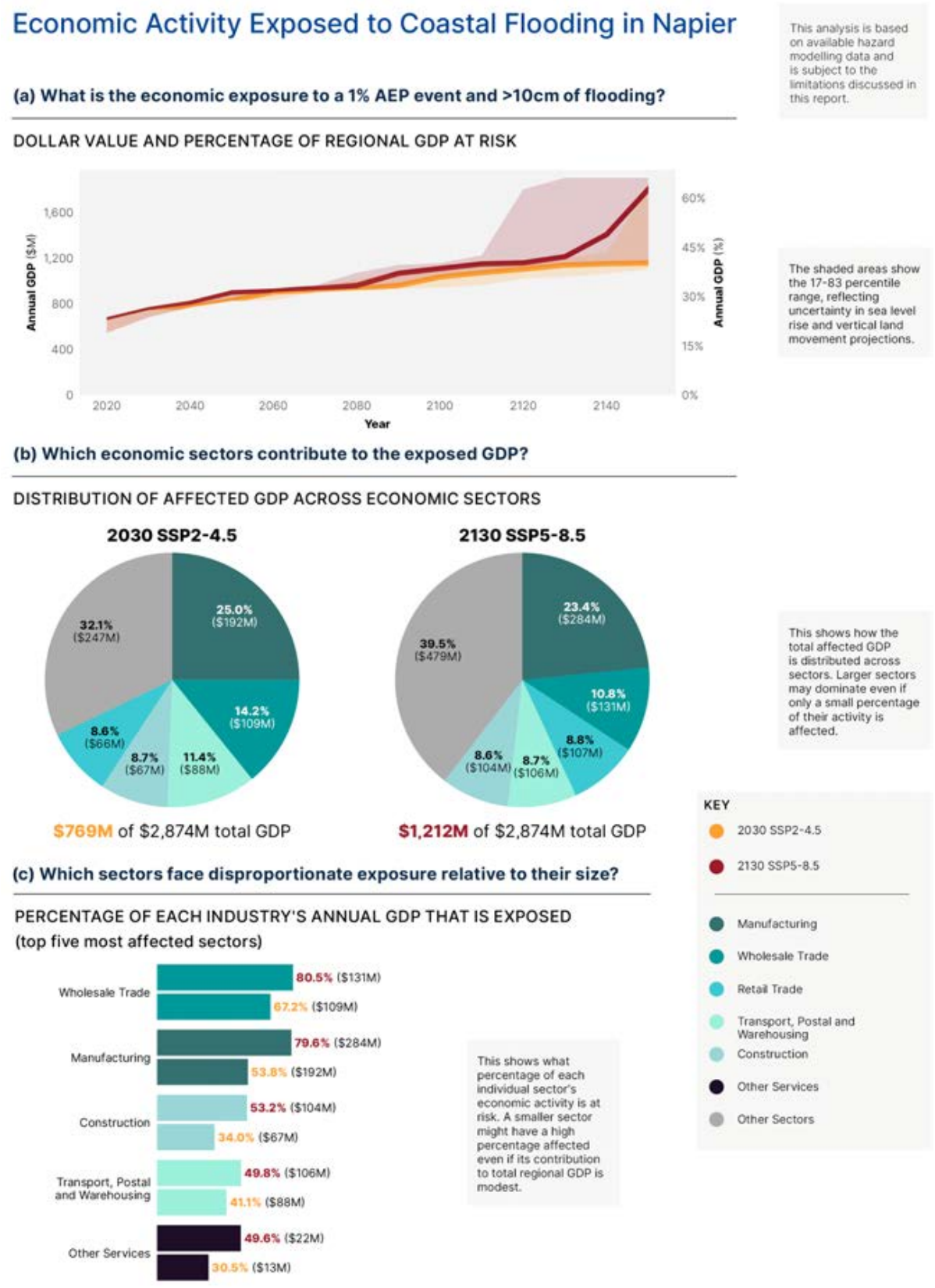


Figure 16.5. Risk to economic sectors in Napier from 1% AEP coastal flooding.

Risks from river and rainfall flooding

River and rainfall flooding poses risks to Napier City, with this analysis based on a 1% AEP storm event modelled for 2100 climate conditions. While this represents future projected conditions rather than current day scenarios, flooding is already a present-day challenge for Napier as demonstrated by recent events (Figure 16.2; Figure 16.6; Table 16-4).

The extent to which flood protection infrastructure (such as stopbanks) is incorporated varies between models, and this assessment does not include detailed analysis of infrastructure vulnerability based on design standards or condition of flood mitigation measures.

Physical Infrastructure Exposure

Analysis shows high exposure levels across multiple infrastructure types. Commercial properties face the highest exposure at 52.8% (525 buildings), followed by industrial buildings at 41.2% (367 buildings). Residential exposure is also substantial, with 5,783 properties (25.6%) at risk.

Three waters infrastructure shows significant exposure, with potable water networks most affected at 35% of pipes and 26% of pump stations. Stormwater and wastewater networks show similar exposure levels at 26% and 22% of pipes respectively and 18% of pump stations exposed for both systems.

Transportation networks show varying exposure, with 26% of local roads at risk, while state highways show lower exposure at 3.6%.

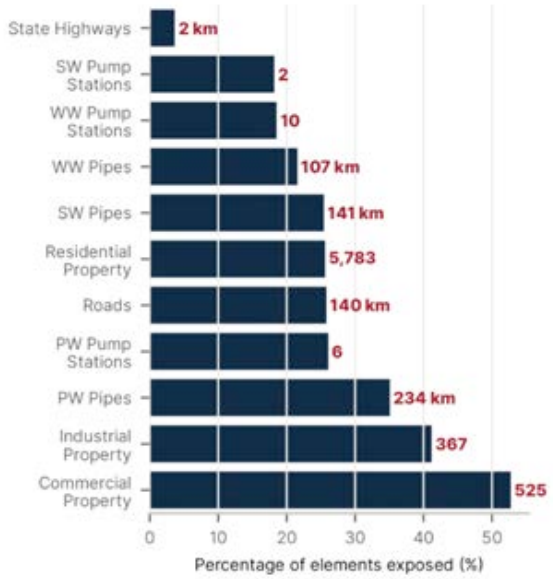


Figure 16.6. Infrastructure exposed to more than 10cm of river and rainfall flooding for 2100 under SSP5-8.5.

Cascading Impacts on Communities

A 1% AEP flood event would create widespread disruption, with 25.4% of the population (16,401 residents) facing direct exposure to flooding (Figure 16.7). The isolation impacts are substantially more widespread, with 75.9% (49,113 residents) potentially

Table 16-4. The length/number of each infrastructure exposed in Napier to 1% AEP river and rainfall flood event. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are damage prone (vulnerable).

Built infrastructure	Exposure to 1% AEP event
Residential Buildings	5,783 (25.6%)
Commercial Buildings	525 (52.8%)
Industrial Buildings	367 (41.2%)
Roads	140.4 km (25.8%)
State Highway	1.7 km (3.6%)
Potable Water (PW) Pipes	234.4 km (35.1%)
Stormwater (SW) Pipes	141.3 km (25.5%)
Wastewater (WW) Pipes	106.7 km (21.6%)

cut off from essential services due to flooded roads (Figure 16.8).

Of all residents exposed to flooding, 53% are in areas of high deprivation (NZDep7-10), and 52% of those at risk of isolation are in these same areas. As a proportion of residents within each deprivation classification, those living in the most deprived areas (NZDep9-10) face the highest isolation risk at 87.2%, significantly higher than the 62% in least deprived areas (NZDep1-2). Direct flooding exposure shows similar but less pronounced differences, affecting 31% of those in medium-high deprivation areas (NZDep5-8) compared to 15.2% in least deprived areas.

Of the 16,401 residents exposed to flooding, 79% identify as European, 24% as Māori, 8% as Asian, and 4% as Pacific peoples. Of the 49,113 residents at risk of isolation, 77% identify as European, 26% as Māori, 7% as Asian, and 5% as Pacific peoples. When examining exposure by ethnicity, Pacific and Māori residents face higher isolation risk (85.5% and 82.3% respectively) compared to the city's total population (75.9%). Asian residents also show elevated risk with 80.4% at risk of isolation and 29.2% directly exposed to flooding.

Those aged 65 and over make up 20.1% of all those exposed to flooding, and 20.2% of those at risk of isolation. Of the 13,686 residents aged 65 and older in Napier City, nearly three-quarters (72.6%) could face isolation issues, while 24.1% are directly exposed to flooding.

Economic Impacts

River and rainfall flooding in Napier creates both direct exposure and isolation risks across the city's economy. Most sectors face greater isolation impacts than direct flooding exposure, creating significant challenges for business continuity and economic resilience (Figure 16.9; Figure A - 48).

Industrial and commercial properties contributing to 44% ($1,278M) of the city's annual GDP are exposed to direct river and rainfall flooding, based on projected flood risk for the year 2100. Several major sectors show over 10% of their GDP contribution at risk, including:

- Rental Hiring and Real Estate
- Retail Trade
- Professional Scientific and Technical Services
- Manufacturing
- Health Care and Social Assistance.

When examining exposure as a proportion of each sector's total activity, Public Administration and Safety is most affected with 63% exposed. Other highly exposed sectors (over 50% at risk) include:

- Rental Hiring and Real Estate
- Retail Trade
- Professional Scientific and Technical Services
- Health Care and Social Assistance
- Financial and Insurance
- Information Media and Telecommunications
- Electricity, Gas, Water and Waste Services.

Isolation impacts are even more extensive, affecting properties that contribute 56% ($1,613m) of the city's annual GDP. Over 70% of several sectors face isolation risk, including:

- Retail Trade
- Public Administration and Safety
- Information Media and Telecommunications
- Electricity, Gas, Water and Waste Services.

This widespread economic exposure indicates that flooding impacts extend well beyond directly affected areas. The high isolation risks across multiple sectors highlight potential disruption to Napier's economic function, even in areas not directly flooded. This creates particular challenges for business continuity planning and emphasises the importance of maintaining critical transport links during flood events.

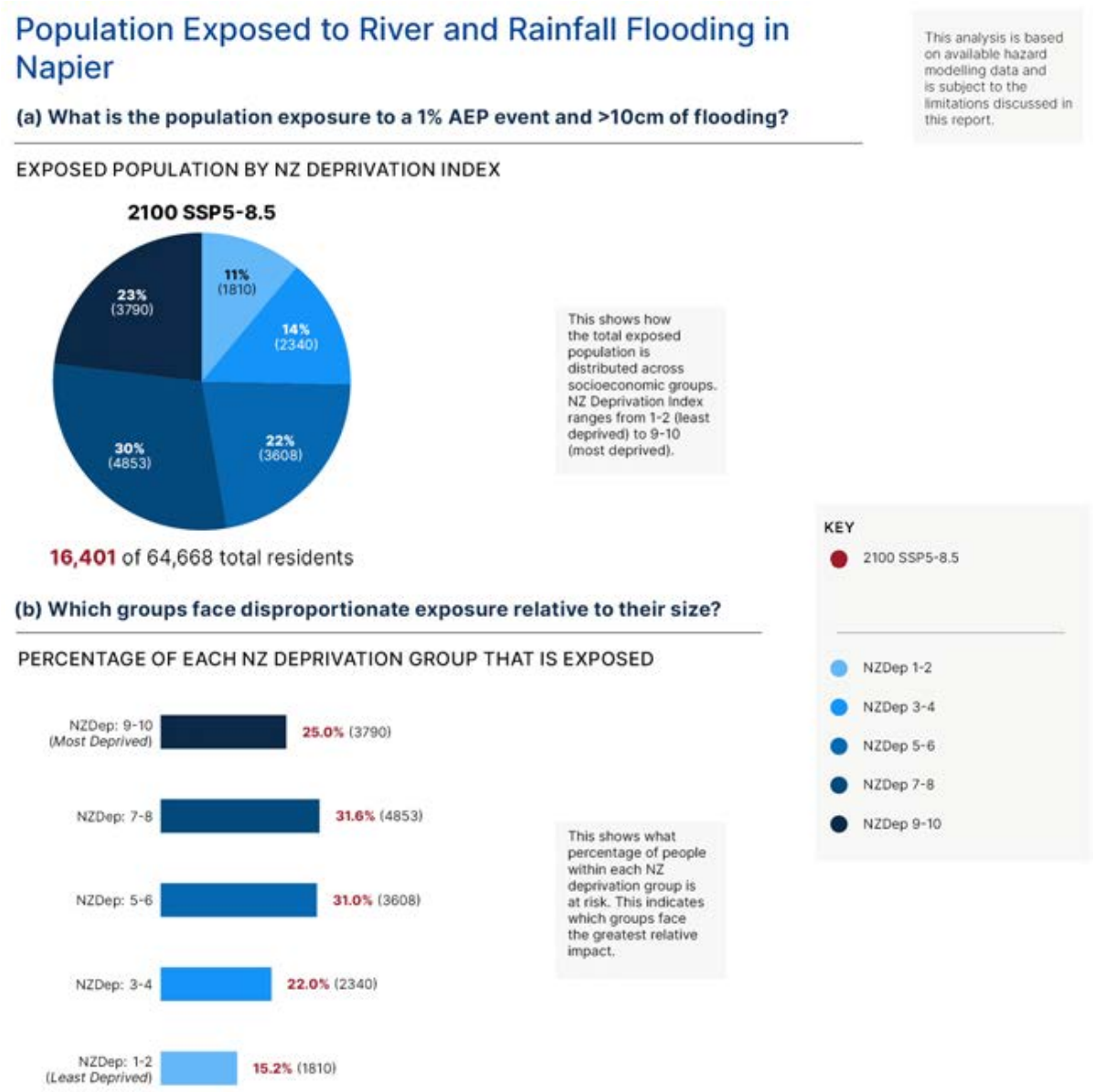


Figure 16.7. Direct risk to residents in Napier from 1% AEP river and rainfall flooding.

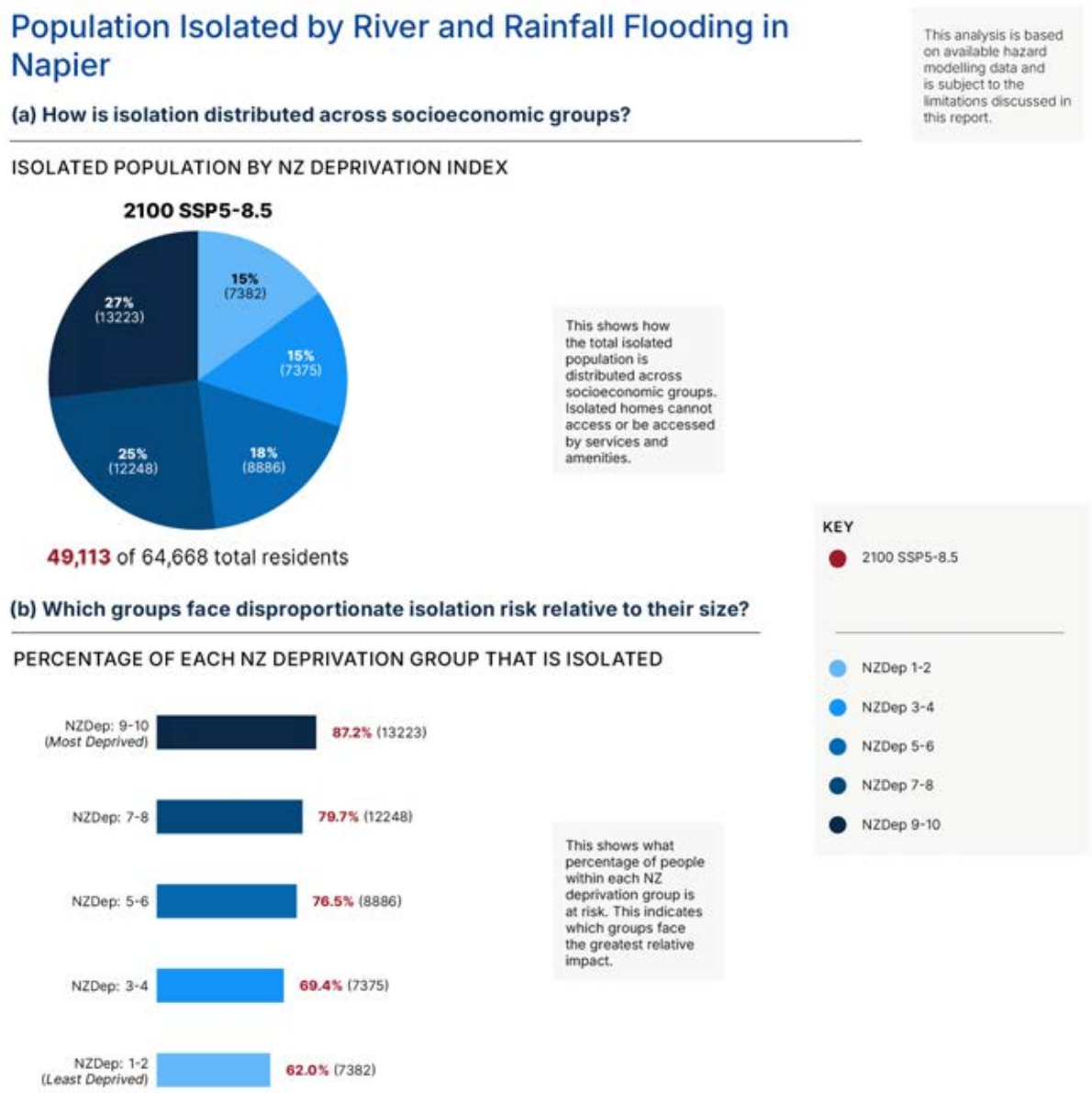


Figure 16.8. Isolation risk to residents from a 1% AEP river and rainfall event modelled for 2100.

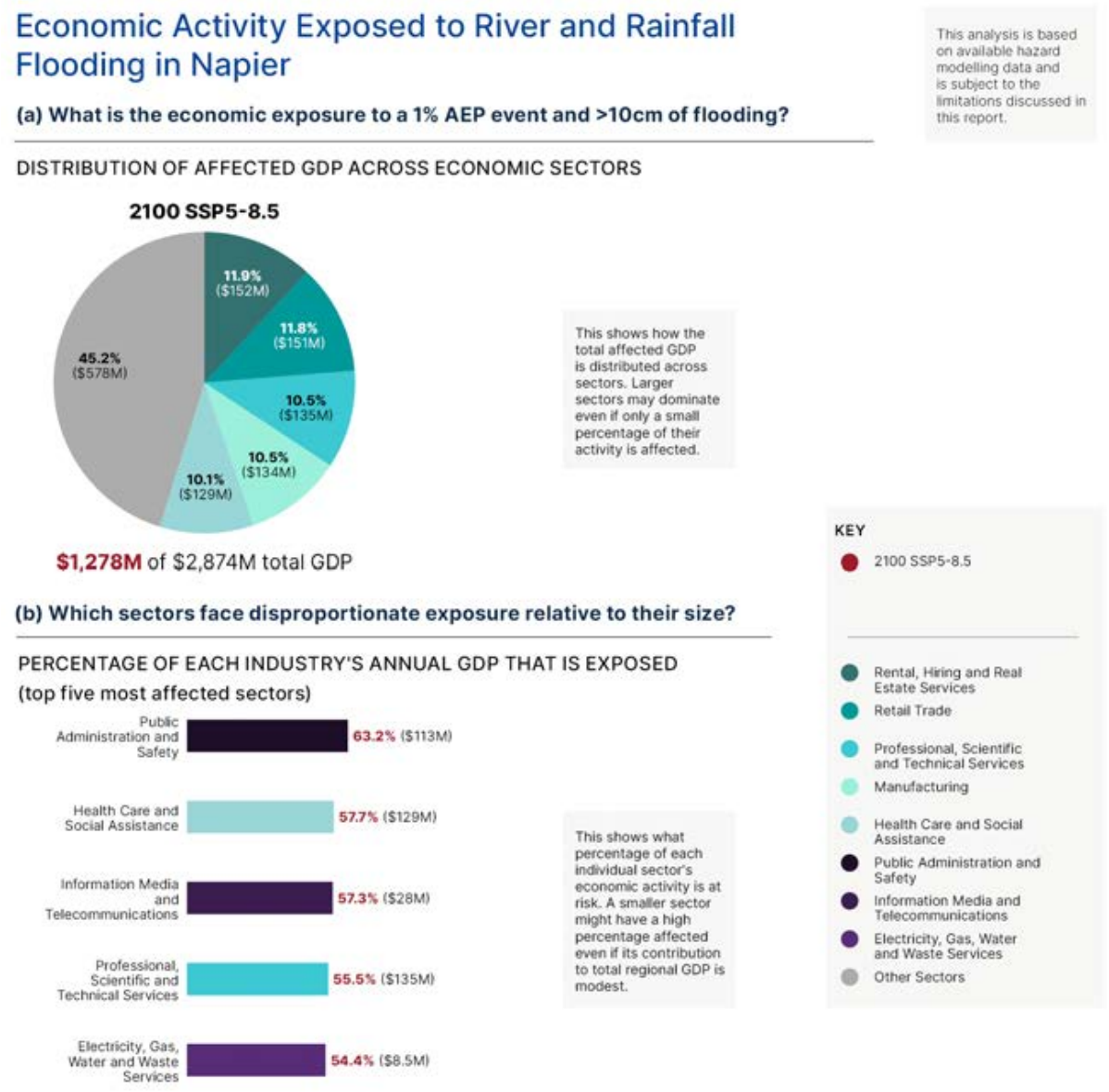


Figure 16.9. Direct risk to economic sectors in Napier from 1% AEP river and rainfall flooding in 2100.

Risks from landslides

Note that this assessment does not include detailed GNS Science analysis of landslide risk for areas like Napier Hill. While the city-scale analysis in this assessment shows relatively low exposure, localised risks may be significantly higher in some areas.

Physical Infrastructure Exposure

Based on available regional-scale data, landslides affect a smaller portion of Napier than flooding, presenting localised risks particularly in hillside areas. Analysis shows limited direct exposure to built infrastructure, with 119 residential properties (0.5%) and 5 industrial buildings (0.6%) in landslide susceptible areas. Infrastructure networks show minimal direct exposure, with small sections of three waters infrastructure affected: wastewater at 1.9% of pipes, stormwater at 0.8%, and potable water at 0.1%. Road exposure is limited to 2.6km (0.5%) of local roads, with <10m of state highways directly affected (Figure 16.10; Table 16-5).

Cascading Impacts on Communities

Direct exposure affects less than 1% of Napier's total population (380 residents), while isolation effects could impact up to 930 residents (1.4%) through disruption to access routes.

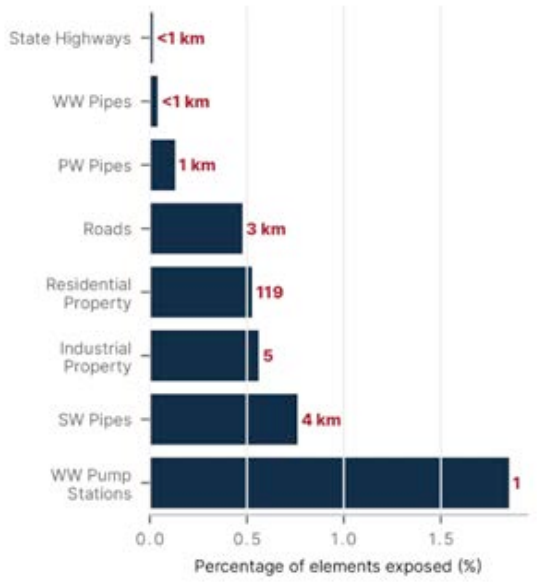


Figure 16.10. Infrastructure exposed to landslides.

Of all residents exposed to landslides, 70% are in areas of low deprivation (NZDep1-2). Similarly, 76% of those at risk of isolation are within these same areas. As a proportion of residents within each deprivation classification, those living in areas of low deprivation show the highest exposure at 2.2%, with isolation potentially affecting up to 5.9% of this population.

Table 16-5. The length/number of each infrastructure exposed to landslides in Napier.

Built infrastructure	Length/number Exposed
Residential Buildings	119 (0.5%)
Commercial Buildings	0
Industrial Buildings	5 (0.6%)
Roads	2.6 km (0.5%)
State Highway	0.0 km (0.0%)
Potable Water (PW) Pipes	0.9 km (0.1%)
Stormwater (SW) Pipes	4.2 km (0.8%)
Wastewater (WW) Pipes	0.2 km (1.9%)

Those aged 65 and over make up 22.5% of all those exposed to landslides, and 21.9% of those at risk of isolation. Of the 13,686 residents aged 65 and older, 0.6% are directly exposed to landslides, and 1.5% could face isolation issues.

Economic Impacts

Economic impacts from landslides are primarily caused by isolation rather than direct exposure. Administrative and Support Services and Education and Training have the highest potential for disruption, with approximately 20% of each sector potentially affected by isolation. This suggests that while physical damage from landslides may be limited, access disruption could create significant operational challenges for certain sectors.

These findings show that while landslide risk may affect a relatively small portion of Napier's population and infrastructure, its impacts are concentrated in particular areas and sectors. This spatial concentration creates potential for significant localised disruption, particularly where landslides could affect access routes or critical infrastructure

Risks from climatic (temperature and seasonal) change

Climate projections for Napier (Appendix A3) indicate changes that will affect infrastructure, communities, and economic activities across the district. By 2081-2100, under SSP3-7.0, temperature increases of 3.0–3.5°C coupled with more hot days (increasing from 24 to 71 days above 25°C annually) and changes in rainfall patterns will create a range of adaptation challenges. The impacts of these projected climatic changes are outlined below.

Infrastructure Impacts

- Increased stress on road rainfalls and rail infrastructure from thermal expansion.
- Higher cooling demands on electrical and telecommunications infrastructure.
- Accelerated deterioration of building materials and increased maintenance requirements.
- Greater pressure on water infrastructure due to increased demand during hot periods.

Community Impacts

- Health risks from extreme heat, particularly with very hot days (>30°C) increasing from 5 to 22 days annually.
- Changes in human disease patterns and potential emergence of new health risks.
- Reduced winter heating needs (frost days decreasing by 7.4 days) but increased summer cooling requirements.
- Growing water security concerns with seasonal rainfall changes (winter rainfall decreasing by 14.4% while summer rainfall increases by 8.4%).
- Disproportionate impacts on vulnerable populations, particularly older residents and those in poorly adapted housing.

Economic Impacts

- Agriculture and horticulture will face both opportunities and challenges:
  - longer growing seasons (growing degree days increasing by nearly 1000 units)
  - increased water stress (PED increasing by 114.5mm)
  - changed pest and disease pressures.
- Tourism may benefit from warmer conditions but face disruption from extreme weather events.
- Construction and outdoor work will need to adapt to more very hot days and changing rainfall patterns.
- Increased cooling costs for commercial and industrial operations.
- Insurance and financial services may face pressure from increased climate risks.

These climate changes will interact with and potentially amplify the flood risks described above, creating compound challenges for adaptation planning. For example, increased summer rainfall intensity combined with sea-level rise could exacerbate flooding impacts, while higher temperatures could increase the vulnerability of isolated communities during flood events.

Key findings for Napier City

- **Coastal flooding is a significant and increasing risk.**
- **River and rainfall flooding also poses a significant risk** to the built environment including lifeline infrastructure, residential properties, commercial properties and industrial buildings.
- **Three waters infrastructure is significantly vulnerable to all types of flooding**, particularly water supply in a 1% AEP river and rainfall flood event, and wastewater exposure to coastal flooding by 2100 (SSP2-4.5).
- **High risk of business isolation during river, rainfall, and coastal flooding**, with the potential for significant disruption to Napier's economy, even in areas not directly flooded.
- **Increasing risk of economic shocks and disruptions from seasonal variability** with a 3.0–3.5°C temperature increase by 2081-2100 under SSP3-7.0, and increased water stress affecting primary industries.
- **Areas of high deprivation are more exposed to flooding and isolation risks**, with those living in areas of high deprivation (NZDep7-10) the most directly exposed to more than 10cm of river and rainfall flooding and coastal flooding.

17 Wairoa District

Snapshot of the Wairoa District

Information on the Wairoa District taken from local plans and reports, the Wairoa District Council, and Census 2023.

- **4,077km² land area**
- **Population 8,826** (2023) over half of which live in the Wairoa township between Napier and Gisborne
- **68.5% of the population identify as Māori and 69% are of Māori descent**
- **18.6% of the population are aged 65 years and over**
- **$65,800 median household income** (Dec 2024), the lowest in the Hawke's Bay
- **$405, 927 average house price** (Jan 2025)
- **$404 million GDP** in 2023, with the main industries being Agriculture, Forestry and Fishing (contributing 20% to the district's GDP), Manufacturing (13%), Construction (8%)
- **Thirty-seven marae** located across the district
- Mahia Peninsula home to Rocket Lab
- Wairoa township is the urban centre, surrounded by small rural settlements and land use

Wairoa District summary

Wairoa District geographic profile

The Wairoa District covers 4,077km² of diverse terrain between Napier and Gisborne (Figure 17.1). The landscape is characterised by a mixture of native forests (approximately 45% of the total area) in the north-west, agricultural grassland (42%) towards the south-east, plantation forestry (9%), and a small but significant horticultural presence (<1%) near the coastal areas. The district's population of 8,826 (2023) is primarily concentrated in the Wairoa township, with the remainder dispersed across rural areas and coastal settlements including the Mahia Peninsula, notable as the location of Rocket Lab's launch facility [16, 61, 70, 71].



Figure 17.1. Wairoa District in Hawke's Bay.

Table 17-1 Employment and Economic Contribution by Economic Sector (greater than 5%) in Wairoa

ANZSIC06 Division	Contribution to District GDP (%)	Percentage of total District workforce employed (%)
Agriculture, Forestry and Fishing	20	22
Manufacturing	13	17
Construction	8	9
Rental, Hiring and Real Estate Services	6	2
Health Care and Social Assistance	5	8
Retail Trade	5	7

Wairoa District population

Wairoa District has distinct local demographic and socioeconomic characteristics that may influence its adaptive capacity and vulnerability to natural hazards. The district has the lowest median household income in Hawke's Bay at $65,800, and 68.5% of the population identify as Māori, representing one of the highest proportions of Māori residents in any New Zealand district. In total, 18.6% of the population is aged 65 years or older, which is slightly higher than Hastings District (17.9%) and lower than Central Hawke's Bay District (21.4%) and Napier City (21.1%). These demographic and economic factors are particularly relevant when considering the community's capacity to prepare for, respond to, and recover from natural hazards events.

Wairoa District local economy

Wairoa District's GDP in 2023 was $404 million. The district's economy is predominantly based on primary industries, with Agriculture, Forestry and Fishing contributing 20% to the district's total GDP and employing 22% of the workforce (Table 16-1). Manufacturing and Construction also play significant roles, together accounting for 21% of GDP and providing 26% of employment. These economic activities are distributed across the district's varied landscape, reflecting the close relationship between the natural environment and local livelihoods.

Overview of hazard data availability and suitability

Wairoa District faces various climate-related hazards, though the availability and quality of hazard data to support risk assessment and adaptation planning is generally limited. The assessment of climate-related risks in the Wairoa District is constrained by limited availability of hazard data appropriate for this level of assessment.

Table 17-2 provides a summary of the suitable hazards data available at the time this assessment was undertaken. The data is classified by suitability, relating to how much confidence there is in the modelling and its applicability for adaptation planning.

The following sections outline the findings of the district-level assessment for Wairoa.

Table 17-2 Summary and suitability for adaptation planning of hazard information available in Wairoa District.

Hazard/Change	Suitability	Description
Coastal Flooding	Low	Nationwide dataset with extent only (no depth) for 1% AEP with 0-2m sea level rise in 10cm increments.
River & Rainfall Flooding	Low	2007 modelling for 1% and 2% AEP flood extents for present day scenario. No climate change scenarios available.
Shallow Groundwater		No suitable mapped data available
Landslides	Moderate	2023 Manaaki Whenua region-wide shallow landslide susceptibility mapping.
Coastal Erosion		No suitable mapped data available
Liquefaction		No suitable mapped data available
Tsunami	Low	Two regional models showing tsunami extents. No depth information or climate change scenarios available.
Wildfire		No suitable mapped data available

Risks from coastal flooding

While direct exposure to coastal flooding affects a relatively small portion of Wairoa District's built environment, the potential for isolation of people and services is more substantial, particularly in the long-term under a higher emissions scenario. The concentration of exposure of infrastructure systems combined with the isolation risks warrant consideration in adaptation planning for the district. The following results describe exposure for a 1% AEP event.

Physical Infrastructure Exposure

Coastal flooding in Wairoa District primarily affects three waters infrastructure networks and a small number of residential and industrial buildings (Figure 17.2; Figure 17.3; Table 17-3). Under current sea levels, approximately 0.2% of residential buildings (5 buildings) are exposed to more than 10cm of coastal flooding. This exposure increases to 0.4% (13 buildings) with 1m of sea level rise. While no commercial buildings are directly exposed across the scenarios examined, industrial building exposure increases from zero under current conditions to 0.6% (4 buildings) with 1m of sea level rise.

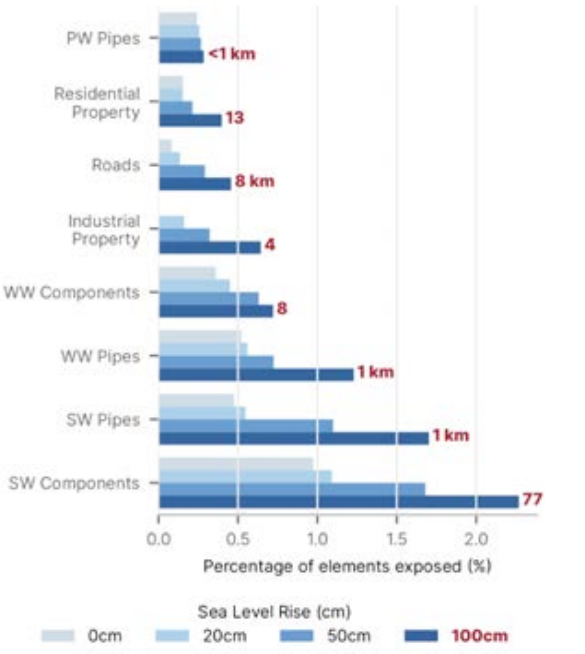


Figure 17.2. Infrastructure exposed to a 1% AEP coastal flood with different amounts of sea level rise (SLR).

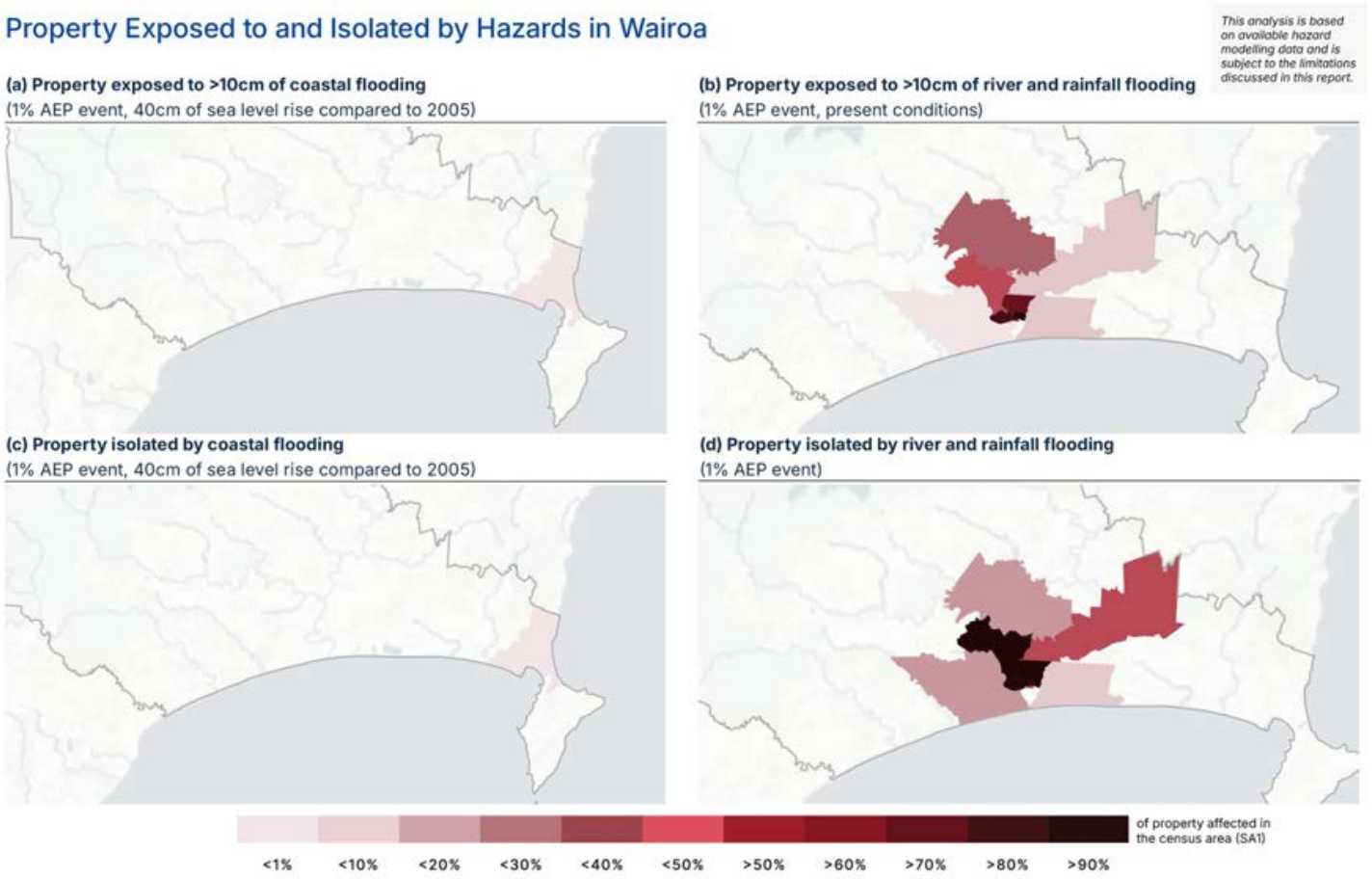


Figure 17.3. Areas with high percentage property risk in Wairoa.

Infrastructure networks also show minor levels of exposure, as detailed in Table 17-3. Road exposure increases from 1.6km (0.1%) currently to 8.5km (0.5%) with 1m of sea level rise, though state highways remain unexposed across all scenarios. Three waters infrastructure also shows varying levels of exposure across the scenarios, with stormwater networks showing the highest relative exposure at 1.7% under 1m of sea level rise.

Cascading Impacts on Communities

The demographic exposure statistics indicate varying levels of vulnerability across different population groups living in Wairoa (Figure 17.4; Figure A - 50). Based on current levels of deprivation and residential development, by the year 2130, 70% of those exposed to more than 10cm of coastal flooding under SSP5-8.5 would be living in areas considered high deprivation (NZDep9-10), and 24% in areas of moderate-high deprivation (NZDep7-8).

In terms of isolation, those in areas of higher deprivation would also be disproportionally affected. Under the same scenario, 68% of those at risk of exposure and isolation would be living in areas considered highly deprived (NZDep9-10), followed by 26% in areas of moderate-high deprivation (NZDep7-8).

Māori and Pacific peoples face disproportionate exposure and isolation risks. Of those directly exposed to coastal flooding, 72% identify as Māori or Pacific peoples (57 out of 79 people). Similarly, of those at risk of isolation, 72% identify as Māori or Pacific peoples (280 out of 390 people).

Approximately 1% of Wairoa District's population aged 65 or older is at risk of coastal flooding exposure by 2130, but this represents 20.4% of the district's total exposed population. Similarly, only 5% of Wairoa District's population aged 65 or older is at risk of isolation. However, this 5% represents 21.6% of the total population at risk of isolation. Older people are more vulnerable to risks of isolation given an increased likelihood of mobility issues and/or other existing health conditions. The district's older population is therefore also considerably vulnerable to cascading risks associated with isolation, including restricted access to essential goods and services.

Table 17-3. The length/number of each infrastructure exposed in Wairoa to 1% AEP coastal flood event, with different amounts of sea level rise. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are damage prone (vulnerable).

Built infrastructure	Baseline sea level (2005)	20cm of sea level rise (2025 – 2050)	1m of sea level rise (2070 – 2150)
Residential Buildings	5 (0.2%)	5 (0.2%)	13 (0.4%)
Commercial Buildings	0	0	0
Industrial Buildings	0	1 (0.2%)	4 (0.6%)
Roads	1.6 km (0.1%)	2.5 km (0.1%)	8.5 km (0.5%)
State Highway	0	0	0
Potable Water (PW) Pipes	0.3 km (0.2%)	0.3 km (0.3%)	0.3 km (0.3%)
Stormwater (SW) Pipes	0.3 km (0.5%)	0.4 km (0.5%)	1.2 km (1.7%)
Wastewater (WW) Pipes	0.3 km (0.5%)	0.3 km (0.6%)	0.8 km (1.2%)

Economic Impacts

The findings of this assessment show minor economic impacts from direct exposure and isolation (Figure 17.5; Figure A - 51). The impact of direct exposure of commercial and industrial property to coastal flooding on the district's GDP is low. By 2130 (SSP5-8.5), direct exposure is projected to affect 1% of the area's annual GDP. By increasing the risk of isolation of commercial and industrial properties, coastal flooding is projected to affect 3% of the district's GDP under the same scenario. Isolation risk as a result of coastal flooding may present a greater challenge for certain sectors, with higher proportions impacted by isolation:

- Rental, hiring and real estate services (23.1% of sector)
- Professional, scientific and technical services (13.2% of sector).



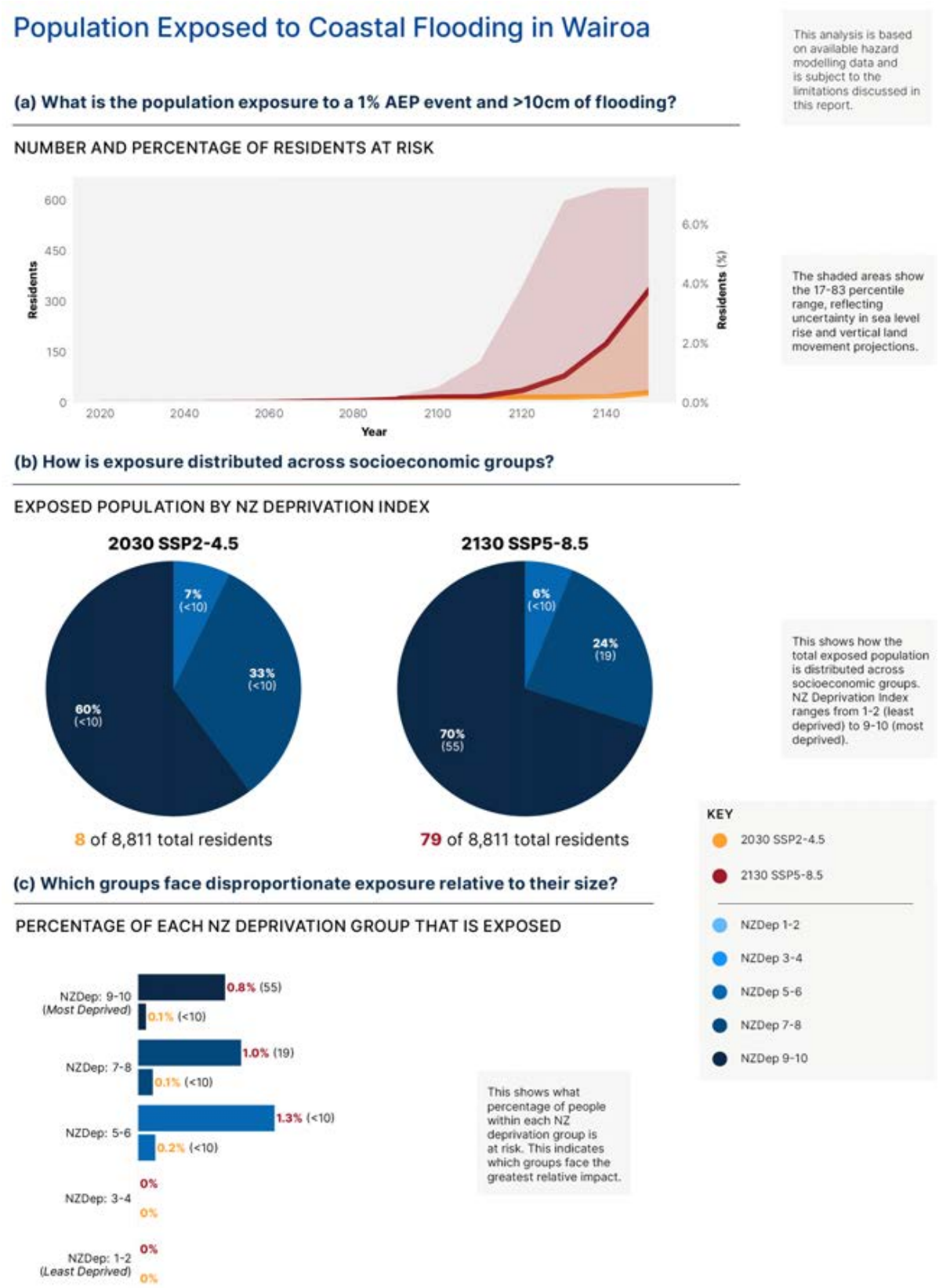


Figure 17.4. Risk to residents being exposed in Wairoa from 1% AEP coastal flooding.

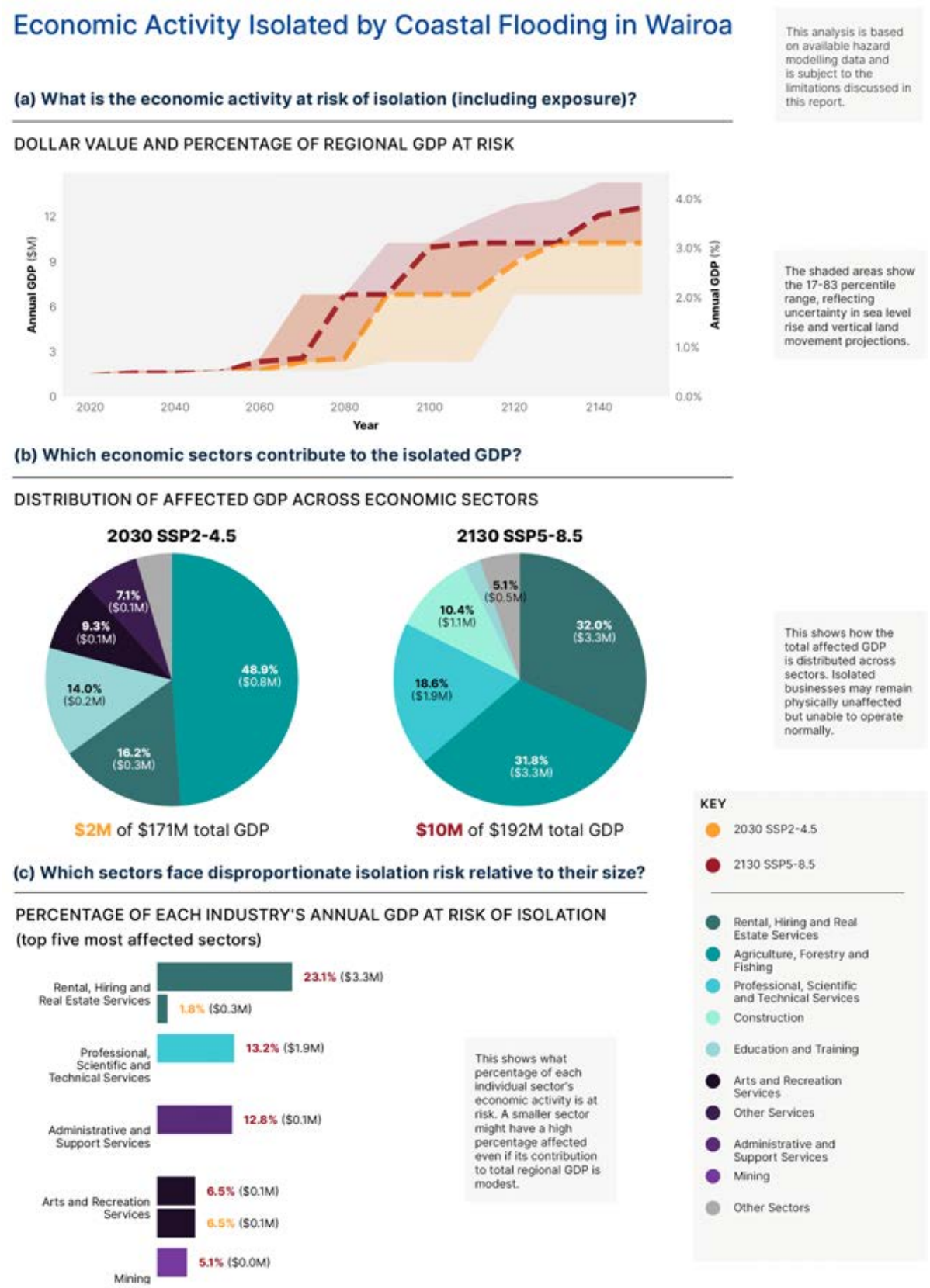


Figure 17.5. Risk to economic sectors in Wairoa from isolation caused by 1% AEP coastal flooding.

Risks from river and rainfall flooding

River and rainfall flooding in Wairoa District presents significant risks to infrastructure, businesses, and communities, with extensive exposure across multiple sectors (Figure 17.3; Figure 17.6; Table 17-4).

The extent to which flood protection infrastructure (such as stopbanks) is incorporated varies between models, and this assessment does not include detailed analysis of infrastructure vulnerability based on design standards or condition of flood mitigation measures.

Physical Infrastructure Exposure

Based on the available 1% AEP flood event modelling, which is confined to parts of the Wairoa River, analysis shows substantial direct exposure of built infrastructure, with 491 residential properties (15%) and 55 commercial buildings (57%) at risk. Industrial properties also show notable exposure, with 96 buildings (15%) potentially affected. River and rainfall flooding risk in other areas such as Nuhaka and Mahia, is not modelled.

Infrastructure networks demonstrate widespread exposure to river and rainfall flooding. Of particular concern is the exposure of three waters infrastructure, with 30% of potable water pipes, 25% of stormwater pipes, and 15.5% of wastewater pipes at risk. Transportation networks also face notable exposure, with 8.8km (5.1%) of state highways and 51km (2.7%) of local roads at risk.

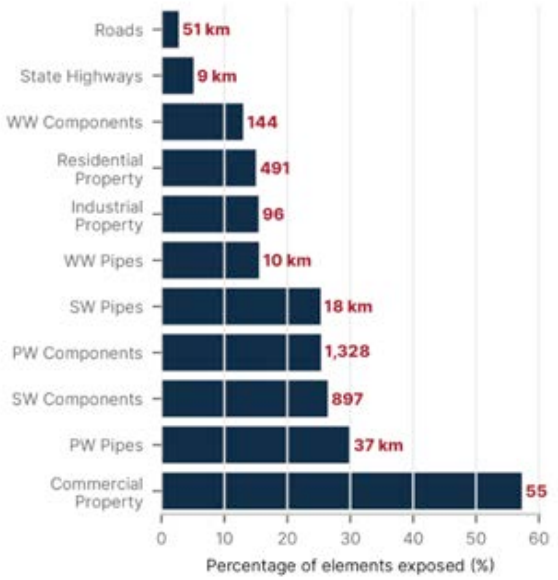


Figure 17.6. Infrastructure exposed to more than 10cm of river and rainfall flooding.

Table 17-4. The length/number of each infrastructure exposed in Wairoa to a 1% AEP river and rainfall flood. Note that exposed does not necessarily mean "damaged" as the characteristics of the assets influence whether they are damage prone (vulnerable).

Built infrastructure	Exposure to a 1% AEP river and rainfall flood (2007)
Residential Buildings	491 (15%)
Commercial Buildings	55 (57%)
Industrial Buildings	96 (15%)
Roads	51 km (2.7%)
State Highway	8.8 km (5.1%)
Potable Water (PW) Pipes	36.5 km (30%)
Stormwater (SW) Pipes	17.8 km (25%)
Wastewater (WW) Pipes	9.5 km (15.5%)

Cascading Impacts on Communities

Of all residents exposed to current modelled river and rainfall flooding, 82% are in areas of high deprivation (NZDep9-10), and 17% are in areas with high-moderate deprivation (NZDep7-8) (Figure 17.7). In terms of those at risk of isolation, 79% are in areas of high deprivation (NZDep9-10), and 19% are in areas with high-moderate deprivation (NZDep7-8) (Figure A - 54).

As a proportion of all residents within each deprivation classification, those living in areas of high deprivation (NZDep9-10) show the highest relative direct exposure (18% of all those living in NZDep9-10 areas are exposed), and highest isolation risk at 23%. Those living in high-moderately deprived areas (NZDep7-8) also show high relative vulnerability with 14% facing direct exposure and 19% facing isolation risk.

The ethnic composition of those exposed to current modelled river and rainfall flooding shows disproportionate impacts. Of the 1,470 residents exposed, 69% identify as Māori, 47% as European, and 5% as Pacific peoples. Similarly, of the 1,885 residents at risk of isolation, 67% identify as Māori, 49% as European, and 5% as Pacific peoples.

The district's older population has similar risk of exposure and isolation to the general population, with 16.3% of those aged 65 and older directly exposed and 21.6% potentially isolated. As a proportion of all those exposed to flooding, 18.1% are aged 65 or older, while 18.7% of those at risk of isolation are aged 65+.

Economic Impacts

Direct exposure of commercial and industrial property to river and rainfall flooding is significant for the Wairoa District (Figure 17.8; Figure A - 56). Commercial and industrial properties contributing 37% ($123M) to the region's annual GDP are directly exposed to more than 10cm of river and rainfall flooding and 39% ($128M) to cascading isolation risks. The sector most affected is Manufacturing, with over 90% of the sector directly exposed.

The proportion of specific sectors at risk of isolation is highly significant, with 97% of manufacturing, 78% of wholesale trade and 60% of the construction sector at risk of short-term isolation from a flooding event. These findings indicate that river and rainfall flooding presents a more extensive risk to Wairoa township (and wider district) than coastal flooding, with widespread exposure across infrastructure, communities, and economic sectors. The concentration of exposure in both critical infrastructure and key economic sectors, combined with significant isolation effects, highlights the importance of comprehensive flood risk management strategies. However, the age and limited spatial extent of the available flood modelling (2007) and lack of climate change scenarios creates uncertainty around future risk levels in the face of a changing climate.

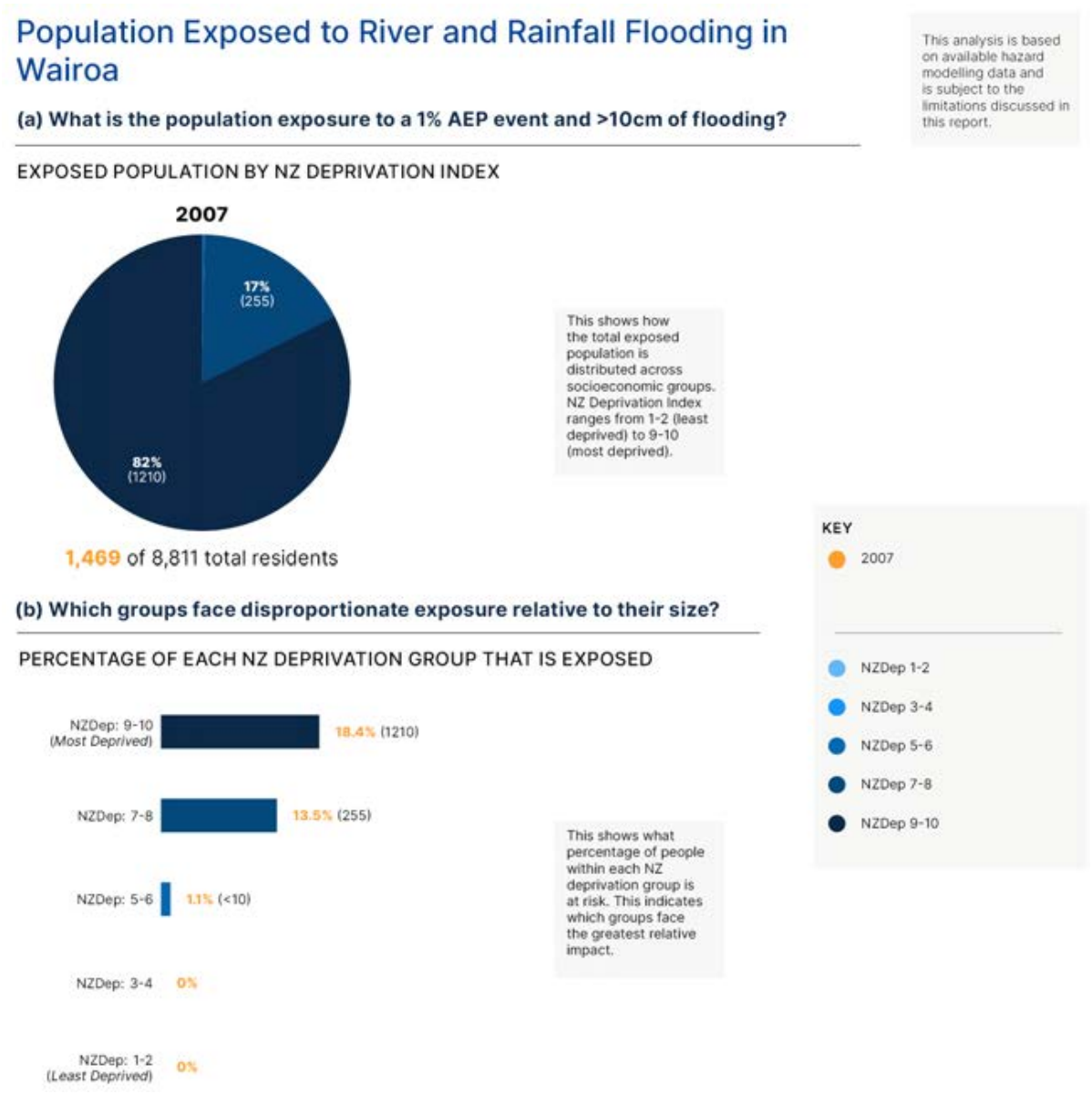


Figure 17.7. Risk to residents in Wairoa from 1% AEP river and rainfall flooding.

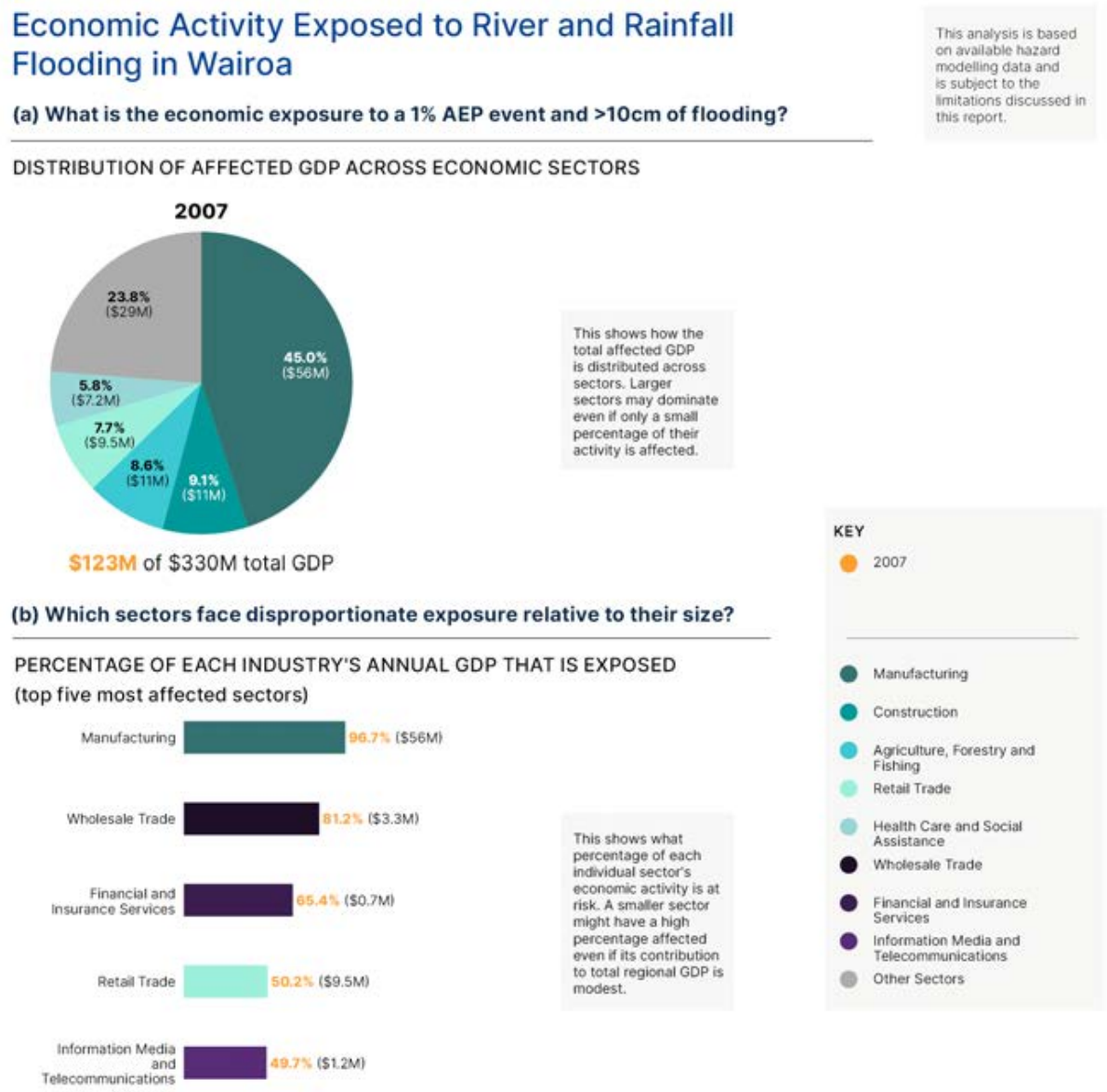


Figure 17.8. Risk to economic sectors in Wairoa from 1% AEP river and rainfall flooding.

Risks from landslides

While direct landslide risks have the potential to affect a relatively small portion of Wairoa's built environment, they present significant indirect risks through isolation effects and disruption to access routes (Table 17-5; Figure 17.9).

Physical Infrastructure Exposure

The assessment shows moderate direct exposure of built infrastructure, with 52 residential buildings (1.6%) and 63 industrial buildings (10.1%) in landslide-susceptible areas. 2.0% of state highways and 3.3% of local roads likely affected.

Infrastructure networks generally show limited direct exposure, with most utilities showing less than 0.5% exposure. Potable water systems are the most exposed among utilities, though still modest at 0.1% of components and 0.3% of pipes exposed. Stormwater and wastewater systems show minimal direct exposure, all below 0.1%.

Cascading Impacts on Communities

While only 1.8% of the Wairoa District's population is directly exposed to landslides (Figure A - 57), 26% is at risk from isolation resulting from landslides (Figure A - 58).

Of all residents exposed to landslides, 58% are in areas of high deprivation (NZDep9-10), and 32% are in areas with high-moderate deprivation (NZDep7-8).

In terms of those at risk of isolation, 63% are in areas of high deprivation (NZDep9-10), and 32% are in areas with high-moderate deprivation (NZDep7-8).

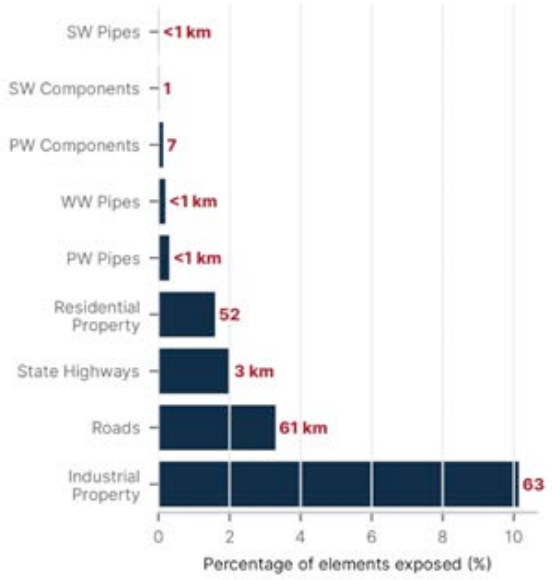


Figure 17.9. Infrastructure exposure to landslides.

As a proportion of all residents within each deprivation classification, those living in areas of moderate deprivation (NZDep5-6) show the highest relative direct exposure (4.2% of all those living in NZDep5-6 areas are exposed), while areas of high deprivation (NZDep9-10) show lower relative exposure at 1.4%. However, isolation effects present a more significant challenge, with up to 39.2% of residents in NZDep7-8 areas isolated, 31% of

Table 17-5. The length/number of each infrastructure exposed to landslides in Wairoa.

Built infrastructure	Length/number Exposed
Residential Buildings	52 (1.6%)
Commercial Buildings	0
Industrial Buildings	63 (10%)
Roads	61.3 km (3.3%)
State Highway	3.5 km (2%)
Potable Water (PW) Pipes	0.4km (0.3%)
Stormwater (SW) Pipes	<1km (~0%)
Wastewater (WW) Pipes	0.1 km (0.2%)

residents in NZDep5-6 areas isolated, and 22% in NZDep9-10 areas affected by isolation.

Of the 162 residents living in property directly exposed to landslides, 54% identify as European, 54% as Māori, and 4% as Pacific peoples. The isolation risk affects a much larger population of 2,293 people, comprising 1,409 Māori, 1,246 European, and 83 Pacific peoples.

The district's older population has similar risk of exposure and isolation to the general population, with 1.7% of those aged 65 and older directly exposed and 25.6% potentially isolated. As a proportion of all those exposed to flooding, 17.7% are aged 65 or older, while 18.3% of those at risk of isolation are aged 65+.

Economic Impacts

Economic impacts demonstrate clear links between direct exposure and indirect isolation effects (Figure A - 59; Figure A - 60). There are no commercial buildings known to be exposed to landslides, but there are 10% of the industrial buildings. However, businesses contributing to 38% of the region's annual GDP face potential isolation risks. The sectors most exposed to isolation risks include:

- agriculture, forestry and fishing (81.6% of sector GDP at risk)
- mining operations (74.9% of sector GDP at risk)
- rental, hiring and real estate services (50.1% of sector GDP at risk)
- electricity, gas, water and waste services (45.0% of sector GDP at risk).

These findings highlight that while direct exposure to landslides affects a relatively small portion of Wairoa's population and infrastructure, the potential of cascading isolation risk (and the economic impacts associated with this risk) is substantial. The concentration of isolation risk in the agricultural and primary industry sectors is particularly significant given their importance to the local economy. The extensive potential for access disruption suggests that resilience planning for the district should focus on maintaining critical access routes and developing contingency plans for isolated communities and businesses.

These findings about isolation risk are particularly significant given Wairoa's recent experience during Cyclone Gabrielle in February 2023, when the town was completely cut off after the destruction of the Waikare Gorge Bridge and multiple slips along State Highway 2 [84] This event demonstrated the vulnerability identified in the analysis - while direct damage from hazards may be manageable, isolation through infrastructure disruption can create significant challenges for the community.

The high proportion of businesses potentially affected by isolation (particularly in the agricultural sector, at 81.6%) and the substantial portion of residents who could be cut off (up to 39.2% in some areas) suggests that strengthening network resilience and developing robust access contingency plans is of critical importance for the district to reduce these risks.

Risks from climatic (temperature and seasonal) change

Climate projections for Wairoa District (Appendix A3) indicate significant changes that will affect infrastructure, communities, and economic activities across the district.

By 2081-2100, under a high emissions scenario (SSP3-7.0), the Wairoa District can expect temperature increases of 3.1°C coupled with more hot days (increasing from 16.6 to 55.4 days above 25°C) and changes in annual rainfall patterns annually are expected. The sections below outline the expected impacts of these projected changes.

Infrastructure Impacts

- Increased stress on road surfaces and bridge structures from thermal expansion, particularly significant given Wairoa's reliance on key transport routes.
- Higher cooling demands on electrical infrastructure and telecommunications equipment, critical for maintaining connectivity given the district's recent experience with isolation during extreme events.

- Accelerated deterioration of building materials and increased maintenance requirements.
- Greater pressure on water infrastructure due to increased demand during hot periods, with PED increasing by 91.0mm annually.

Community Impacts

- Health risks from extreme heat, particularly concerning with very hot days (>30°C) increasing from 1.1 to 8.1 days annually.
- Reduced winter heating needs (frost days decreasing by 13.4 days) but increased summer cooling requirements.
- Growing water security concerns with significant seasonal rainfall changes (winter rainfall decreasing by 14.2% while summer rainfall increases slightly by 2.7%).
- Disproportionate impacts on vulnerable populations, particularly low socio-economic and rural communities due to Wairoa's high deprivation levels and dispersed rural communities.
- Existing social inequities may be increased as levels of service are eroded by repeat events.
- Increased risk of isolation events due to transport network and infrastructure disruption. Increased frequency of periods of isolation will likely reduce the desirability of the district as a place to live or operate a business. This may also create risks for social cohesion.
- Failure to address risk of isolation leading to the erosion of services will generate risks of loss of trust in government.
- Risk to mental health due to isolation or ongoing damage to homes and social infrastructure, as well as loss of valued land, taonga, environmental degradation and changes in access to mahinga kai.
- In areas affected by repeat flood events or frequent coastal flooding, risks to community/social cohesion may arise.

Economic Impacts

- Agriculture and forestry, the district's primary economic drivers, face significant changes:
  - longer growing seasons (growing degree days increasing by 916.2 units)
  - increased water stress from higher PED and reduced winter rainfall
  - changed pest and disease pressures affecting both agriculture and forestry
  - potential impacts on forestry harvest and planting schedules from seasonal rainfall changes.
- Tourism and space industry operations at Mahia may face disruption from extreme weather events and changing wind patterns.
- Construction and outdoor work will need to adapt to more very hot days and changed seasonal rainfall patterns.
- Increased cooling costs for commercial and industrial operations.
- Transport and logistics face greater disruption risk, particularly significant given Wairoa's reliance on key transport routes.

Changes in the climate will interact with and potentially amplify the flood and landslide risks described in this district-level assessment. For example, while total annual rainfall is projected to decrease by 7.4%, the increase in summer rainfall intensity combined with drier winters could increase both flood and landslide risks. This is particularly significant given Wairoa's recent experience with extreme events and isolation, suggesting a need for integrated adaptation strategies for sectors and communities that consider both gradual climate changes and extreme event impacts.

Refer to the Appendix A3 for detailed climate projections for the Wairoa District.

Key findings for the Wairoa District

- **River and rainfall flooding is the most severe hazard**, affecting residential properties and the manufacturing sector.
- **High risk of business isolation during landslide events**, particularly for primary industries and mining operations.
- **Three waters infrastructure** (including pipes and components such as pump stations) **is significantly exposed to river and rainfall flooding**.
- **Increasing risk of economic shocks and disruption from seasonal variability**, and significant seasonal rainfall changes affecting primary industries.
- **High population vulnerability to hazard impacts** and cascading risks due to low-income levels, dispersed population and isolation exposure. Significant number of residents exposed to more than 10cm of river and rainfall flooding. High proportion of residents exposed to more than 10cm of coastal flooding (by 2130 SSP5-8.5) are living in areas of high deprivation (NZDep9-10).
- **Limited natural hazards modelling** makes climate change adaptation planning challenging.

18 Next Steps and Opportunities For Further Action

This first pass risk assessment provides a snapshot of climate change risk based on available and accessible information at the time of writing. It is a foundational piece for understanding vulnerability and risks posed by a changing climate for the Hawke's Bay region, while highlighting opportunities for further work.

This section outlines potential next steps for councils and communities to build on the findings of this assessment and take action to address the risks and impacts of climate change. In line with best practice, ongoing engagement with communities, iwi/hapū and other stakeholders is necessary to ensure adaptation planning reflects local values, priorities and knowledge.

In particular, ongoing collaboration between lifeline providers, infrastructure/asset management planners and councils is important for establishing a single, shared data and evidence base for all stakeholders working to adapt to a changing climate. This unified approach is important to eliminate siloed information systems and enable more effective decision-making across local government, private sector entities and by communities.

The following section outlines opportunities at regional and local levels to build on this assessment.



Regionally-led action

Regionally-led action will require sustained investment in both technical understanding and collaboration/relationship building. Four key areas of opportunity have been identified below.

1. Regional Data and Evidence

Development of consistent climate-related hazard modelling across districts will assist in improving the evidence base for adaptation planning, and future climate change risk assessments. Through this work there are opportunities to establish regional data standards, consistent with any relevant central government direction. Other opportunities include data sharing agreements and shared platforms for understanding risk, including co-funding opportunities between public and private sector partners. Future regional climate change risk assessments would benefit from additional data and information inputs that were limited or unavailable for this first pass assessment. This includes:

Hazard modelling

- comprehensive flood modelling (fluvial and pluvial) across all districts, under different climate scenarios and timeframes
- detailed coastal flooding and erosion assessments for Wairoa and Central Hawke's Bay
- additional stormwater system capacity analysis for urban areas
- groundwater modelling for Wairoa, Central Hawke's Bay and Hastings.

Other climate risk information

- asset and infrastructure vulnerability characteristics
- climate impacts on agricultural and horticultural productivity
- economic implications for key primary sectors
- regional ecosystem climate scenario modelling for terrestrial, freshwater, and marine species and habitats
- emerging biosecurity risks to regional production.

This expanded evidence base would enable transition from exposure-based risk assessment to detailed vulnerability analysis, supporting more effective adaptation planning across the region.

2. Supporting Infrastructure Resilience

Further work to inform critical lifelines risk and resilience planning will strengthen future risk assessments. An updated lifeline vulnerability assessment is currently underway by the Hawke's Bay Lifelines Group, examining interdependencies between electricity networks, communication systems, and transport hubs.

3. Supporting Māori-Led Adaptation

The findings of this assessment can be used to support Māori climate adaptation and resilience kaupapa across the region. Weaving together mātauranga Māori with this, and other technical assessments, can strengthen understanding of climate risks and support Māori-led (iwi, hapū, marae) action to reduce risks and seize opportunities from a changing climate.

4. Climate Risk Integration

This assessment can be used as a basis for councils and other organisations to embed climate risk considerations into daily operations and long-term strategies and decisions. There are opportunities to ensure this occurs in a consistent way across the region and at different levels of decision-making, such as through the development of regional guidelines and standards, monitoring and reporting, and ongoing investment into data sharing and collaborative capability building initiatives.

Locally-led action

This assessment provides each district with a baseline understanding of their climate risks within the regional context. **Hawke's Bay councils have an opportunity to deepen this understanding through further local assessment and engagement with communities.** Work programmes led by councils around the country may provide insights and learnings on approaches to progress this work.

- Local assessments could, for example, examine specific vulnerabilities of council infrastructure, facilities, or priority areas. Where regional or local hazard data isn't yet available, councils could consider targeted assessments of their highest identified 'at risk' areas.
- Community engagement could focus on defining local adaptation priorities and risk tolerances. This work needs to align with existing council planning processes while creating space for communities, including iwi and hapū to lead place-based adaptation responses.
- Community groups and sectors can also use the information in this assessment to inform localised/targeted community or sector-led adaptation planning, such as the development of adaptation plans and strategies.

Using this risk assessment as the foundation for future more targeted and localised work will enable coordinated regional action while empowering locally-led adaptation. Both sustained regional leadership combined with dedicated resources within each council is critical to driving adaptation action needed to reduce the broad range of climate risks identified in this assessment.

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AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI KI TE MATAU-A-MĀUI | HAWKE'S BAY REGIONAL CLIMATE CHANGE RISK ASSESSMENT

05

Ngā Āpitihanga
Appendices

URBAN INTELLIGENCE

A1. Method

1.1 Risk Assessment Framework

Risk arises when there are possible outcomes that are uncertain related to something of value - that is, risk is the potential for and severity of consequences that are uncertain. In climate adaptation planning, consequences occur when a system, person, or element is both vulnerable and exposed to a hazard or environmental change (Figure A - 1).

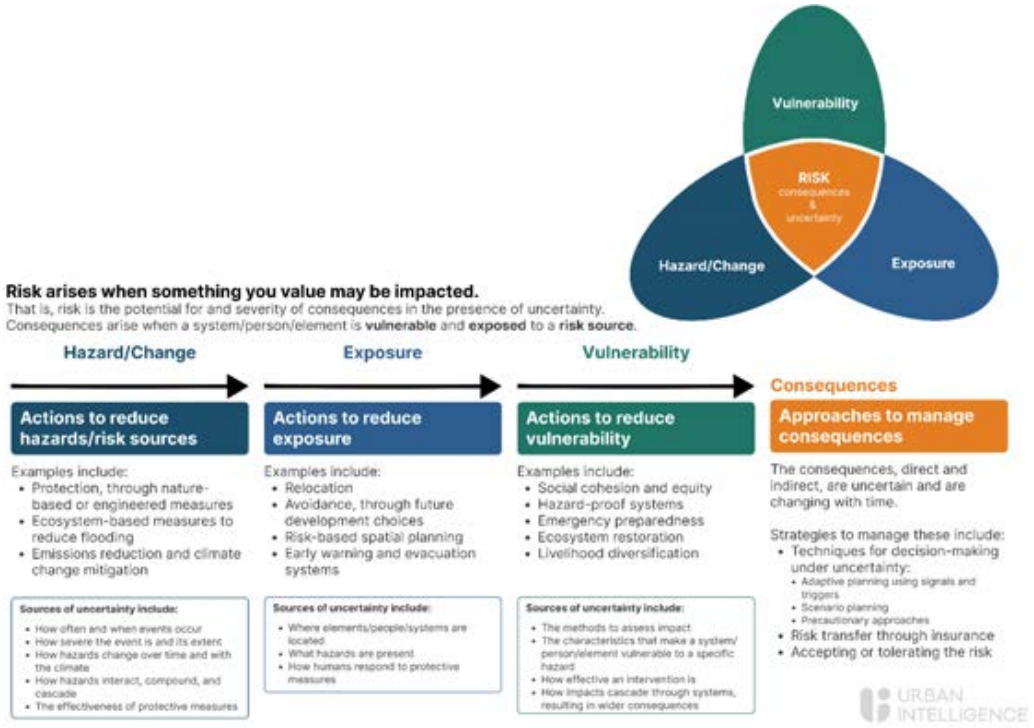


Figure A - 1. Risk arises when something you value could be impacted. That is, it's the combination of consequences and uncertainty. In a natural hazards and climate change context, consequences arise when something that is vulnerable is exposed to a hazard or change. Risk can be reduced by intervening at each of these stages or it can be accepted or managed.

This assessment examines risks across six interconnected value domains aligned with the Ministry for the Environment guidance:

- Te Taiao (Natural Environment): Indigenous species, he kura taiao, and terrestrial, freshwater and marine ecosystems
- Taiao Hanga (Built Environment): Physical infrastructure, transport networks, and buildings
- Pāpori (Human): Social systems, cultural values, and community wellbeing
- Ohaoha (Economic): Production, distribution, and economic activities
- Mana Whakahaere (Governance): Institutional frameworks and decision-making processes
- Iwi/Māori Domain: The whānau, hapū, and iwi networks; Māori businesses and economic assets; and taonga (inherited treasures), including whenua, wai, and ecosystems, central to Māori identity, well-being, and kaitiakitanga.

Understanding cascading impacts is critical - risks often flow between domains creating compound effects. For example, a flooded road (Built Environment) may isolate communities (Human), disrupt business operations (Economic), and stress emergency response systems (Governance). Within these six domains, risk is considered across three primary risk components:

- Direct Exposure: physical presence in hazard areas
- Indirect Effects: disruption to critical services and networks
- Cascading Impacts: flow-on consequences between domains

This framework enables systematic analysis of both immediate physical risks and the broader social, cultural and economic implications of climate change. It supports identification of both vulnerabilities and opportunities for building resilience through coordinated action across domains.

1.2 Quantitative Assessment

The quantitative analysis used in this assessment examines both direct exposure to hazards and indirect impacts that cascade through communities (See Table A 0.1). The methodology uses spatial analysis and dasymetric mapping techniques to understand risk at multiple scales.

Direct Exposure Analysis: The assessment identifies exposed elements by intersecting hazard extents with asset locations. For flood hazards, exposure depths exceeding 10cm are considered within this assessment. Building footprints are intersected with hazard extents and aggregated to property titles, with properties then categorised as residential or commercial/industrial (including agricultural and horticultural) using council land use data. This provides the foundation for understanding physical exposure across the region.

Population Impact Analysis: To understand community exposure, the assessment uses dasymetric mapping to distribute 2023 Statistical Area 1 (SA1) census data across individual properties. This enables the estimation of exposed populations within hazard areas while maintaining privacy. Social vulnerability is assessed using the NZ Deprivation Index, providing an evaluation into which communities may have reduced adaptive capacity. This analysis helps identify areas where targeted support may be needed.

First-Pass Economic Impact Analysis: The economic assessment allocates 2023 business demography data to individual properties and calculates exposure by industry sector using the ANZSIC06 classification. Regional GDP contributions are estimated using Infometrics data to understand potential economic disruption. This provides an initial view of business exposure, though detailed business continuity impacts would require site-specific assessment.

Cascading Impact Analysis: Network analysis examines how hazard impacts may cascade through infrastructure systems. The assessment identifies properties at risk of losing access to critical services like schools, hospitals, and fire stations. Areas vulnerable to transport network disruption are mapped to understand potential isolation risks. This helps identify communities where coordinated planning may be needed to maintain critical services during hazard events.

1.3 Workshops & Literature Review

The quantitative analysis was supported by structured engagement with technical experts and review of existing research to provide context and validate findings.

Domain-Specific Workshops: Two region-wide workshops were held in Hawke's Bay during November 2024, bringing together technical experts and practitioners across relevant disciplines. Participants included representatives from local and regional councils, CDEM Group and the Hawke's Bay Lifelines Group. The workshops focused on understanding hazard impacts and identifying potential cascading effects between domains. This localised technical knowledge helped validate the quantitative analysis and identify both data sources and opportunities for further investigation.

Technical Advisory Group: A Technical Advisory Group consisting of council staff provided ongoing guidance throughout the assessment process. The group reviewed methodologies, validated findings, and ensured the assessment aligned with regional priorities. Their expertise helped integrate local knowledge and expertise into the risk assessment framework, ensuring the analysis reflected both technical, local, and cultural understanding of risk.

Literature Review: The assessment builds on existing research and regional strategies, drawing from MfE guidance, regional biodiversity plans, infrastructure studies, and previous hazard assessments. This foundation of existing work was enhanced through the examination of social impact studies and climate change projections specific to Hawke's Bay.

The combination of technical analysis, local knowledge, and existing research provides a robust evidence base for adaptation planning. This structured engagement process ensured the assessment captured both measurable impacts and local perspectives, creating a more complete understanding of climate risk across the region.

Table A .0 1 Data Used In Quantitative Assessment

Layer	Creator	Coverage	Date
Coastal Flooding	NIWA	New Zealand	2023
Pluvial Flooding Depth	Stantec [85]	Ōtane	2019
Pluvial Flooding Depth	Stantec [86]	Waipawa	2023
Pluvial Flooding Depth	WSP [87], [88]	Waipukurau	2022
Pluvial Flooding Depth	Hastings District Council (HDC Stormwater Model Results-uncalibrated)	Clive, Flaxmere, Hastings and Havelock North	2024
Pluvial Flooding Depth	Hawke's Bay Regional Council	Wairoa	2007
Pluvial Flooding Depth	Napier City Council [89]	Napier	2024
Landslide Susceptibility	Manaaki Whenua	Te Matau-a-Māui Hawke's Bay	2023

Layer	Creator	Coverage	Date
Climate Projections	NIWA	Zone Three	2024
Marae	Te Puni Kōkiri	Aotearoa New Zealand	2024
LINZ Building Outlines	Toitū Te Whenua Land Information New Zealand	Aotearoa New Zealand	2024
LINZ Unit of Property	Toitū Te Whenua Land Information New Zealand	Aotearoa New Zealand	2024
Road Centrelines	Toitū Te Whenua Land Information New Zealand	Aotearoa New Zealand	2024
State Highways	Waka Kotahi	Aotearoa New Zealand	2024
Potable Water, Stormwater and Wastewater Infrastructure	Local Councils	Local Councils	
Economic Data	HBREDA	Hawke's Bay Region	2023
Population Data	Stats NZ	Aotearoa New Zealand	2023
NZ Deprivation Index	EHINZ	Aotearoa New Zealand	2023

A2. Resilience Explorer®

Adaptation planning is inherently local and requires robust, area-specific risk evidence. Spatial information is essential for identifying, prioritising, and communicating adaptation needs across different communities and hazard types. While this report presents a point-in-time snapshot of regional risks, it cannot capture the full detail needed for day-to-day local decision-making.

To support this, the Resilience Explorer® (REx) platform was used to conduct the quantitative analysis underpinning this assessment. REx is a sophisticated web-based tool designed for internal use by councils and organisations. It enables consistent, scalable, and repeatable risk assessments across hazards, assets, and communities, and supports exploration of both direct and indirect impacts—including isolation risks from infrastructure disruption.

The Resilience Explorer automates complex geospatial analysis and risk modelling. New hazard layers can be uploaded and automatically assessed for consequences across key domains such as infrastructure, economy, and social vulnerability. The platform is designed to evolve as new data becomes available, ensuring users stay up to date with emerging risks and can efficiently integrate new modelling and scenarios.

Beyond assessment, REx is a decision support and operational tool. It helps staff explore detailed, location-specific risk information, supporting adaptation planning, infrastructure investment, and strategic decision-making across council work programmes.

Should they wish, councils and organisations in Hawke's Bay can access the Resilience Explorer as an internal tool, with functions including:

- Spatial Analysis: view and analyse exposure of assets and infrastructure to climate hazards across different scenarios and timeframes, enabling examination of risks at both regional and local scales
- Location-Specific Information: generate detailed risk information for specific areas of interest, helping inform place-based planning and decision-making
- Vulnerability Assessment: overlay hazard information with social and demographic data to better understand community vulnerability and support equitable adaptation planning
- Current Evidence Base: access regularly updated hazard and asset information, ensuring decisions are based on the most recent available data
- Adaptation Support: identify priority areas for adaptation planning and evaluate potential interventions using consistent regional evidence
- Community and Stakeholder Engagement: support discussions with communities through clear visual representations of local climate risks and adaptation considerations.

A3. Detailed Climate and Hazard Projections

3.1 Regional

Table A. 1. Projected Coastal Conditions for Hawke's Bay Region [42], [43]. Projections are relative to a 1995-2014 'baseline' (where 2005 is considered the mid-point (zero).

Hazard	2040	2090
Sea Level Rise	0.24m (SSP2-4.5)	0.55m (SSP2-4.5)
	0.28m (SSP5-8.5)	0.79m (SSP5-8.5)
Coastal Erosion	Land subsidence will exacerbate the effects of SLR; Highly variable erosion, depends on geology, tidal range, geomorphology and exposure; Areas with small tidal range more sensitive to erosion than large tidal range	

Table A. 2. Projected Hydrological Conditions for the Hawke's Bay [43]. Projections are relative to a 198-2005 'baseline'.

Hazard	2040	2090
Rainfall	Minimal change in annual rainfall with most change seen at seasonal scale (SSP2-4.5 and SSP5-8.5)	Localised 5% decrease in annual rainfall seasonally for Napier (SSP2-4.5) with regional annual rainfall decrease of 5%-15% (SSP5-8.5).
Dry Days (<1mm rainfall)	5-8 more dry days annually under both (SSP2-4.5 and SSP5-8.5)	5-15 more dry days annually (SSP2-4.5); 10-20 more dry days annually, probability of drought up 50-70% with low river thresholds reached earlier, and decrease of ~5% in relative humidity (SSP5-8.5)
Increased Storminess and Extreme Winds	Extreme wind speeds increase up to 10% with intensity of ex-tropical cyclones projected to increase (SSP2-4.5) and the most severe ex-tropical cyclones expected to be stronger (SSP5-8.5)	Extreme wind events expected to increase by 10% with increased frequency in winter and decreased frequency in summer (SSP2-4.5); most severe ex-tropical cyclones expected to be stronger (SSP5-8.5)

Table A. 3. Projected Climatic Conditions for Hawke's Bay (Zone 3) [43]. Projections are relative to a 1986-2005 'baseline'.

Hazard	2040	2090
Temperature	Increase in annual average temperature of 0.7-0.9°C (SSP2-4.5)	Increase in annual average temperature of 1.3-1.4°C (SSP2-4.5)
	Increase in annual average temperature of 0.8-1.1°C (SSP5-8.5)	2.8-3.1°C increase in annual temperature (SSP5-8.5)
Hot Days (>25°C)	5-15 more hot days annually (SSP2-4.5)	5-25 more hot days annually (SSP2-4.5)
	5-25 more hot days annually (SSP5-8.5)	30-40 more hot days annually (SSP5-8.5)
Frost Days (<0°C)	10-25 fewer frost days annually (SSP2-4.5)	10-25 fewer frost days (SSP2-4.5)
	10-25 fewer frost days (SSP5-8.5)	25-50 fewer frost days (SSP5-8.5)
Wildfire	Increased risk with 0-400% increase in days with very high and extreme fire danger (SSP2-4.5)	Increased risk with 0-400% increase in days with very high and extreme fire danger 0-700% (SSP2-4.5)
	Increased fire risk with seasonal severity of an additional 30%-50% (SSP5-8.5)	Increase in days with very high and extreme fire danger of 44-48 more days (SSP5-8.5)
Wind	Up to 10% increase in extreme wind and intensity of ex-tropical cyclones projected to increase (SSP2-4.5)	Poleward shift of midlatitude and possible small reduction in frequency, with most severe ex-tropical cyclones expected to be stronger (SSP2-4.5)
	Frequency of extreme winds is likely to increase in winter and decrease in summer with mean westerly flow of wind to increase 20% in spring and 70% in winter and decrease 20% in summer and autumn (SSP5-8.5)	The most severe ex-tropical cyclones are expected to be stronger, with conditions conducive to storm development projected to increase by 3-6% (SSP5-8.5)
Marine Temperature	1.1°C increase in sea surface temperatures (SSP2-4.5)	1.3°C increase in sea surface temperatures (SSP2-4.5)
	1.5°C increase in sea surface temperatures (SSP5-8.5)	3.3°C increase in sea surface temperatures (SSP5-8.5)
Ocean Acidification	pH decrease to 7.98 with no significant decrease in surface macronutrient concentrations (SSP2-4.5)	pH decrease to 7.98 with significant decrease of surface macronutrient concentrations, net primary production to decrease by 1.2% (SSP2-4.5)
	pH to decrease to 7.93 with no significant decrease in surface macronutrient concentrations and net primary production (SSP5-8.5)	pH decrease to 7.77 with 7.5-20% decrease in macronutrients and 4.5% decrease in primary production (SSP5-8.5)
Hail	Although storm intensity is expected to increase, there is limited understanding of changes to hail	

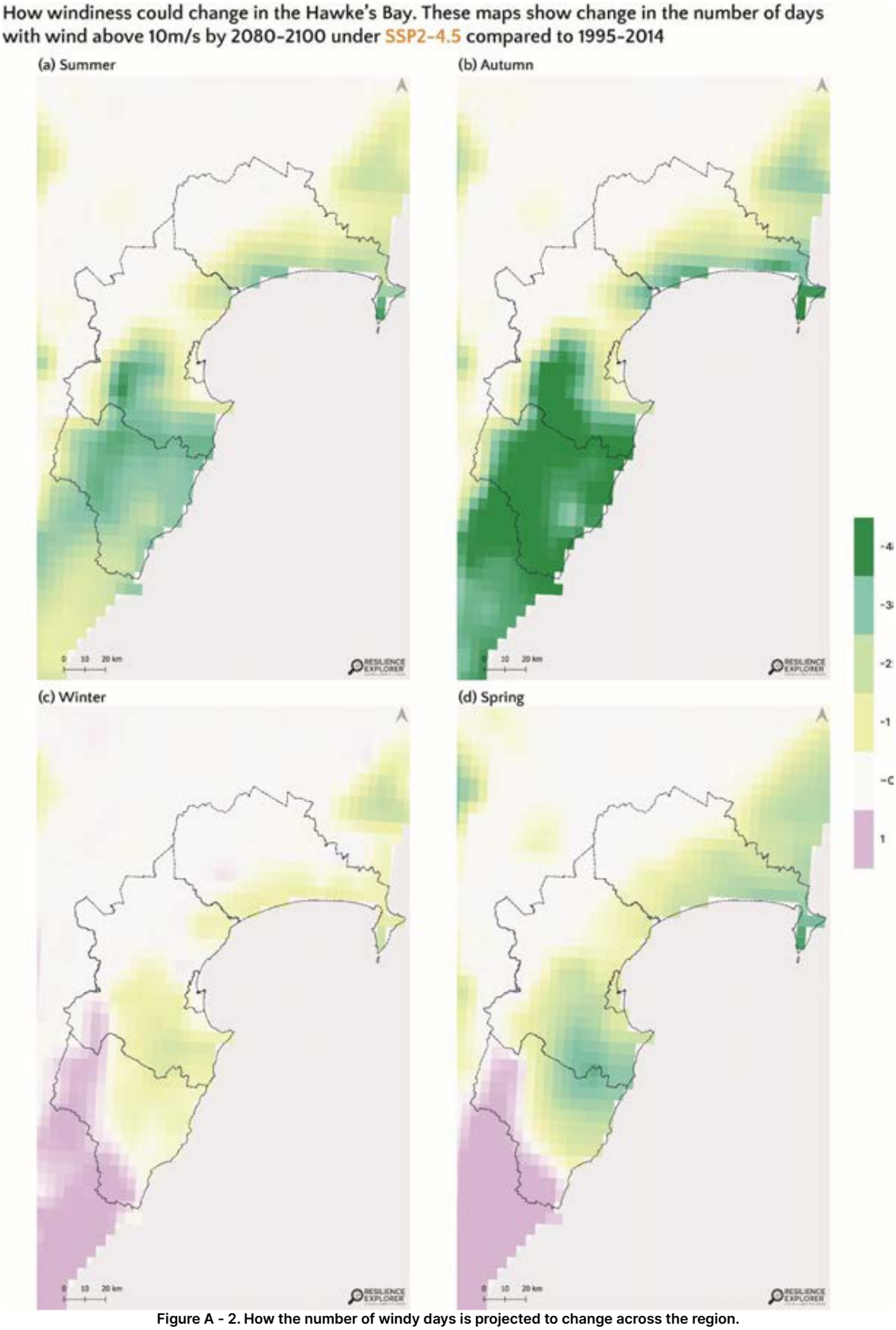


Figure A - 2. How the number of windy days is projected to change across the region.

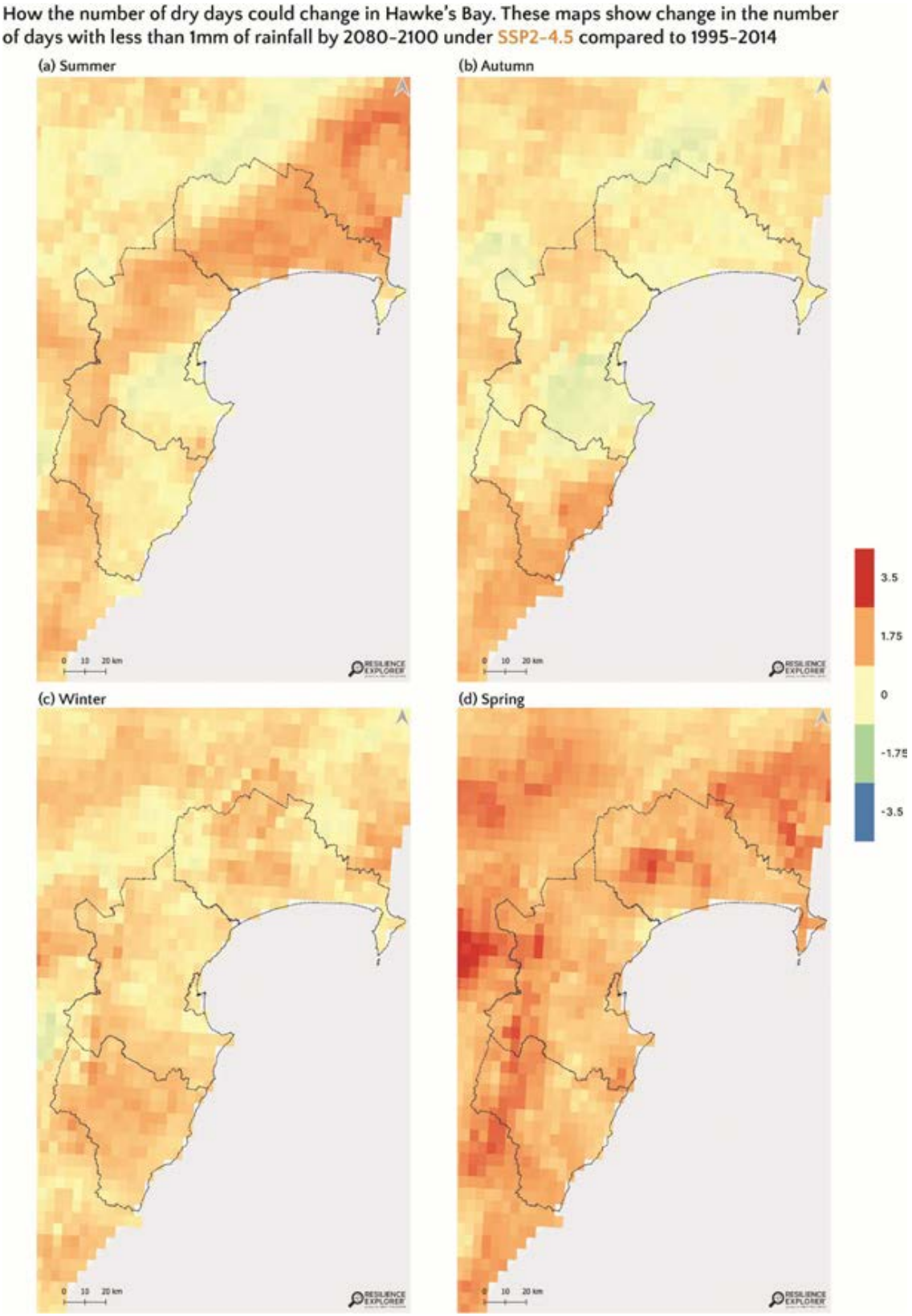


Figure A - 3. How the number of dry days (with less than 1mm of rainfall) is projected to change across the region (seasonally).

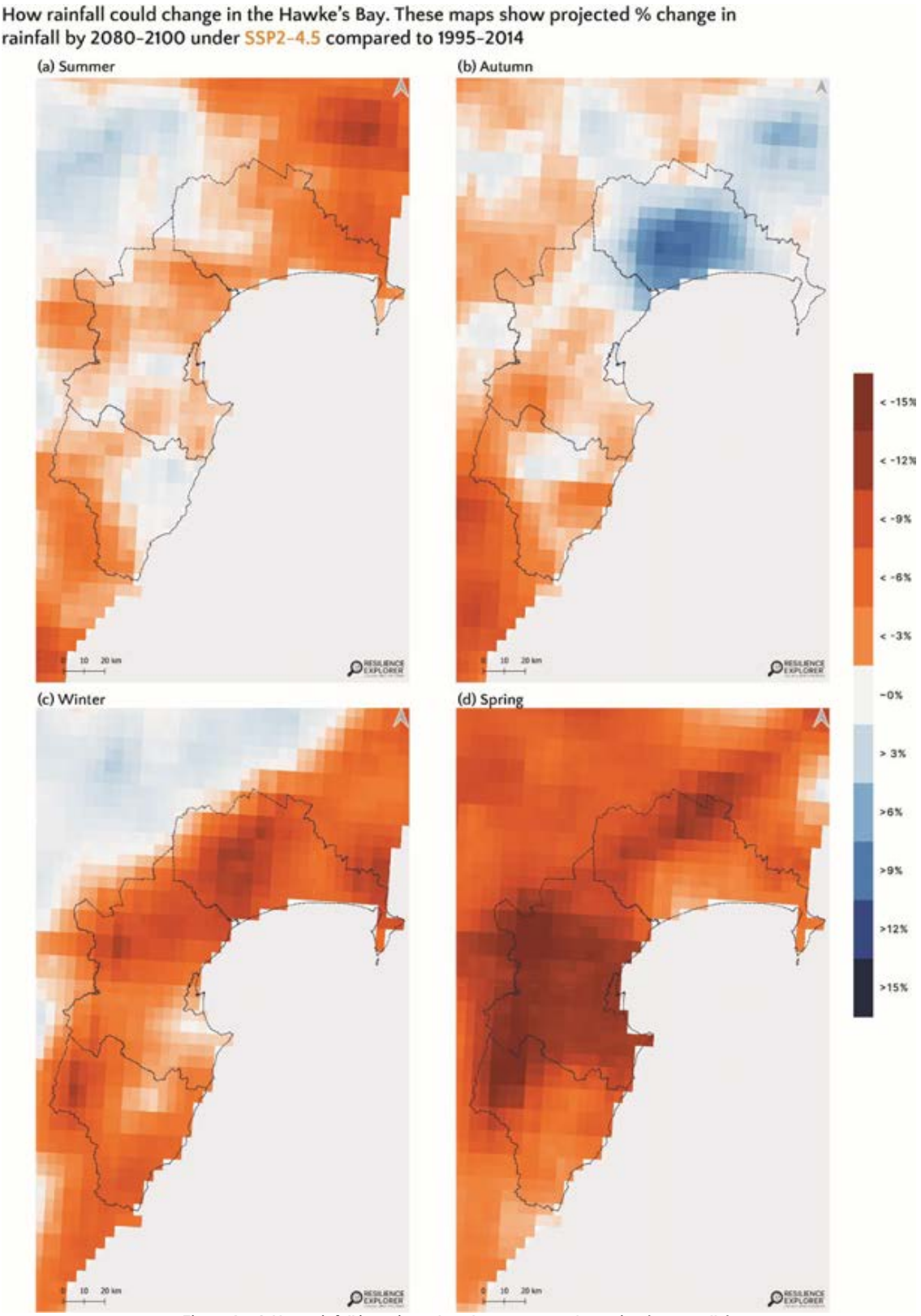


Figure A - 4. How rainfall is projected to change across the region (seasonally).

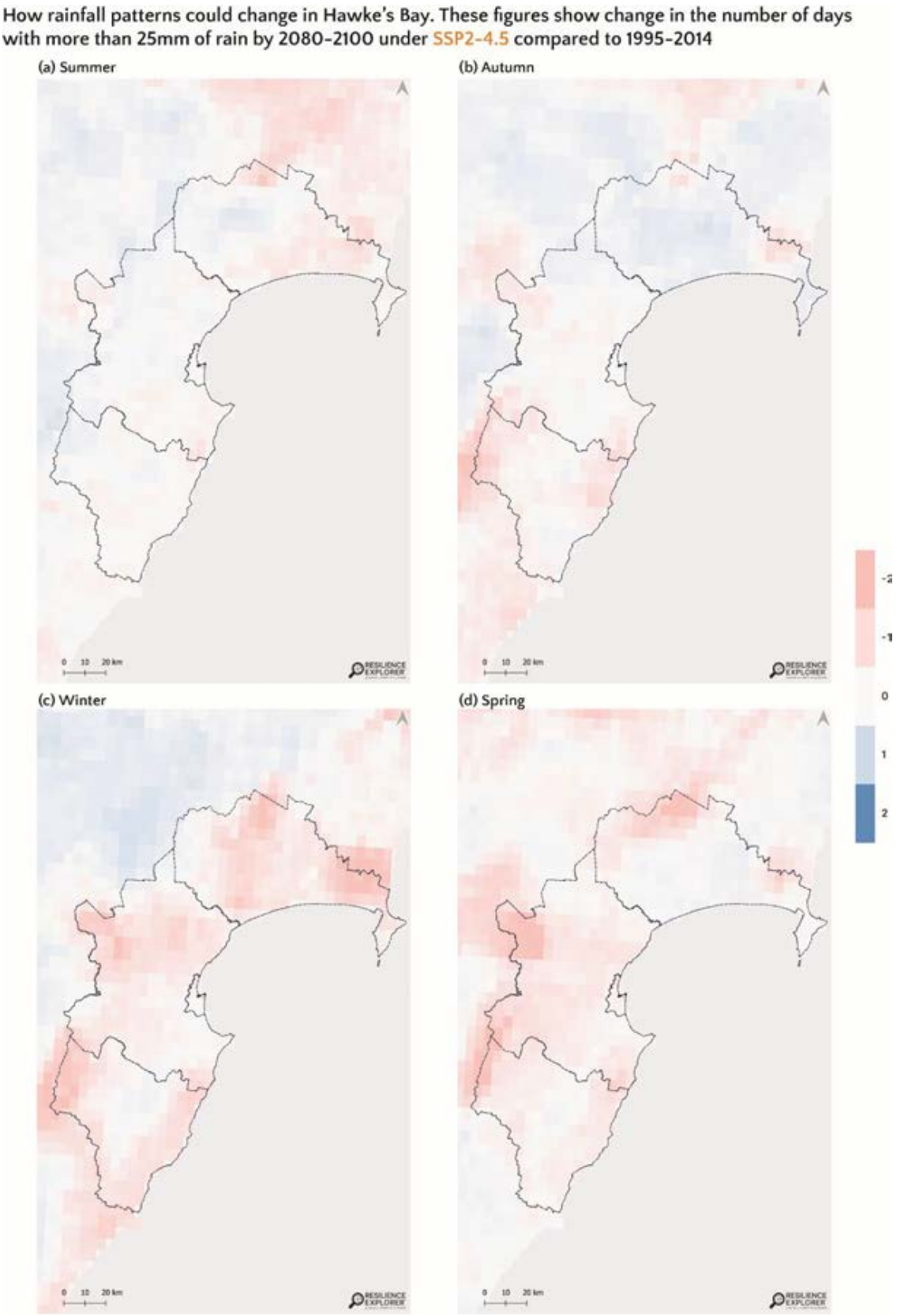


Figure A - 5. How the number of rainy days is projected to change across the region (seasonally).

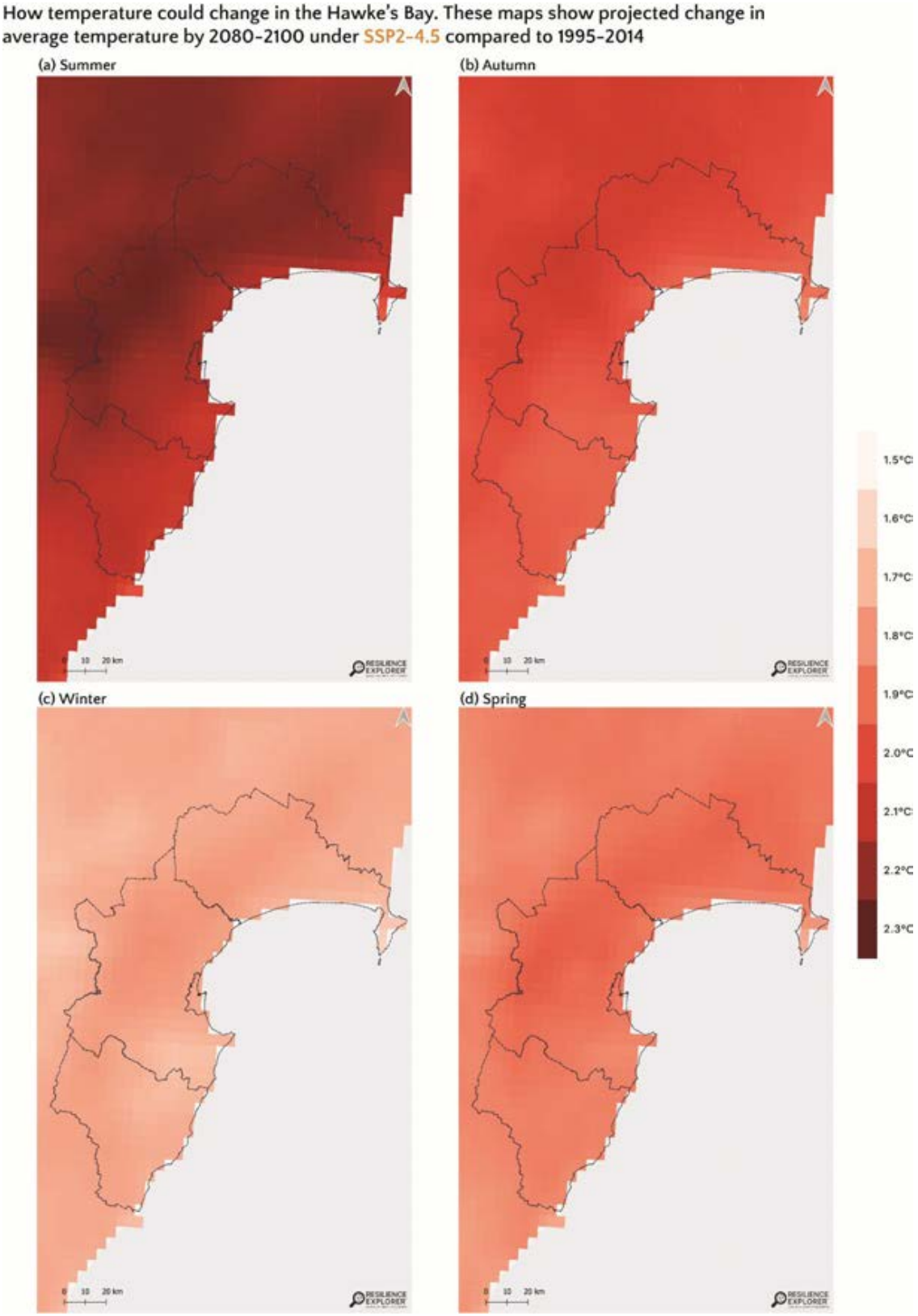


Figure A - 6. How temperature is projected to change across the region.

3.2 Central Hawke's Bay

Table A. 4. Climate projections for Central Hawke's Bay District (2041-2060 and 2081-2100). The table shows average (min, max) change values for selected climate variables using downscaled AR6 climate data [44]. Projections are relative to a 1995-2014 'baseline'.

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Average daily air temperature: Tmean (°C)				
Annual	1.1 (1.1, 1.2)	2.0 (2.0, 2.1)	1.4 (1.3, 1.4)	3.0 (2.9, 3.1)
Summer	1.3 (1.2, 1.4)	2.3 (2.2, 2.4)	1.7 (1.6, 1.8)	3.5 (3.4, 3.7)
Autumn	1.2 (1.1, 1.3)	2.1 (2.0, 2.1)	1.3 (1.3, 1.4)	3.0 (3.0, 3.1)
Winter	0.9 (0.9, 1.0)	1.8 (1.7, 1.8)	1.2 (1.2, 1.2)	2.7 (2.5, 2.7)
Spring	1.1 (1.1, 1.1)	1.9 (1.9, 2.0)	1.4 (1.3, 1.4)	2.9 (2.8, 3.0)
Growing degree days (base 10°C) (GDDs)				
Annual	321.3 (150.9, 359.0)	577.4 (271.6, 647.0)	394.9 (191.5, 438.6)	899.0 (459.2, 995.2)
Number of dry days (<1mm) (days)				
Annual	1.0 (-2.8, 3.4)	4.0 (1.8, 6.6)	1.3 (-2.9, 5.5)	8.2 (4.4, 11.2)
Summer	-0.2 (-1.7, 1.0)	0.6 (0.1, 1.7)	0.1 (-0.7, 1.5)	0.5 (-0.3, 1.3)
Autumn	0.2 (-0.8, 1.0)	0.8 (-0.5, 2.2)	-0.1 (-1.1, 0.6)	1.6 (0.1, 2.6)
Winter	-0.2 (-1.7, 0.5)	1.1 (-0.1, 2.0)	-0.3 (-2.0, 0.6)	2.9 (2.1, 4.0)
Spring	1.1 (-0.4, 2.5)	1.5 (0.5, 2.6)	1.5 (-0.5, 3.2)	3.0 (1.3, 4.9)
Number of frost days (<0°C) (days)				
Annual	-7.1 (-21.8, -1.8)	-11.1 (-38.1, -2.3)	-8.2 (-25.5, -1.9)	-13.9 (-49.7, -2.6)
Summer	-0.0 (-1.7, 0.0)	-0.1 (-2.4, 0.0)	-0.0 (-1.8, 0.0)	-0.1 (-2.9, 0.0)
Autumn	-1.3 (-6.4, -0.1)	-1.8 (-8.7, -0.2)	-1.2 (-6.0, -0.1)	-2.1 (-11.6, -0.2)
Winter	-4.8 (-8.3, -1.6)	-7.6 (-16.1, -1.9)	-5.6 (-10.6, -1.6)	-9.8 (-21.4, -2.1)
Spring	-1.0 (-5.5, -0.1)	-1.7 (-10.9, -0.2)	-1.3 (-7.1, -0.1)	-2.0 (-13.9, -0.2)
Number of hot days (>25°C) (days)				
Annual	18.6 (0.1, 22.8)	35.5 (0.4, 44.0)	25.2 (0.2, 31.5)	56.5 (2.6, 67.1)
Summer	12.5 (0.1, 14.9)	22.6 (0.4, 25.4)	17.0 (0.2, 19.6)	33.9 (2.4, 39.7)
Autumn	3.9 (0.0, 5.6)	8.6 (0.0, 11.7)	5.1 (0.0, 7.2)	13.4 (0.1, 18.1)
Winter	0.0 (0.0, 0.0)	0.0 (0.0, 0.1)	0.0 (0.0, 0.0)	0.0 (0.0, 0.1)

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Spring	1.9 (0.0, 4.0)	4.4 (0.0, 8.4)	3.0 (0.0, 5.8)	8.9 (0.0, 15.5)
Number of very hot days (>30°C) (days)				
Annual	2.3 (-0.0, 4.5)	5.2 (0.0, 9.8)	2.7 (0.0, 5.8)	12.2 (0.0, 20.3)
Summer	2.0 (-0.0, 4.0)	4.5 (0.0, 8.3)	2.4 (0.0, 5.1)	10.3 (0.0, 16.9)
Autumn	0.2 (0.0, 0.4)	0.6 (0.0, 1.2)	0.2 (0.0, 0.6)	1.4 (0.0, 2.6)
Winter	0	0	0	0
Spring	0.1 (0.0, 0.2)	0.1 (0.0, 0.5)	0.0 (-0.0, 0.3)	0.3 (0.0, 0.9)
Number of windy days (>10m/s) (days)				
Annual	-3.5 (-6.1, -0.1)	-7.0 (-11.7, -0.0)	-4.5 (-7.5, -0.5)	-12.0 (-18.8, -0.4)
Summer	-1.6 (-2.2, -0.0)	-2.6 (-3.5, -0.0)	-2.8 (-3.5, 0.0)	-4.9 (-6.1, -0.2)
Autumn	-2.0 (-2.8, -0.0)	-3.6 (-4.6, -0.0)	-2.4 (-3.2, 0.0)	-4.7 (-5.8, -0.1)
Winter	0.0 (-0.7, 1.2)	-0.0 (-1.3, 1.2)	0.9 (-0.1, 1.5)	-1.8 (-4.5, 0.5)
Spring	0.0 (-1.7, 1.7)	-0.7 (-3.3, 2.0)	-0.1 (-2.1, 2.2)	-0.6 (-3.6, 3.0)
Potential Evapotranspiration Deficit (PED) (mm)				
Annual	33.2 (7.0, 51.0)	68.8 (12.6, 96.8)	45.9 (9.0, 65.9)	94.2 (25.0, 139.0)
Total rainfall (%)				
Annual	-1.9 (-6.0, 1.9)	-5.2 (-9.5, -1.1)	-2.8 (-7.2, 0.2)	-6.5 (-12.4, -2.2)
Summer	3.9 (-2.6, 9.6)	-1.3 (-6.1, 2.9)	4.0 (-0.0, 8.9)	6.3 (0.3, 12.7)
Autumn	-0.2 (-4.9, 3.8)	-2.9 (-7.7, 2.0)	3.9 (-1.4, 7.6)	1.9 (-8.8, 8.7)
Winter	-2.2 (-5.2, 1.5)	-6.9 (-12.7, -1.2)	-3.9 (-9.7, 0.4)	-15.4 (-21.3, -11.5)
Spring	-6.8 (-12.9, -3.1)	-8.9 (-16.8, -3.9)	-13.2 (-20.8, -9.8)	-14.3 (-22.3, -9.4)

3.3 Hastings

Table A. 5. Climate projections for Hastings District (2041-2060 and 2081-2100). The table shows average (min, max) change values for selected climate variables using downscaled AR6 climate data [44]. Projections are relative to a 1995-2014 'baseline'.

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Average daily air temperature: Tmean (°C)				
Annual	1.2 (1.1, 1.2)	2.1 (2.0, 2.1)	1.4 (1.4, 1.5)	3.1 (2.9, 3.2)
Summer	1.4 (1.3, 1.5)	2.4 (2.2, 2.5)	1.8 (1.6, 1.9)	3.6 (3.4, 3.8)
Autumn	1.2 (1.2, 1.3)	2.1 (2.0, 2.2)	1.4 (1.3, 1.5)	3.1 (3.0, 3.2)
Winter	1.0 (0.9, 1.0)	1.8 (1.7, 1.9)	1.2 (1.1, 1.2)	2.7 (2.5, 2.8)
Spring	1.1 (1.1, 1.2)	2.0 (1.9, 2.1)	1.4 (1.3, 1.5)	3.0 (2.9, 3.1)
Growing degree days (base 10°C) (GDDs)				
Annual	316.5 (162.8, 371.3)	568.6 (298.5, 668.4)	393.7 (211.5, 461.6)	887.2 (498.3, 1021.9)
Number of dry days (<1mm) (days)				
Annual	1.0 (-2.8, 3.4)	3.1 (0.3, 6.3)	1.6 (-1.8, 5.0)	6.8 (3.3, 10.4)
Summer	0.1 (-1.4, 1.2)	0.8 (-0.5, 1.9)	0.4 (-0.7, 1.4)	0.5 (-0.7, 1.3)
Autumn	0.2 (-0.9, 1.2)	0.2 (-0.8, 1.1)	-0.2 (-1.1, 0.9)	0.8 (-0.2, 2.0)
Winter	-0.3 (-1.7, 0.8)	0.7 (-0.1, 1.9)	0.0 (-1.9, 1.4)	2.4 (1.3, 4.3)
Spring	0.9 (-0.2, 2.1)	1.4 (0.2, 3.0)	1.2 (-0.4, 3.8)	2.9 (1.4, 5.5)
Number of frost days (<0°C) (days)				
Annual	-8.4 (-20.5, -2.9)	-13.6 (-36.2, -4.0)	-9.9 (-23.8, -3.6)	-17.8 (-48.4, -4.8)
Summer	-0.1 (-1.4, 0.0)	-0.1 (-1.8, 0.0)	-0.1 (-1.4, 0.0)	-0.1 (-2.2, 0.0)
Autumn	-1.7 (-6.2, -0.2)	-2.3 (-8.7, -0.3)	-1.6 (-6.2, -0.2)	-2.7 (-10.7, -0.3)
Winter	-5.3 (-8.6, -2.5)	-8.8 (-16.5, -3.6)	-6.4 (-10.4, -3.1)	-11.9 (-22.2, -4.2)
Spring	-1.3 (-5.4, -0.2)	-2.4 (-10.6, -0.2)	-1.8 (-7.2, -0.2)	-3.1 (-14.4, -0.2)
Number of hot days (>25°C) (days)				
Annual	17.0 (0.3, 25.8)	33.8 (0.9, 49.7)	23.8 (0.4, 35.7)	55.1 (3.1, 74.7)
Summer	11.6 (0.3, 19.8)	21.7 (0.7, 33.1)	15.9 (0.4, 25.8)	33.8 (2.9, 48.4)
Autumn	3.2 (0.0, 6.5)	7.5 (0.0, 13.9)	4.5 (0.0, 8.6)	12.0 (0.1, 20.2)
Winter	0.0 (0.0, 0.0)	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.0, 0.3)

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Spring	2.1 (0.0, 5.4)	4.7 (0.0, 10.8)	3.2 (0.0, 7.7)	9.2 (0.1, 18.9)
Number of very hot days (>30°C) (days)				
Annual	1.9 (-0.0, 5.9)	4.6 (0.0, 12.7)	2.7 (0.0, 8.1)	10.4 (0.0, 24.7)
Summer	1.7 (-0.0, 5.0)	3.8 (0.0, 10.1)	2.3 (0.0, 6.5)	8.6 (0.0, 19.5)
Autumn	0.1 (0.0, 0.7)	0.5 (0.0, 2.0)	0.2 (-0.0, 1.0)	1.2 (0.0, 3.7)
Winter	0	0	0	0
Spring	0.1 (0.0, 0.3)	0.2 (0.0, 1.0)	0.1 (-0.0, 0.6)	0.5 (0.0, 1.9)
Number of windy days (>10m/s) (days)				
Annual	-2.1 (-6.3, 0.1)	-4.2 (-11.9, 0.0)	-2.7 (-7.3, 0.0)	-7.0 (-19.0, 0.1)
Summer	-0.8 (-2.7, 0.1)	-1.2 (-3.9, 0.0)	-1.1 (-3.6, 0.1)	-2.1 (-6.5, 0.0)
Autumn	-0.9 (-2.7, 0.2)	-1.6 (-4.6, 0.0)	-1.1 (-2.8, 0.0)	-2.1 (-5.8, 0.0)
Winter	-0.1 (-0.9, 0.6)	-0.4 (-1.6, 0.8)	0.4 (-0.0, 1.3)	-1.6 (-5.0, 0.3)
Spring	-0.4 (-1.7, 0.4)	-1.0 (-3.2, 0.1)	-0.8 (-2.0, 0.0)	-1.2 (-4.0, 0.1)
Potential Evapotranspiration Deficit (PED) (mm)				
Annual	40.4 (9.9, 63.1)	70.6 (21.2, 89.8)	57.9 (14.9, 84.9)	96.0 (29.6, 127.2)
Total rainfall (%)				
Annual	-3.0 (-5.7, 0.6)	-5.4 (-9.1, -2.4)	-5.4 (-9.6, -1.5)	-7.7 (-12.6, -2.9)
Summer	2.0 (-3.4, 8.1)	-1.9 (-5.4, 1.7)	0.7 (-3.6, 7.2)	6.9 (1.6, 11.3)
Autumn	-1.9 (-4.3, 3.1)	-1.2 (-6.2, 7.8)	3.2 (-3.6, 8.7)	-0.1 (-7.9, 6.5)
Winter	-3.2 (-6.9, -0.4)	-6.6 (-12.4, 0.1)	-8.8 (-11.3, -3.6)	-17.0 (-20.8, -11.2)
Spring	-7.8 (-13.9, -4.1)	-13.3 (-18.9, -7.8)	-14.9 (-21.7, -10.8)	-17.3 (-25.9, -10.7)

3.4 Napier

Table A. 6. Climate projections for Napier City (2041-2060 and 2081-2100). The table shows average (min, max) change values for selected climate variables using downscaled AR6 climate data [44]. Projections are relative to a 1995-2014 'baseline'.

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Average daily air temperature: Tmean (°C)				
Annual	1.1	2.0 (2.0, 2.0)	1.4	3.0 (3.0, 3.0)
Summer	1.3	2.3 (2.3, 2.3)	1.7 (1.7, 1.7)	3.5 (3.5, 3.5)
Autumn	1.2 (1.2, 1.2)	2.1 (2.1, 2.1)	1.4	3.1
Winter	1	1.8 (1.8, 1.8)	1.2 (1.2, 1.2)	2.7 (2.7, 2.7)
Spring	1.1 (1.1, 1.1)	2.0 (2.0, 2.0)	1.4	3.0 (2.9, 3.0)
Growing degree days (base 10°C) (GDDs)				
Annual	360.3 (358.5, 361.3)	657.3 (652.9, 660.2)	451.1 (448.9, 452.2)	998.0 (991.2, 1003.3)
Number of dry days (<1mm) (days)				
Annual	0.6 (0.1, 1.1)	1.7 (1.3, 1.9)	1.6 (1.1, 2.4)	5.6 (5.4, 5.8)
Summer	-0.2 (-0.5, 0.1)	0.1 (-0.1, 0.2)	-0.1 (-0.2, -0.0)	0.3 (0.1, 0.5)
Autumn	-0.3 (-0.6, -0.1)	-0.2 (-0.3, -0.0)	-0.6 (-0.9, -0.2)	0.7 (0.4, 0.9)
Winter	-0.5 (-0.8, -0.2)	0.5 (0.2, 0.7)	0.7 (0.4, 1.0)	2.0 (1.8, 2.1)
Spring	1.4 (1.1, 1.7)	1.3 (1.1, 1.5)	1.4 (1.3, 1.6)	2.4 (2.0, 2.7)
Number of frost days (<0°C) (days)				
Annual	-4.2 (-4.7, -3.8)	-6.1 (-7.0, -5.6)	-5.2 (-5.8, -4.9)	-7.4 (-8.4, -6.8)
Summer	0	0	0	0
Autumn	-0.4 (-0.5, -0.4)	-0.5 (-0.6, -0.5)	-0.5 (-0.5, -0.4)	-0.6 (-0.7, -0.5)
Winter	-3.5 (-3.9, -3.2)	-5.3 (-5.9, -4.8)	-4.5 (-4.9, -4.2)	-6.4 (-7.2, -6.0)
Spring	-0.2 (-0.3, -0.2)	-0.3 (-0.4, -0.3)	-0.3 (-0.3, -0.3)	-0.4 (-0.4, -0.3)
Number of hot days (>25°C) (days)				
Annual	24.6 (24.2, 24.9)	47.3 (46.5, 48.2)	33.7 (33.3, 34.1)	71.0 (69.5, 72.2)
Summer	13.1 (12.9, 13.3)	23.7 (23.1, 24.3)	17.8 (17.4, 18.3)	32.6 (31.7, 33.5)
Autumn	5.9 (5.8, 6.0)	13.2 (12.9, 13.6)	8.4 (8.2, 8.5)	19.8 (19.5, 20.0)
Winter	0	0	0.0 (0.0, 0.0)	0.2 (0.2, 0.2)

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Spring	5.2 (5.1, 5.5)	10.4 (10.3, 10.6)	7.3 (7.1, 7.4)	18.4 (18.1, 18.5)
Number of very hot days (>30°C) (days)				
Annual	2.3 (-0.0, 4.5)	5.2 (0.0, 9.8)	2.7 (0.0, 5.8)	12.2 (0.0, 20.3)
Summer	2.0 (-0.0, 4.0)	4.5 (0.0, 8.3)	2.4 (0.0, 5.1)	10.3 (0.0, 16.9)
Autumn	0.2 (0.0, 0.4)	0.6 (0.0, 1.2)	0.2 (0.0, 0.6)	1.4 (0.0, 2.6)
Winter	0	0	0	0
Spring	0.1 (0.0, 0.2)	0.1 (0.0, 0.5)	0.0 (-0.0, 0.3)	0.3 (0.0, 0.9)
Number of windy days (>10m/s) (days)				
Annual	5.2 (4.9, 5.4)	11.9 (11.3, 12.3)	7.9 (7.5, 8.1)	22.3 (22.1, 22.6)
Summer	4.4 (4.3, 4.5)	9.2 (9.0, 9.4)	6.3 (6.1, 6.4)	17.0 (16.8, 17.2)
Autumn	0.5 (0.4, 0.6)	1.7 (1.4, 1.9)	0.9 (0.8, 1.0)	3.4 (3.2, 3.6)
Winter	0	0	0	0
Spring	0.3 (0.2, 0.3)	1.0 (0.8, 1.1)	0.6 (0.5, 0.7)	1.8 (1.6, 1.9)
Potential Evapotranspiration Deficit (PED) (mm)				
Annual	49.4 (48.9, 49.7)	86.1 (85.9, 86.4)	65.3 (63.7, 67.1)	114.5 (111.4, 117.5)
Total rainfall (%)				
Annual	-2.3 (-2.3, -2.3)	-4.0 (-4.4, -3.8)	-4.1 (-4.5, -3.8)	-4.9 (-6.1, -4.0)
Summer	3.1 (2.8, 3.4)	-2.3 (-2.5, -2.2)	1.9 (1.5, 2.3)	8.4 (6.0, 10.2)
Autumn	-1.0 (-1.7, -0.5)	1.0 (0.2, 1.5)	5.2 (4.8, 5.4)	3.1 (2.7, 3.4)
Winter	-2.3 (-2.8, -1.4)	-3.9 (-5.4, -2.6)	-8.2 (-8.7, -7.7)	-14.4 (-15.7, -13.5)
Spring	-8.3 (-9.3, -7.6)	-13.8 (-14.0, -13.7)	-13.6 (-14.4, -13.2)	-13.3 (-14.6, -12.0)

3.5 Wairoa

Table A. 7. Climate projections for Wairoa District (2041-2060 and 2081-2100). The table shows average (min, max) change values for selected climate variables using downscaled AR6 climate data [44]. Projections are relative to a 1995-2014 'baseline'.

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Average daily air temperature: Tmean (°C)				
Annual	1.2 (1.0, 1.2)	2.1 (1.9, 2.1)	1.4 (1.3, 1.5)	3.1 (2.7, 3.2)
Summer	1.4 (1.2, 1.4)	2.4 (2.1, 2.5)	1.8 (1.5, 1.8)	3.7 (3.1, 3.8)
Autumn	1.2 (1.1, 1.3)	2.1 (1.9, 2.2)	1.4 (1.3, 1.5)	3.1 (2.8, 3.2)
Winter	1.0 (0.9, 1.0)	1.8 (1.6, 1.9)	1.2 (1.1, 1.2)	2.7 (2.4, 2.8)
Spring	1.1 (1.0, 1.2)	2.0 (1.8, 2.0)	1.4 (1.2, 1.5)	3.0 (2.6, 3.1)
Growing degree days (base 10°C) (GDDs)				
Annual	327.3 (220.6, 384.9)	584.6 (396.2, 686.2)	406.7 (278.0, 478.2)	916.2 (644.9, 1062.5)
Number of dry days (<1mm) (days)				
Annual	0.6 (-2.2, 4.5)	3.6 (0.3, 6.8)	0.7 (-2.5, 4.8)	7.8 (4.1, 11.1)
Summer	0.6 (-0.8, 1.4)	1.3 (-0.4, 2.1)	0.7 (-0.8, 1.8)	1.1 (0.2, 1.9)
Autumn	-0.3 (-1.6, 0.9)	0.3 (-0.4, 1.1)	-0.6 (-1.4, 0.3)	0.7 (-0.1, 1.8)
Winter	-0.7 (-1.9, 0.5)	0.8 (-0.3, 1.8)	-0.7 (-1.7, 0.6)	2.5 (1.6, 3.5)
Spring	0.9 (-1.1, 2.4)	1.4 (0.2, 3.0)	1.2 (-0.7, 3.5)	3.5 (1.1, 5.8)
Number of frost days (<0°C) (days)				
Annual	-6.4 (-17.2, -0.2)	-10.5 (-29.7, -0.3)	-7.5 (-20.3, -0.2)	-13.4 (-39.6, -0.3)
Summer	-0.0 (-0.5, 0.0)	-0.0 (-0.6, 0.0)	-0.0 (-0.5, 0.0)	-0.0 (-0.6, 0.0)
Autumn	-1.2 (-4.6, 0.0)	-1.6 (-6.3, -0.0)	-1.1 (-4.6, -0.0)	-1.9 (-8.0, -0.0)
Winter	-4.2 (-8.8, -0.2)	-7.1 (-16.2, -0.3)	-5.0 (-10.5, -0.2)	-9.2 (-22.5, -0.3)
Spring	-1.0 (-4.3, 0.0)	-1.8 (-7.7, 0.0)	-1.3 (-5.6, 0.0)	-2.3 (-10.2, 0.0)
Number of hot days (>25°C) (days)				
Annual	16.6 (1.3, 28.9)	32.8 (3.2, 52.1)	23.1 (1.5, 38.2)	55.4 (11.1, 77.7)
Summer	12.4 (1.1, 20.3)	22.9 (2.8, 33.3)	16.8 (1.5, 26.1)	36.6 (10.1, 48.3)
Autumn	2.7 (0.0, 7.2)	6.5 (0.2, 14.0)	4.0 (0.0, 9.6)	11.3 (0.6, 21.4)
Winter	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.0, 0.2)

Season	SSP2-4.5 2041-2060	SSP2-4.5 2081-2100	SSP3-7.0 2041-2060	SSP3-7.0 2081-2100
Spring	1.4 (0.1, 4.7)	3.4 (0.2, 9.9)	2.1 (0.1, 6.2)	7.3 (0.3, 18.9)
Number of very hot days (>30°C) (days)				
Annual	1.1 (-0.0, 4.2)	3.0 (0.0, 10.6)	1.5 (-0.0, 6.5)	8.1 (0.2, 24.7)
Summer	1.0 (-0.0, 3.8)	2.6 (0.0, 9.2)	1.3 (-0.0, 5.6)	7.1 (0.2, 21.0)
Autumn	0.0 (-0.0, 0.2)	0.2 (0.0, 1.0)	0.1 (0.0, 0.5)	0.6 (0.0, 2.6)
Winter	0	0	0	0
Spring	0.1 (0.0, 0.2)	0.1 (0.0, 0.5)	0.1 (0.0, 0.3)	0.3 (0.0, 1.1)
Number of windy days (>10m/s) (days)				
Annual	-1.6 (-8.7, 0.0)	-3.1 (-14.2, 0.0)	-2.2 (-9.7, 0.0)	-5.2 (-23.3, 0.1)
Summer	-0.7 (-2.9, 0.0)	-0.8 (-3.7, 0.0)	-0.7 (-3.7, 0.0)	-1.3 (-5.8, 0.1)
Autumn	-0.7 (-3.4, 0.0)	-1.1 (-5.2, -0.0)	-0.8 (-3.0, 0.0)	-1.4 (-6.2, 0.0)
Winter	0.0 (-0.6, 0.5)	-0.2 (-1.9, 0.3)	0.4 (-0.0, 1.3)	-1.2 (-6.4, 0.1)
Spring	-0.3 (-2.0, 0.4)	-1.0 (-3.6, 0.0)	-1.0 (-3.7, 0.0)	-1.2 (-5.0, 0.0)
Potential Evapotranspiration Deficit (PED) (mm)				
Annual	38.5 (5.6, 59.5)	59.0 (5.5, 87.5)	51.7 (9.8, 74.5)	91.0 (18.6, 131.9)
Total rainfall (%)				
Annual	-1.6 (-5.0, 1.6)	-3.5 (-7.2, -0.8)	-3.5 (-6.8, -0.5)	-7.4 (-11.2, -3.5)
Summer	-0.9 (-5.5, 4.2)	-3.5 (-8.7, 0.9)	0.2 (-5.5, 5.4)	2.7 (-4.2, 8.1)
Autumn	2.4 (-2.4, 6.1)	5.2 (-1.1, 11.9)	3.6 (-3.4, 9.2)	0.3 (-7.2, 6.8)
Winter	-1.4 (-6.6, 5.5)	-9.0 (-12.9, 0.0)	-5.3 (-11.1, 0.3)	-14.2 (-20.4, -8.0)
Spring	-6.6 (-11.7, -2.9)	-8.3 (-14.6, -2.1)	-11.9 (-17.5, -7.6)	-17.1 (-22.9, -10.9)

A4. Quantitative Risk Assessment Figures

4.1 Regional Assessment

Figure A - 7 to Figure A - 18 illustrates the risk to residents and economic activity across Hawke's Bay based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects across different socioeconomic groups and industry sectors. The assessment methodology is detailed in Section 3 and Appendix A1.

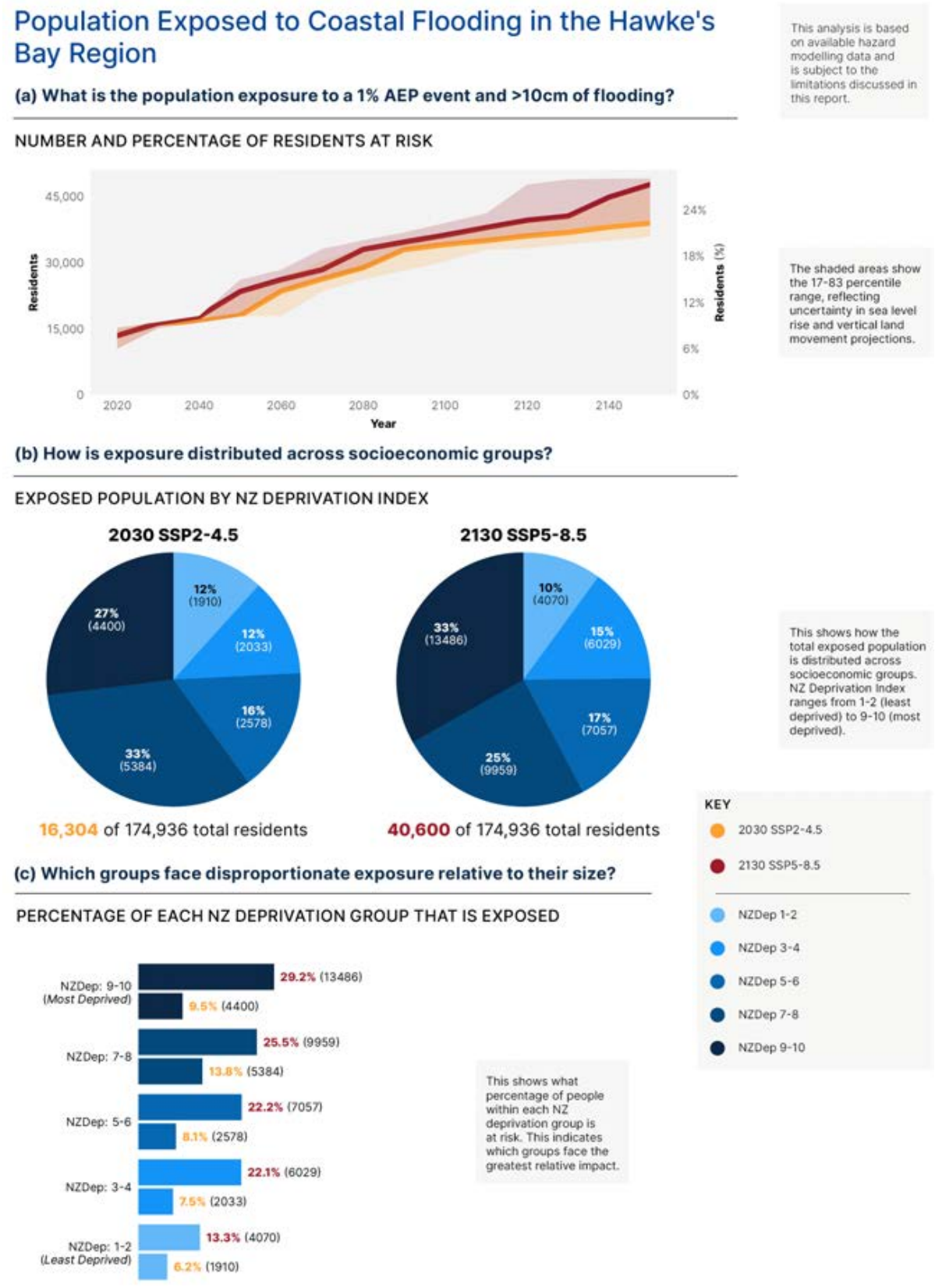

Population Exposed to Coastal Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
45,000
30,000
15,000
0
Residents
24%
18%
12%
6%
0%
Residents (%)
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is exposure distributed across socioeconomic groups?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
12% (1910)
12% (2033)
16% (2578)
33% (5384)
27% (4400)
16,304 of 174,936 total residents
2130 SSP5-8.5
10% (4070)
15% (6029)
17% (7057)
25% (9959)
33% (13486)
40,600 of 174,936 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived)
29.2% (13486)
9.5% (4400)
NZDep: 7-8
25.5% (9959)
13.8% (5384)
NZDep: 5-6
22.2% (7057)
8.1% (2578)
NZDep: 3-4
22.1% (6029)
7.5% (2033)
NZDep: 1-2 (Least Deprived)
13.3% (4070)
6.2% (1910)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 7.

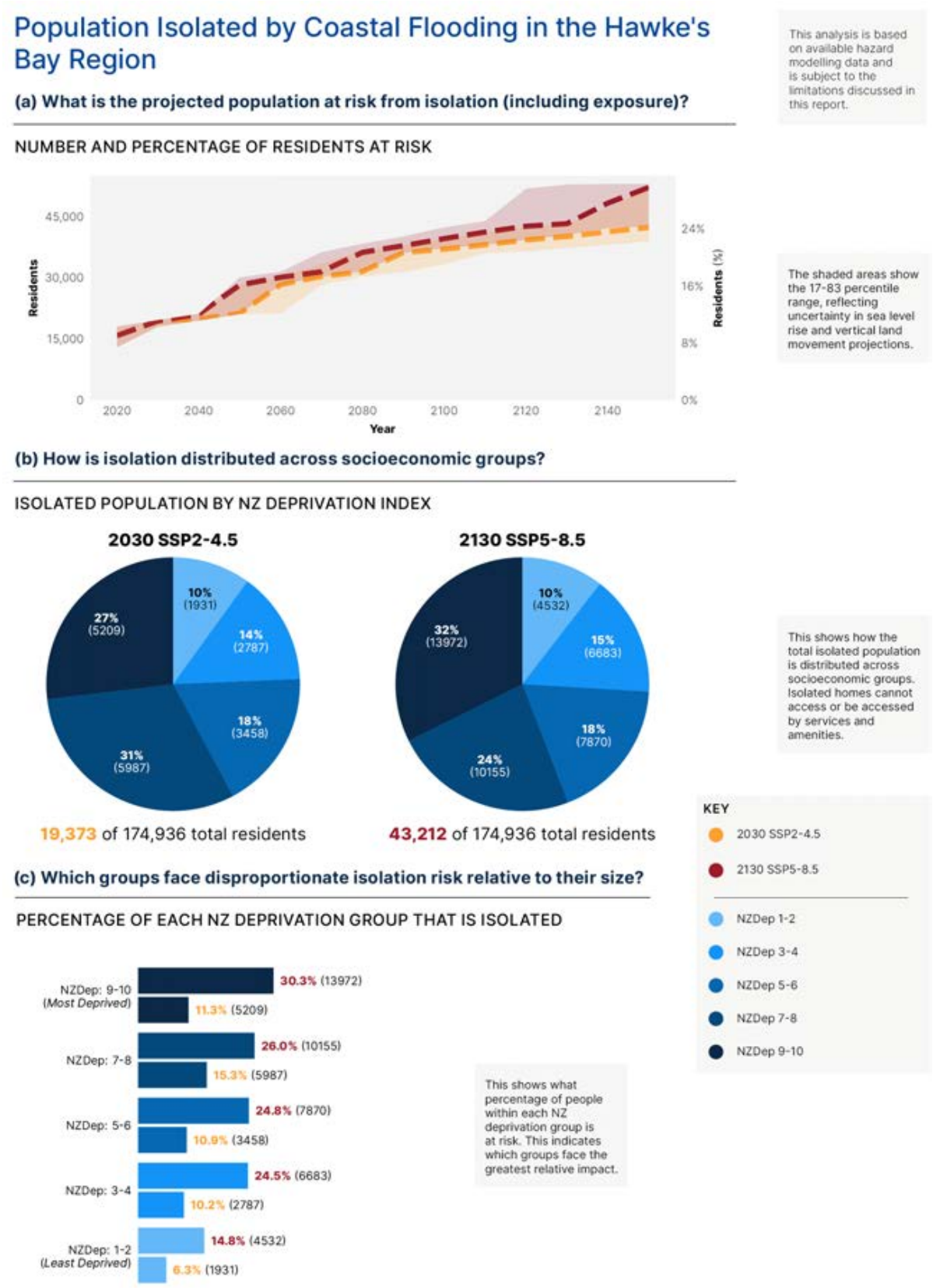

Population Isolated by Coastal Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the projected population at risk from isolation (including exposure)?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
45,000
30,000
15,000
0
Residents
24%
16%
8%
0%
Residents (%)
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
10% (1931)
14% (2787)
18% (3458)
31% (5987)
27% (5209)
19,373 of 174,936 total residents
2130 SSP5-8.5
10% (4532)
15% (6683)
18% (7870)
24% (10155)
32% (13972)
43,212 of 174,936 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived)
30.3% (13972)
11.3% (5209)
NZDep: 7-8
26.0% (10155)
15.3% (5987)
NZDep: 5-6
24.8% (7870)
10.9% (3458)
NZDep: 3-4
24.5% (6683)
10.2% (2787)
NZDep: 1-2 (Least Deprived)
14.8% (4532)
6.3% (1931)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 8.

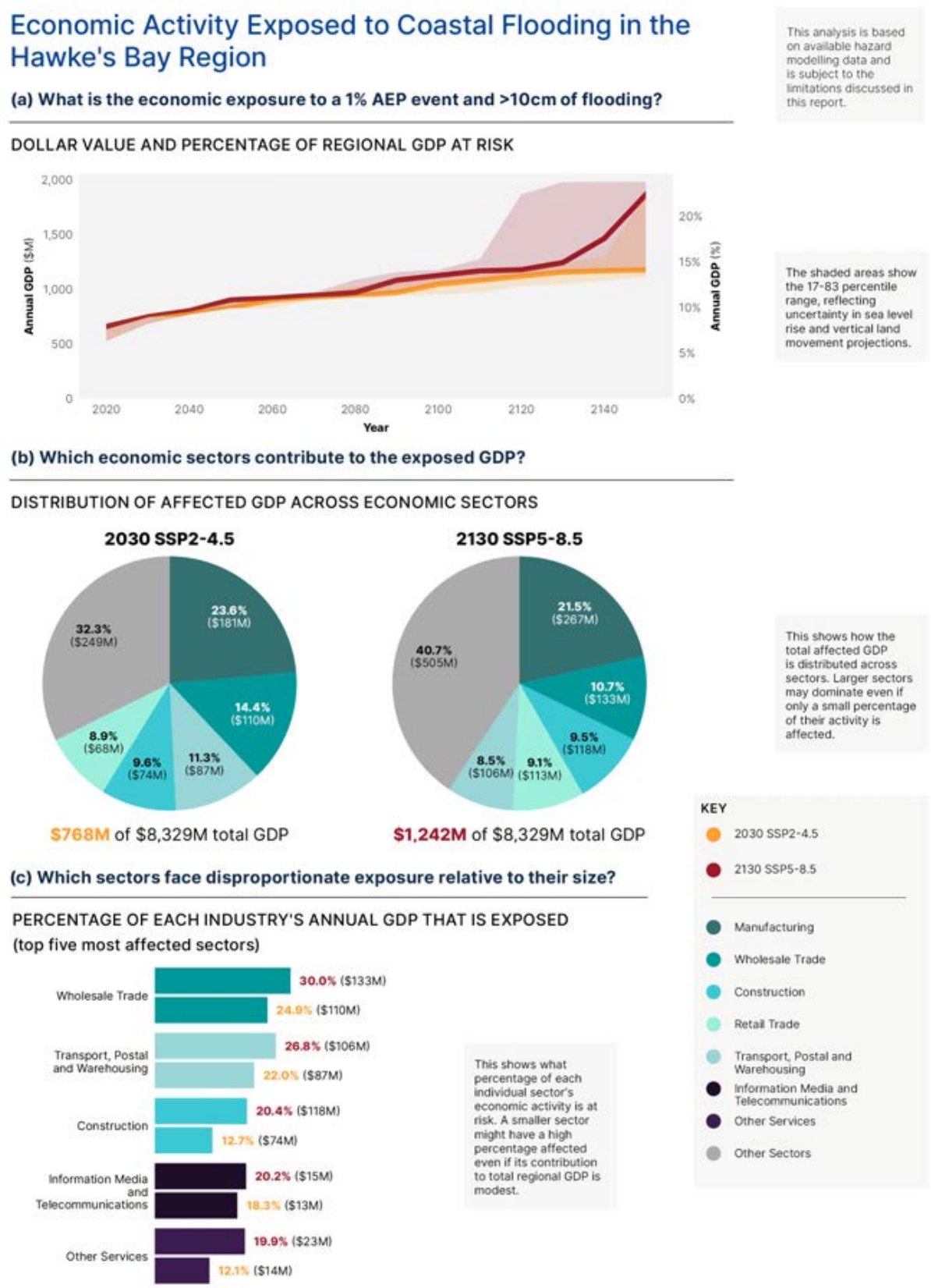

Economic Activity Exposed to Coastal Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% AEP event and >10cm of flooding?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
2,000
1,500
1,000
500
0
Annual GDP (%)
20%
15%
10%
5%
0%
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the exposed GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2030 SSP2-4.5
32.3% ($249M)
23.6% ($181M)
14.4% ($110M)
11.3% ($87M)
9.6% ($74M)
8.9% ($68M)
$768M of $8,329M total GDP
2130 SSP5-8.5
40.7% ($505M)
21.5% ($267M)
10.7% ($133M)
9.5% ($118M)
9.1% ($113M)
8.5% ($106M)
$1,242M of $8,329M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Manufacturing
Wholesale Trade
Construction
Retail Trade
Transport, Postal and Warehousing
Information Media and Telecommunications
Other Services
Other Sectors
(c) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Wholesale Trade
30.0% ($133M)
24.9% ($110M)
Transport, Postal and Warehousing
26.8% ($106M)
22.0% ($87M)
Construction
20.4% ($118M)
12.7% ($74M)
Information Media and Telecommunications
20.2% ($15M)
18.3% ($13M)
Other Services
19.9% ($23M)
12.1% ($14M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 9.

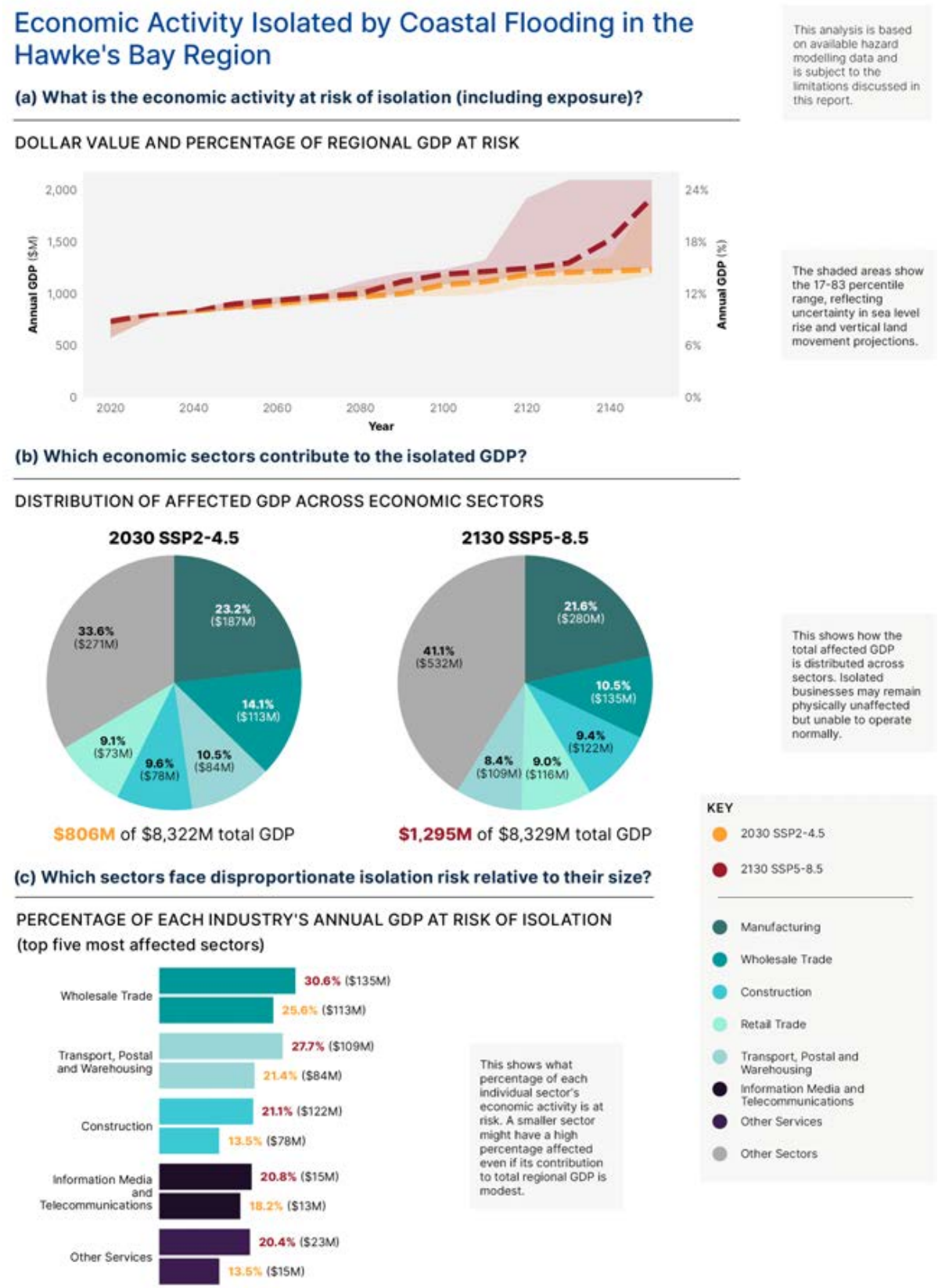

Economic Activity Isolated by Coastal Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic activity at risk of isolation (including exposure)?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
2,000
1,500
1,000
500
0
Annual GDP (%)
24%
18%
12%
6%
0%
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2030 SSP2-4.5
23.2% ($187M)
14.1% ($113M)
10.5% ($84M)
9.6% ($78M)
9.1% ($73M)
33.6% ($271M)
$806M of $8,322M total GDP
2130 SSP5-8.5
21.6% ($280M)
10.5% ($135M)
9.4% ($122M)
9.0% ($116M)
8.4% ($109M)
41.1% ($532M)
$1,295M of $8,329M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Manufacturing
Wholesale Trade
Construction
Retail Trade
Transport, Postal and Warehousing
Information Media and Telecommunications
Other Services
Other Sectors
(c) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Wholesale Trade
30.6% ($135M)
25.6% ($113M)
Transport, Postal and Warehousing
27.7% ($109M)
21.4% ($84M)
Construction
21.1% ($122M)
13.5% ($78M)
Information Media and Telecommunications
20.8% ($15M)
18.2% ($13M)
Other Services
20.4% ($23M)
13.5% ($15M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 10.

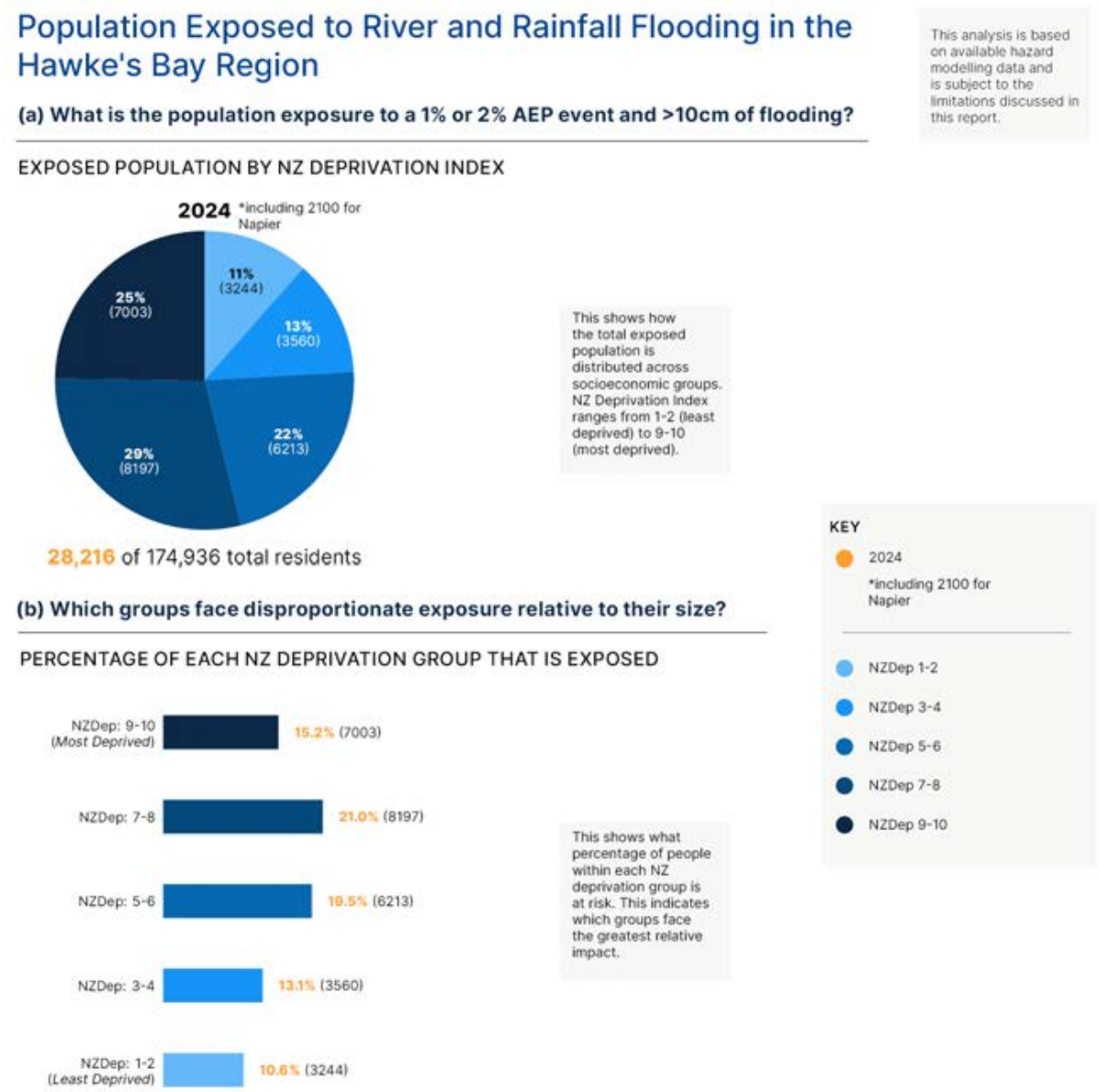

Population Exposed to River and Rainfall Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% or 2% AEP event and >10cm of flooding?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2024 *including 2100 for Napier
11% (3244)
13% (3560)
22% (6213)
29% (8197)
25% (7003)
28,216 of 174,936 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2024
*including 2100 for Napier
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived) 15.2% (7003)
NZDep: 7-8 21.0% (8197)
NZDep: 5-6 19.5% (6213)
NZDep: 3-4 13.1% (3560)
NZDep: 1-2 (Least Deprived) 10.6% (3244)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 11.

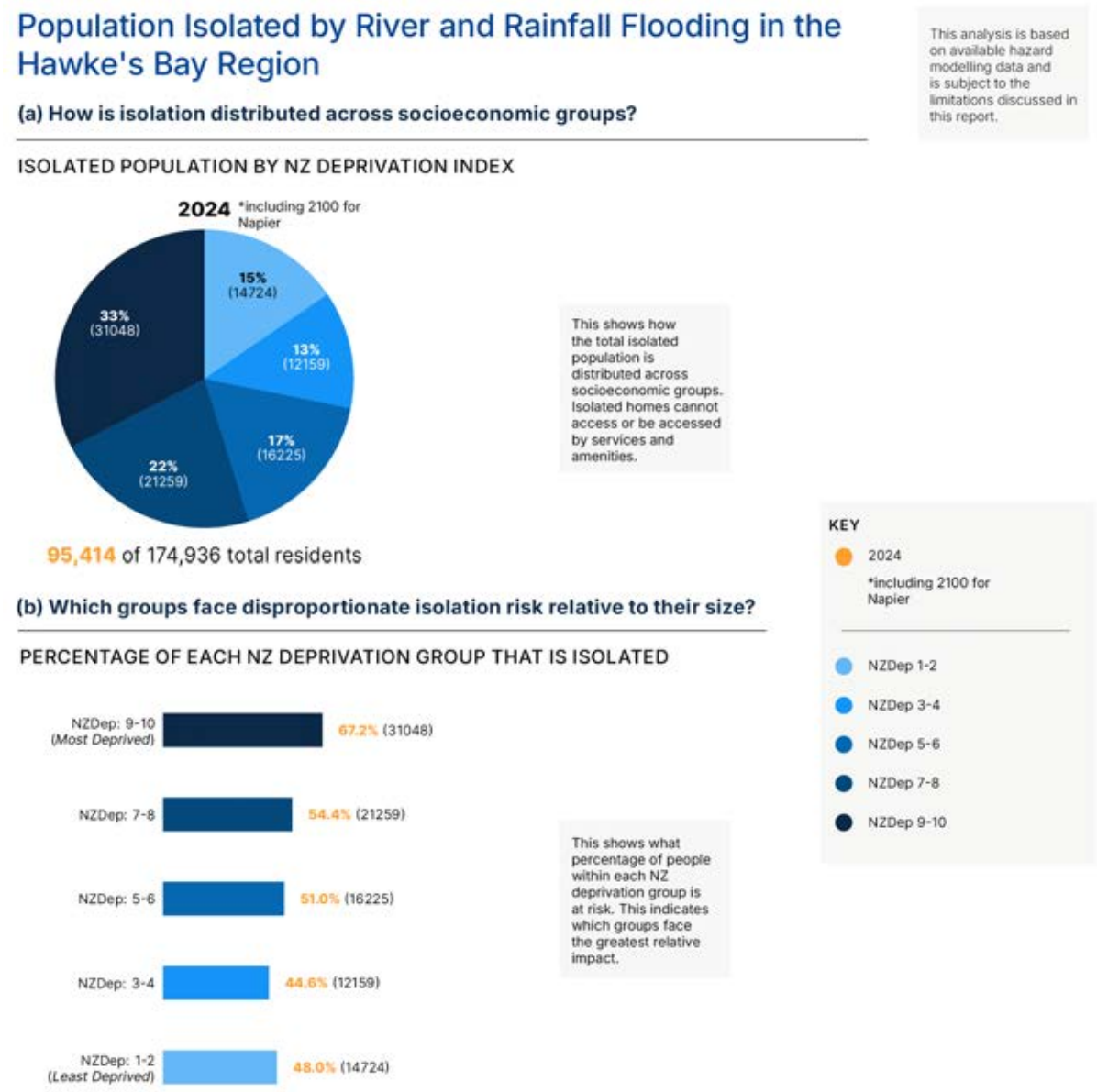

Population Isolated by River and Rainfall Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2024 *including 2100 for Napier
15% (14724)
13% (12159)
17% (16225)
22% (21259)
33% (31048)
95,414 of 174,936 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2024
*including 2100 for Napier
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 67.2% (31048)
NZDep: 7-8 54.4% (21259)
NZDep: 5-6 51.0% (16225)
NZDep: 3-4 44.6% (12159)
NZDep: 1-2 (Least Deprived) 48.0% (14724)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 12.

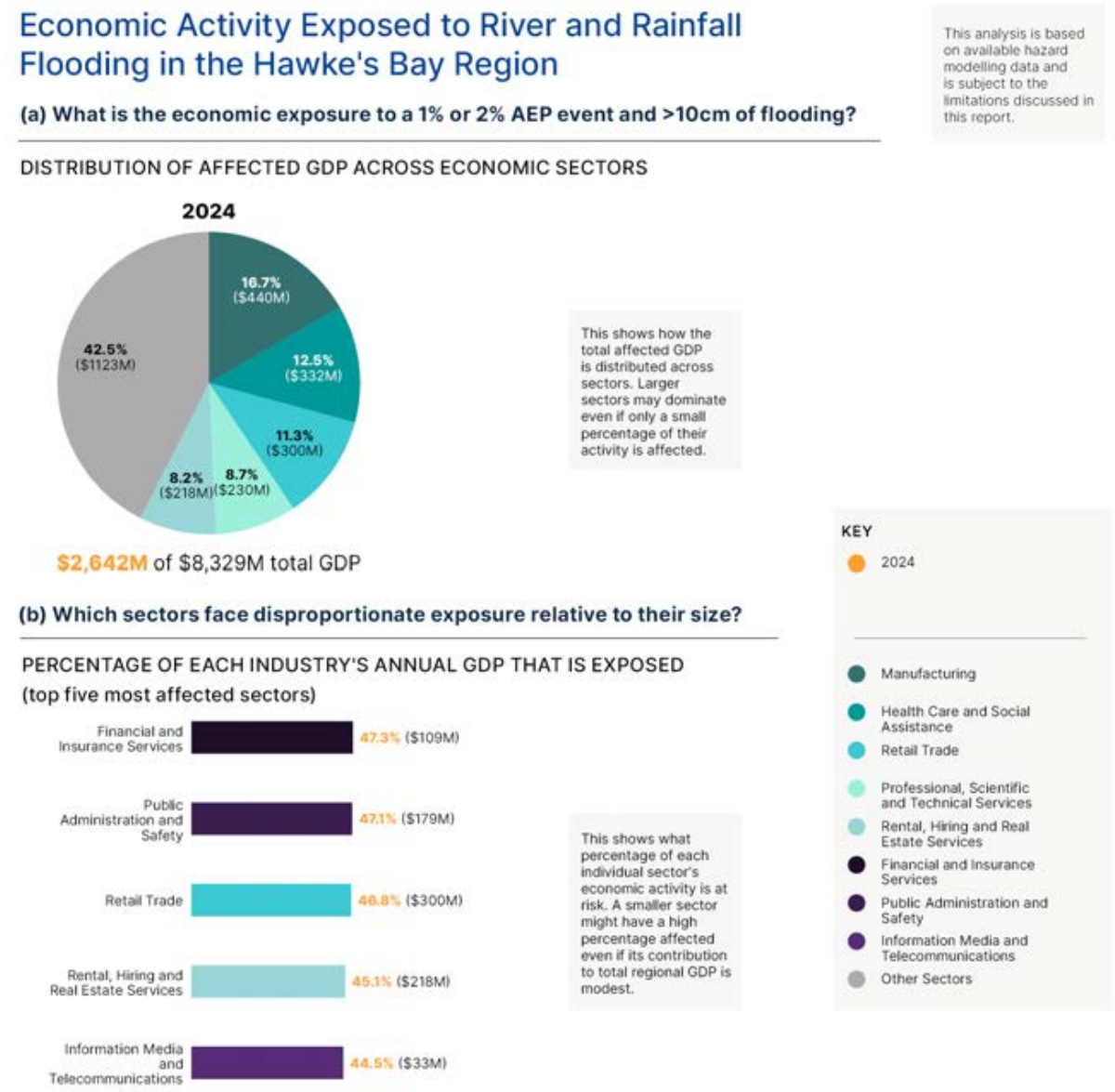

Economic Activity Exposed to River and Rainfall Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% or 2% AEP event and >10cm of flooding?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2024
16.7% ($440M)
12.5% ($332M)
11.3% ($300M)
8.7% ($230M)
8.2% ($218M)
42.5% ($1123M)
$2,642M of $8,329M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2024
Manufacturing
Health Care and Social Assistance
Retail Trade
Professional, Scientific and Technical Services
Rental, Hiring and Real Estate Services
Financial and Insurance Services
Public Administration and Safety
Information Media and Telecommunications
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Financial and Insurance Services
47.3% ($109M)
Public Administration and Safety
47.1% ($179M)
Retail Trade
46.8% ($300M)
Rental, Hiring and Real Estate Services
45.1% ($218M)
Information Media and Telecommunications
44.5% ($33M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 13.

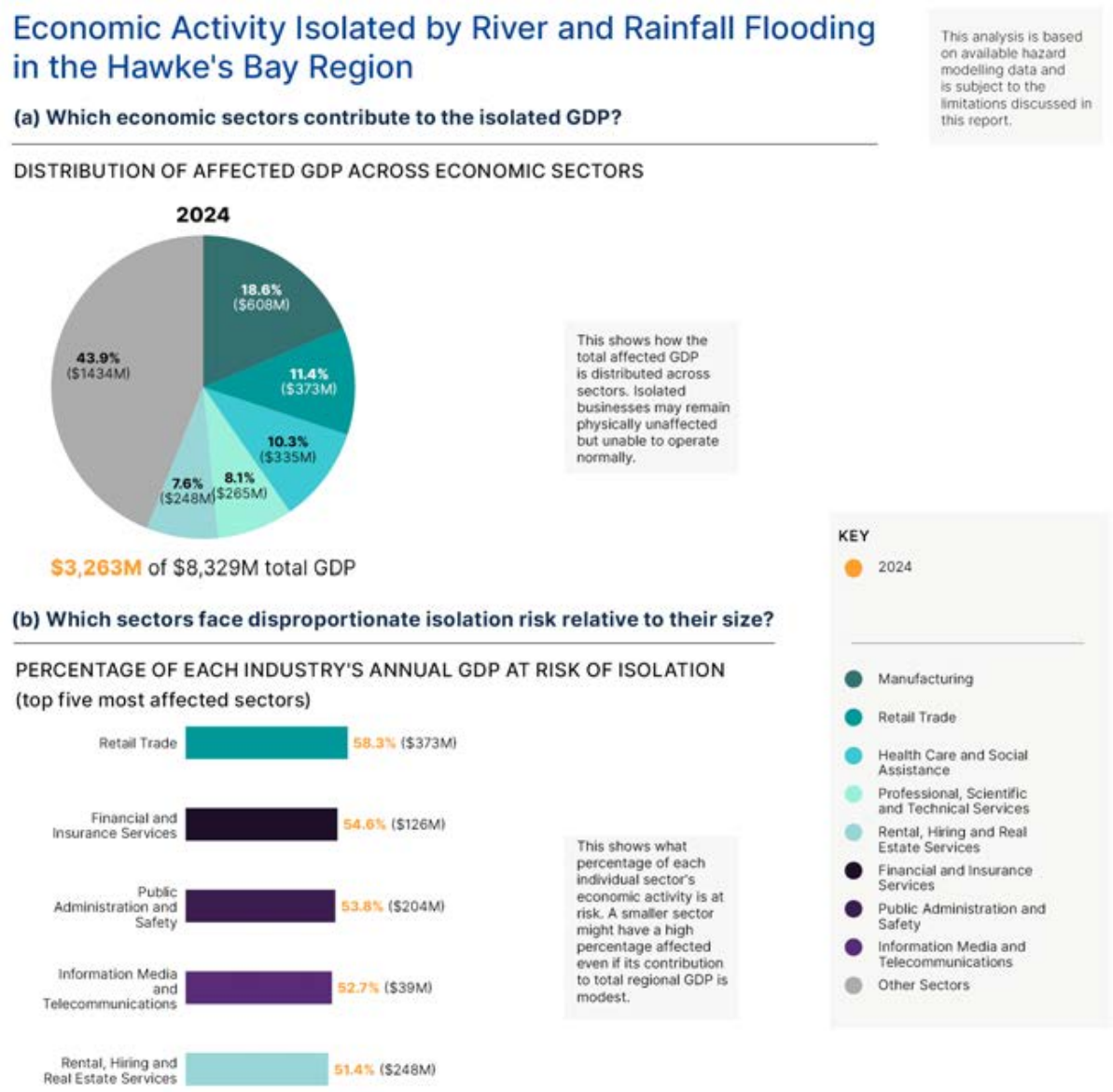

Economic Activity Isolated by River and Rainfall Flooding in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2024
18.6% ($608M)
11.4% ($373M)
10.3% ($335M)
8.1% ($265M)
7.6% ($248M)
43.9% ($1434M)
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
$3,263M of $8,329M total GDP
KEY
2024
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Retail Trade 58.3% ($373M)
Financial and Insurance Services 54.6% ($126M)
Public Administration and Safety 53.8% ($204M)
Information Media and Telecommunications 52.7% ($39M)
Rental, Hiring and Real Estate Services 51.4% ($248M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.
Manufacturing
Retail Trade
Health Care and Social Assistance
Professional, Scientific and Technical Services
Rental, Hiring and Real Estate Services
Financial and Insurance Services
Public Administration and Safety
Information Media and Telecommunications
Other Sectors

Figure A - 14.

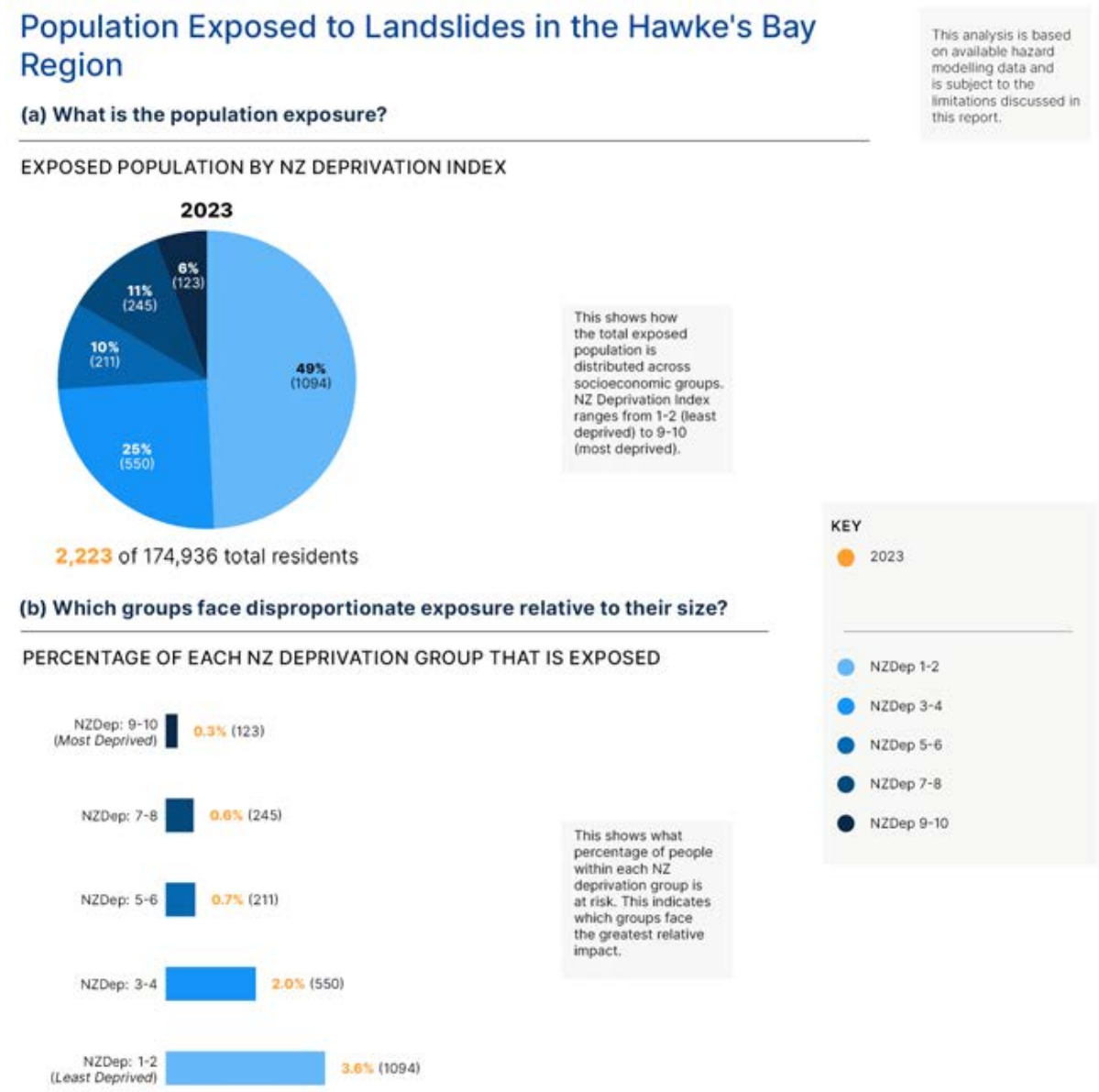

Population Exposed to Landslides in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2023
6% (123)
11% (245)
10% (211)
49% (1094)
25% (550)
2,223 of 174,936 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived) 0.3% (123)
NZDep: 7-8 0.6% (245)
NZDep: 5-6 0.7% (211)
NZDep: 3-4 2.0% (550)
NZDep: 1-2 (Least Deprived) 3.6% (1094)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 15.

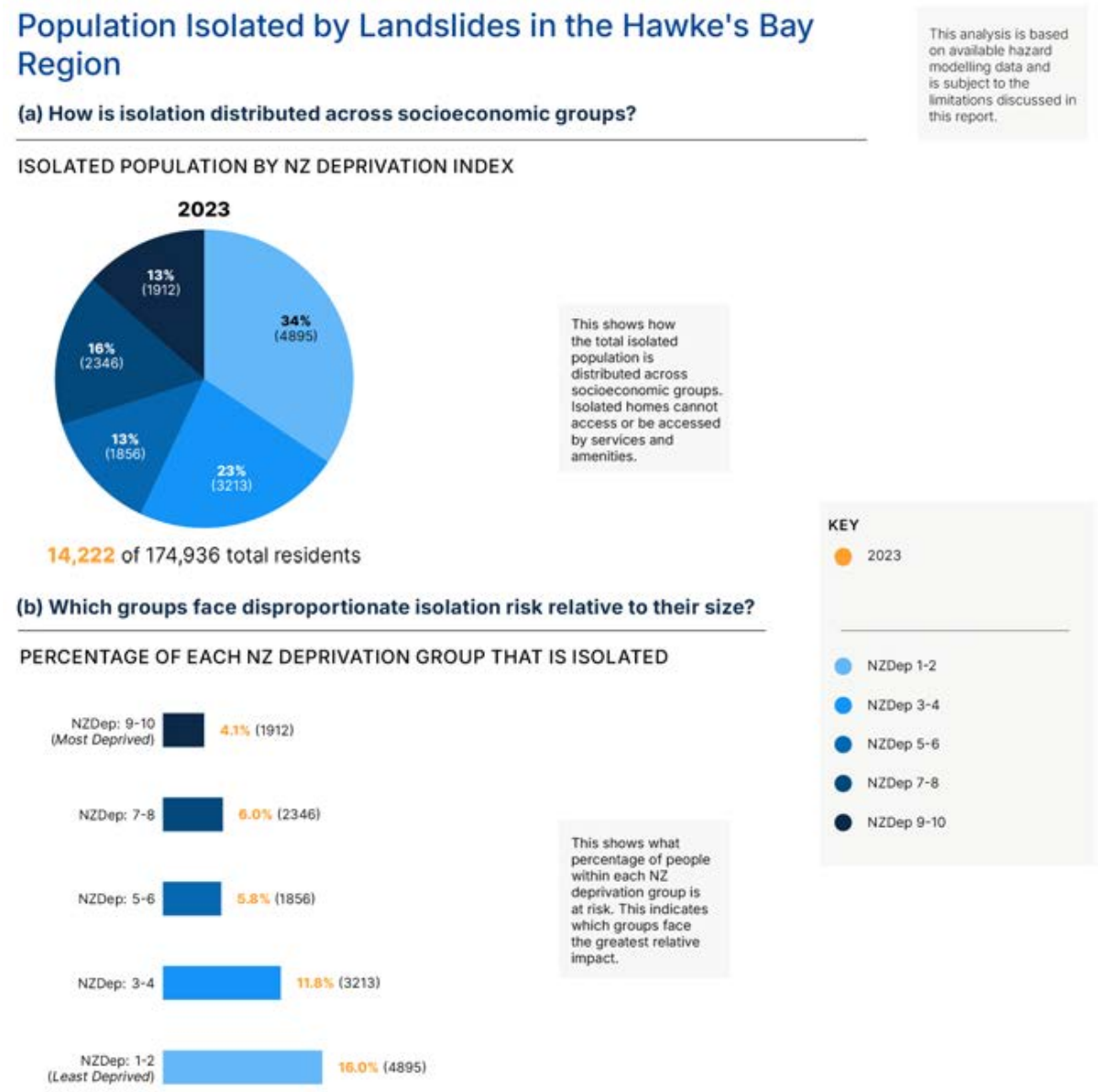

Population Isolated by Landslides in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2023
13% (1912)
34% (4895)
16% (2346)
13% (1856)
23% (3213)
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
14,222 of 174,936 total residents
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 4.1% (1912)
NZDep: 7-8 6.0% (2346)
NZDep: 5-6 5.8% (1856)
NZDep: 3-4 11.8% (3213)
NZDep: 1-2 (Least Deprived) 16.0% (4895)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 16.

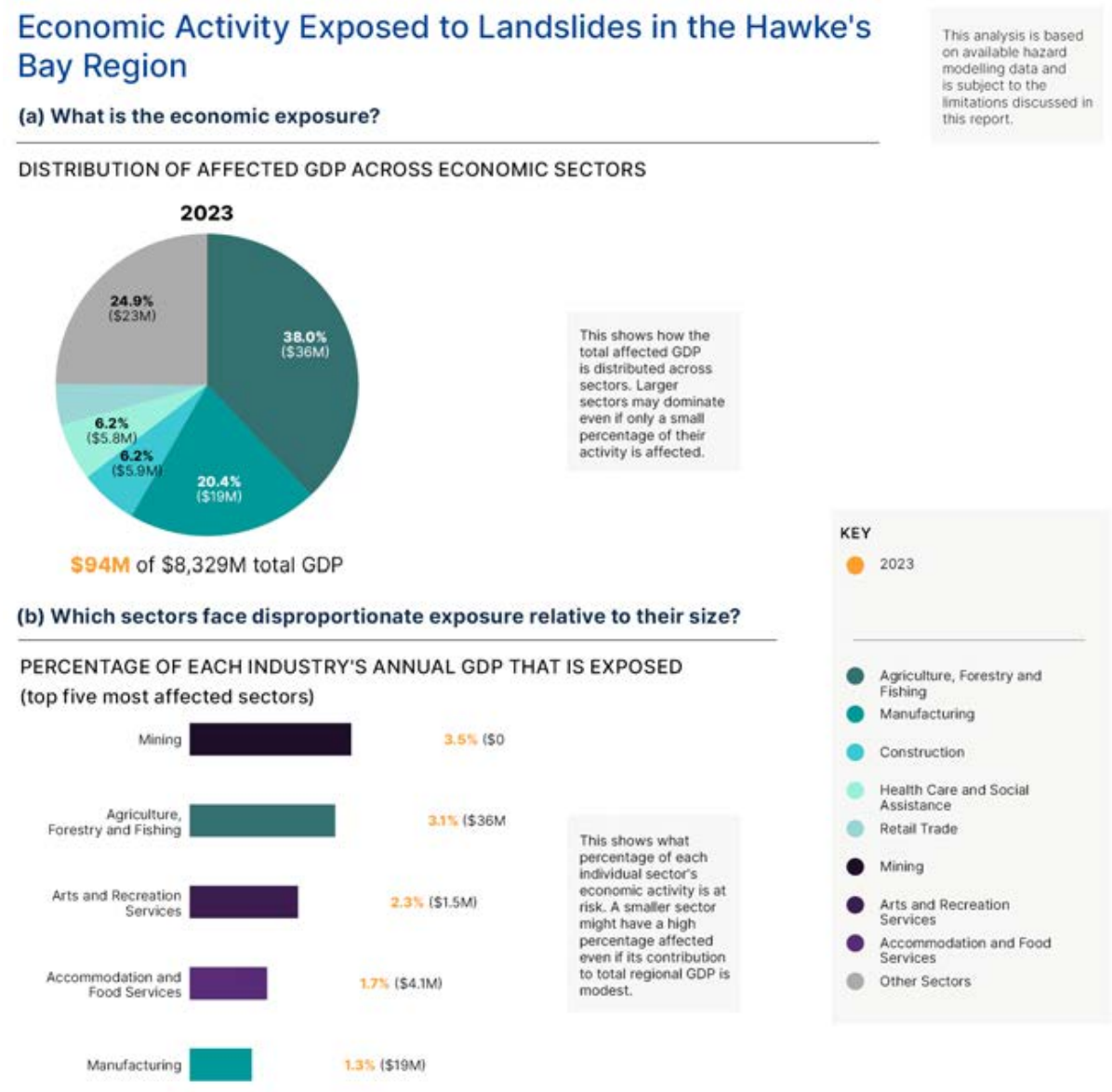

Economic Activity Exposed to Landslides in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
24.9% ($23M)
38.0% ($36M)
6.2% ($5.8M)
6.2% ($5.9M)
20.4% ($19M)
$94M of $8,329M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2023
Agriculture, Forestry and Fishing
Manufacturing
Construction
Health Care and Social Assistance
Retail Trade
Mining
Arts and Recreation Services
Accommodation and Food Services
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Mining
3.5% ($0
Agriculture, Forestry and Fishing
3.1% ($36M
Arts and Recreation Services
2.3% ($1.5M)
Accommodation and Food Services
1.7% ($4.1M)
Manufacturing
1.3% ($19M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 17.

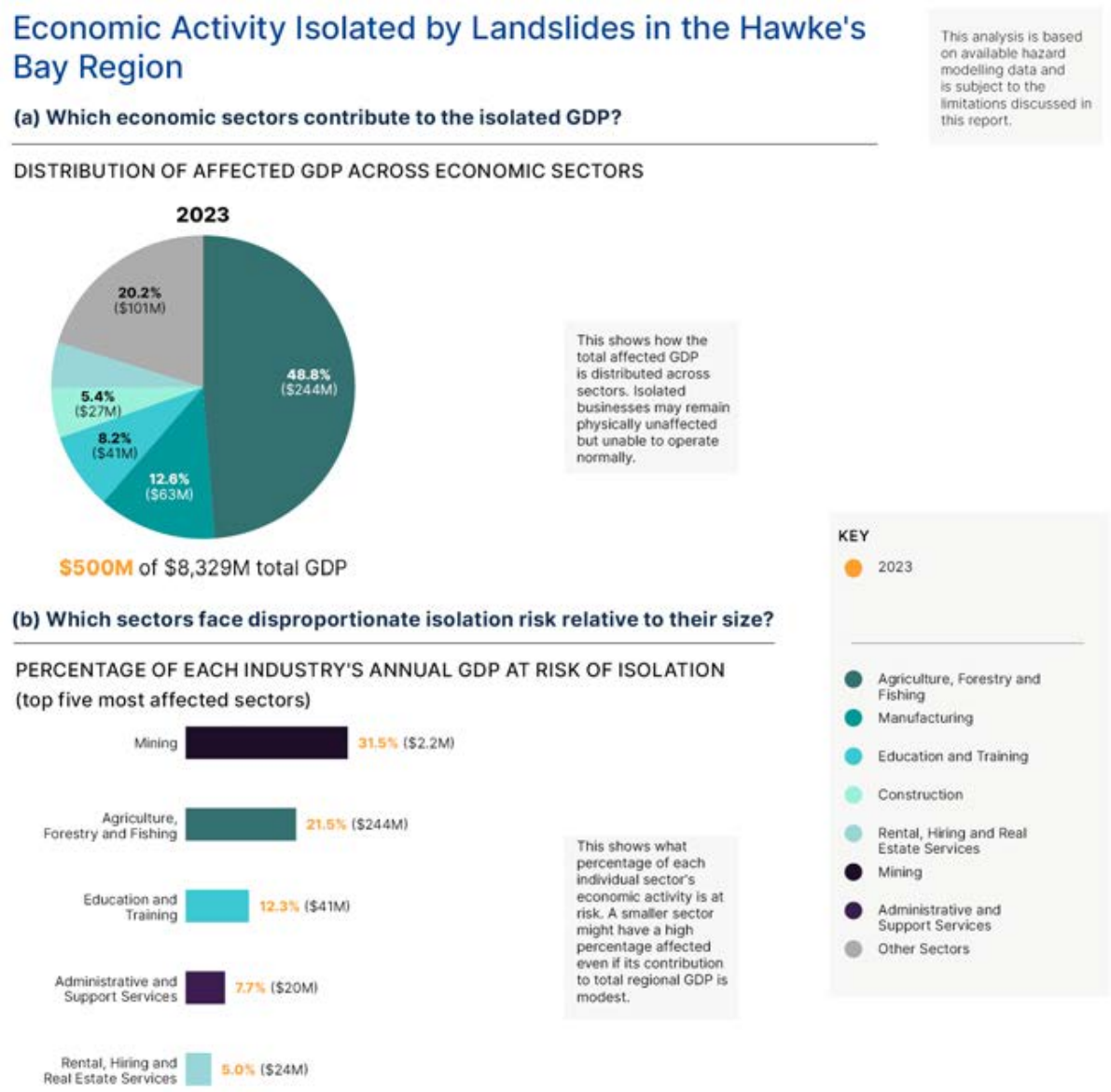

Economic Activity Isolated by Landslides in the Hawke's Bay Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
20.2% ($101M)
48.8% ($244M)
5.4% ($27M)
8.2% ($41M)
12.6% ($63M)
$500M of $8,329M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2023
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Mining 31.5% ($2.2M)
Agriculture, Forestry and Fishing 21.5% ($244M)
Education and Training 12.3% ($41M)
Administrative and Support Services 7.7% ($20M)
Rental, Hiring and Real Estate Services 5.0% ($24M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.
Agriculture, Forestry and Fishing
Manufacturing
Education and Training
Construction
Rental, Hiring and Real Estate Services
Mining
Administrative and Support Services
Other Sectors

Figure A - 18.

4.2 Central Hawke's Bay

Figure A - 19 to Figure A - 28 illustrates the risk to residents and economic activity in Central Hawke's Bay based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects across different socioeconomic groups and industry sectors. The assessment methodology is detailed in Section 3 and Appendix A1.

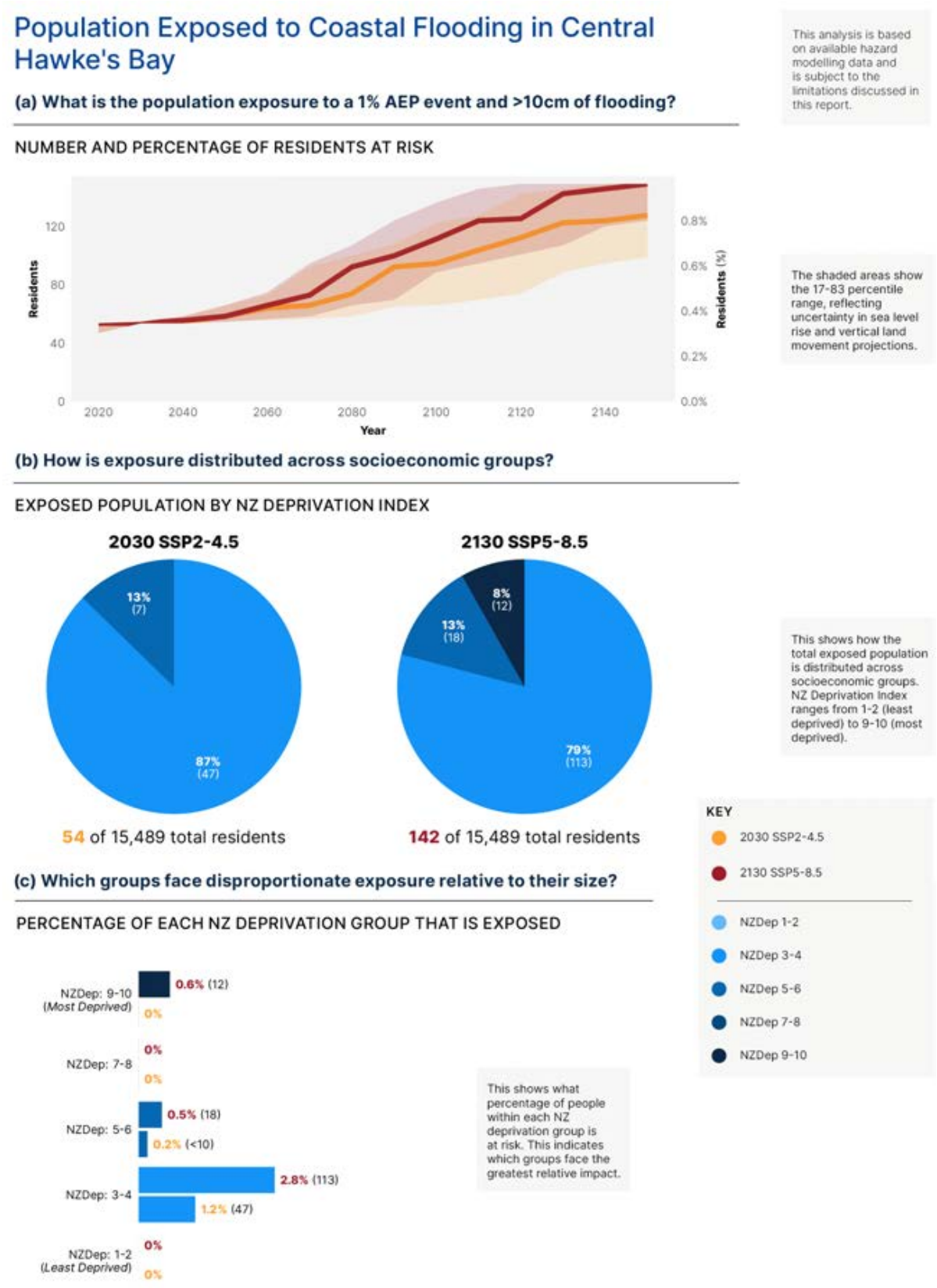

Population Exposed to Coastal Flooding in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
Residents
Residents (%)
120
80
40
0
0.8%
0.6%
0.4%
0.2%
0.0%
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is exposure distributed across socioeconomic groups?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
13% (7)
87% (47)
54 of 15,489 total residents
2130 SSP5-8.5
8% (12)
13% (18)
79% (113)
142 of 15,489 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived)
0.6% (12)
0%
NZDep: 7-8
0%
0%
NZDep: 5-6
0.5% (18)
0.2% (<10)
NZDep: 3-4
2.8% (113)
1.2% (47)
NZDep: 1-2 (Least Deprived)
0%
0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 19.

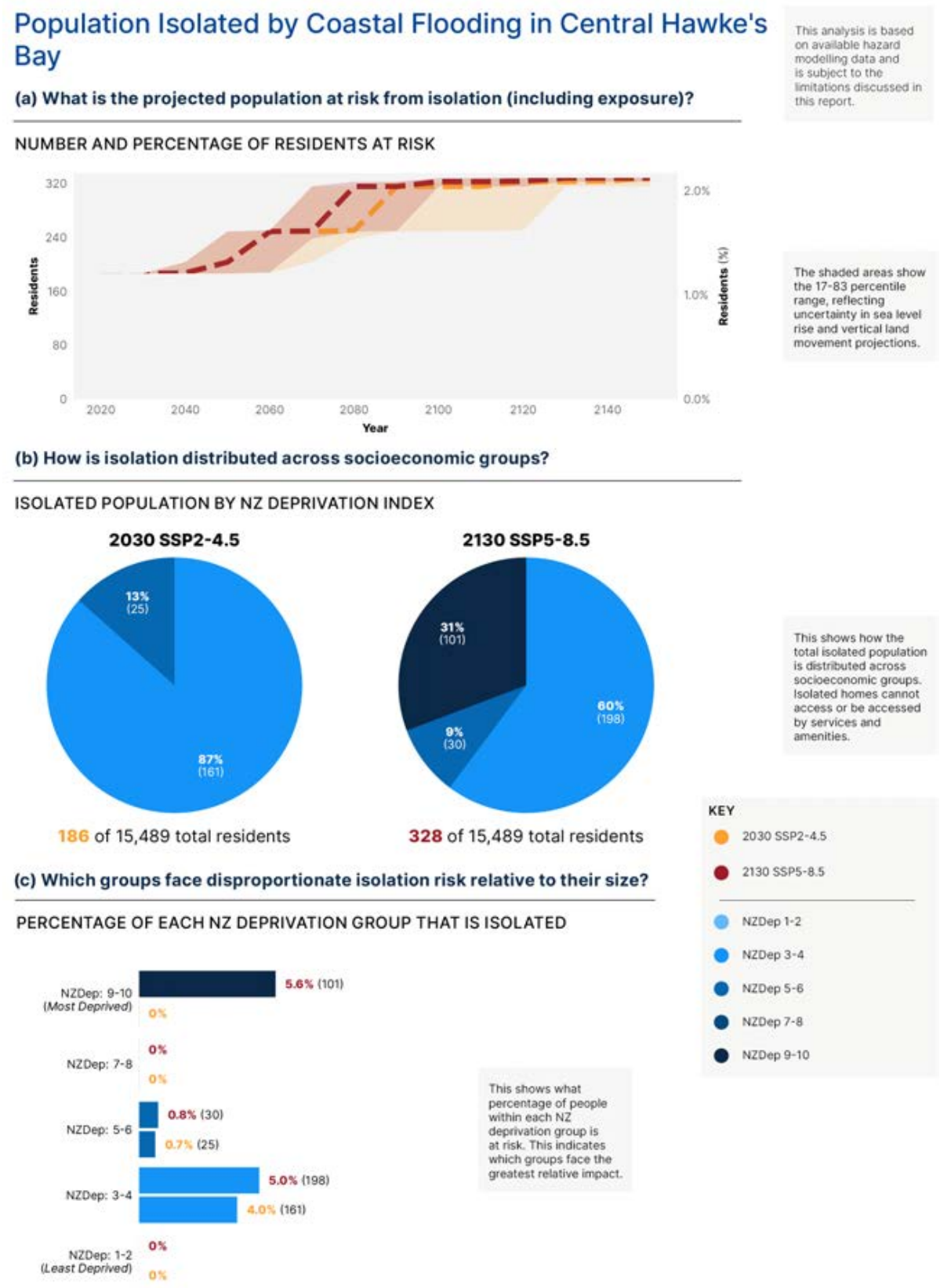

Population Isolated by Coastal Flooding in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the projected population at risk from isolation (including exposure)?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
Residents
Residents (%)
320
240
160
80
0
2.0%
1.0%
0.0%
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
13% (25)
87% (161)
186 of 15,489 total residents
2130 SSP5-8.5
31% (101)
9% (30)
60% (198)
328 of 15,489 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived)
5.6% (101)
0%
NZDep: 7-8
0%
0%
NZDep: 5-6
0.8% (30)
0.7% (25)
NZDep: 3-4
5.0% (198)
4.0% (161)
NZDep: 1-2 (Least Deprived)
0%
0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 20.

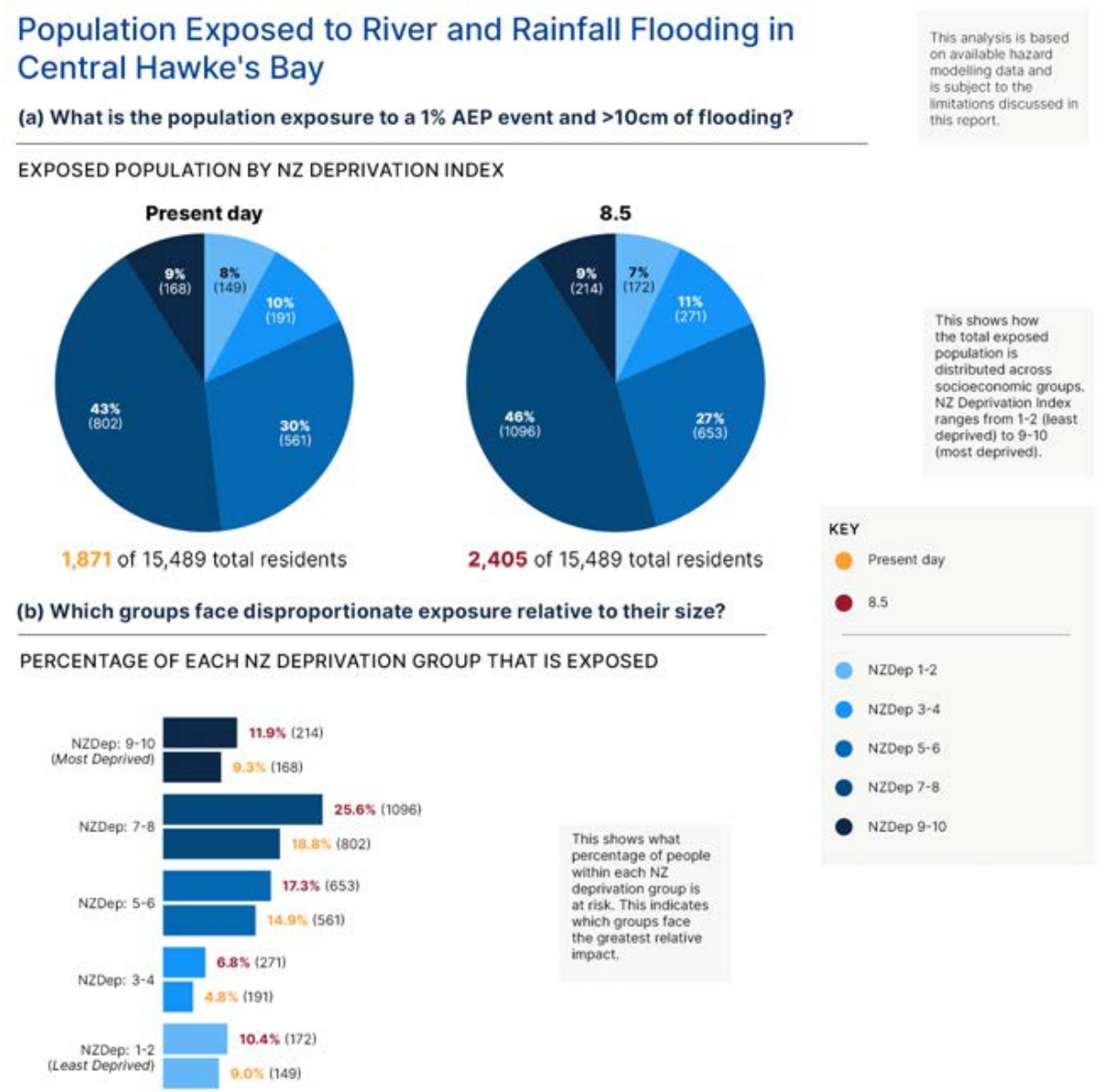

Population Exposed to River and Rainfall Flooding in Central Hawke's Bay
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
Present day
8.5
9% (168)
8% (149)
10% (191)
43% (802)
30% (561)
9% (214)
7% (172)
11% (271)
46% (1096)
27% (653)
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
1,871 of 15,489 total residents
2,405 of 15,489 total residents
KEY
Present day
8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived)
11.9% (214)
9.3% (168)
NZDep: 7-8
25.6% (1096)
18.8% (802)
NZDep: 5-6
17.3% (653)
14.9% (561)
NZDep: 3-4
6.8% (271)
4.8% (191)
NZDep: 1-2 (Least Deprived)
10.4% (172)
9.0% (149)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 21.

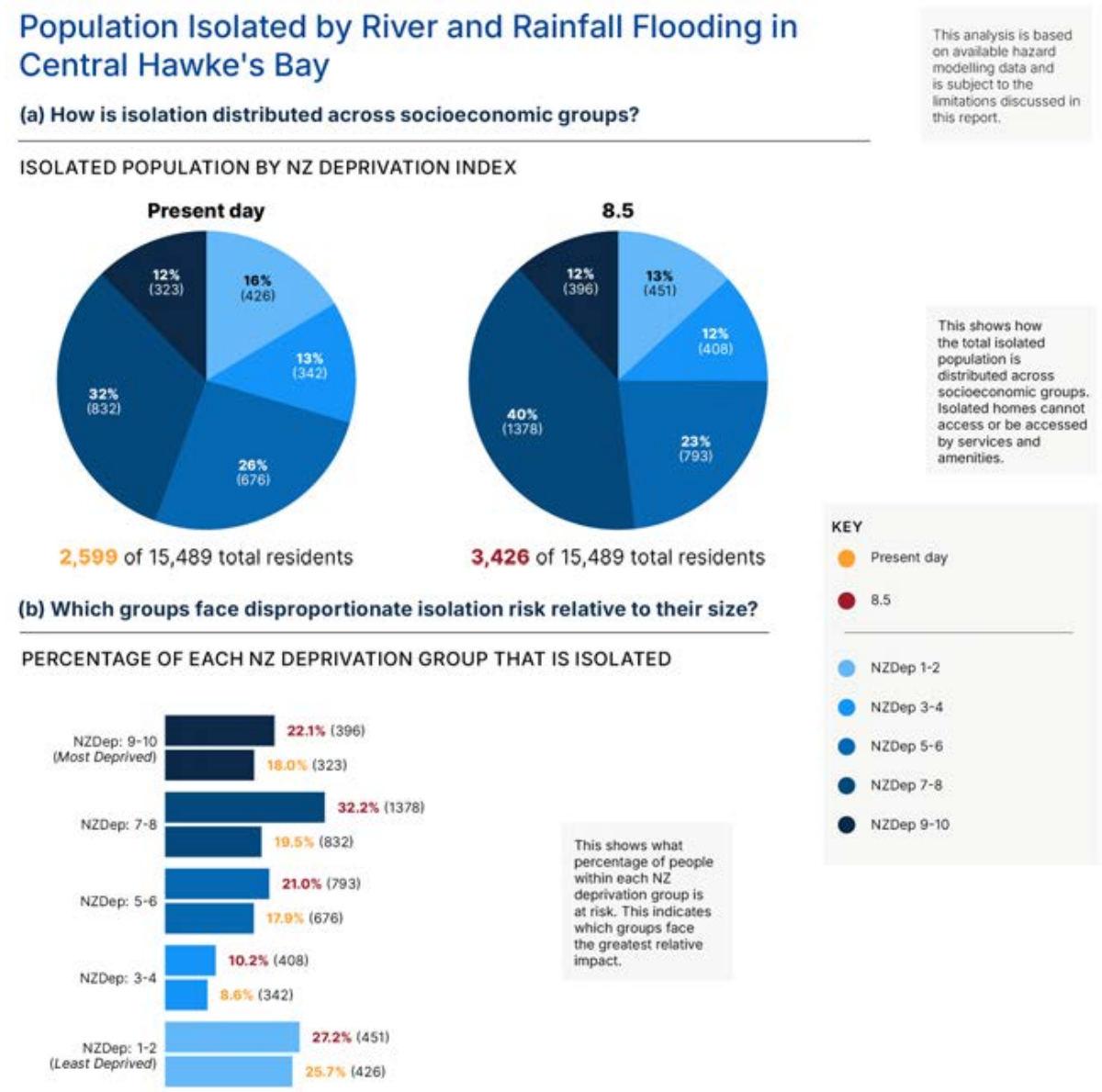

Population Isolated by River and Rainfall Flooding in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
Present day
12% (323)
16% (426)
13% (342)
32% (832)
26% (676)
2,599 of 15,489 total residents
8.5
12% (396)
13% (451)
12% (408)
40% (1378)
23% (793)
3,426 of 15,489 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
Present day
8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived)
22.1% (396)
18.0% (323)
NZDep: 7-8
32.2% (1378)
19.5% (832)
NZDep: 5-6
21.0% (793)
17.9% (676)
NZDep: 3-4
10.2% (408)
8.6% (342)
NZDep: 1-2 (Least Deprived)
27.2% (451)
25.7% (426)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 22.

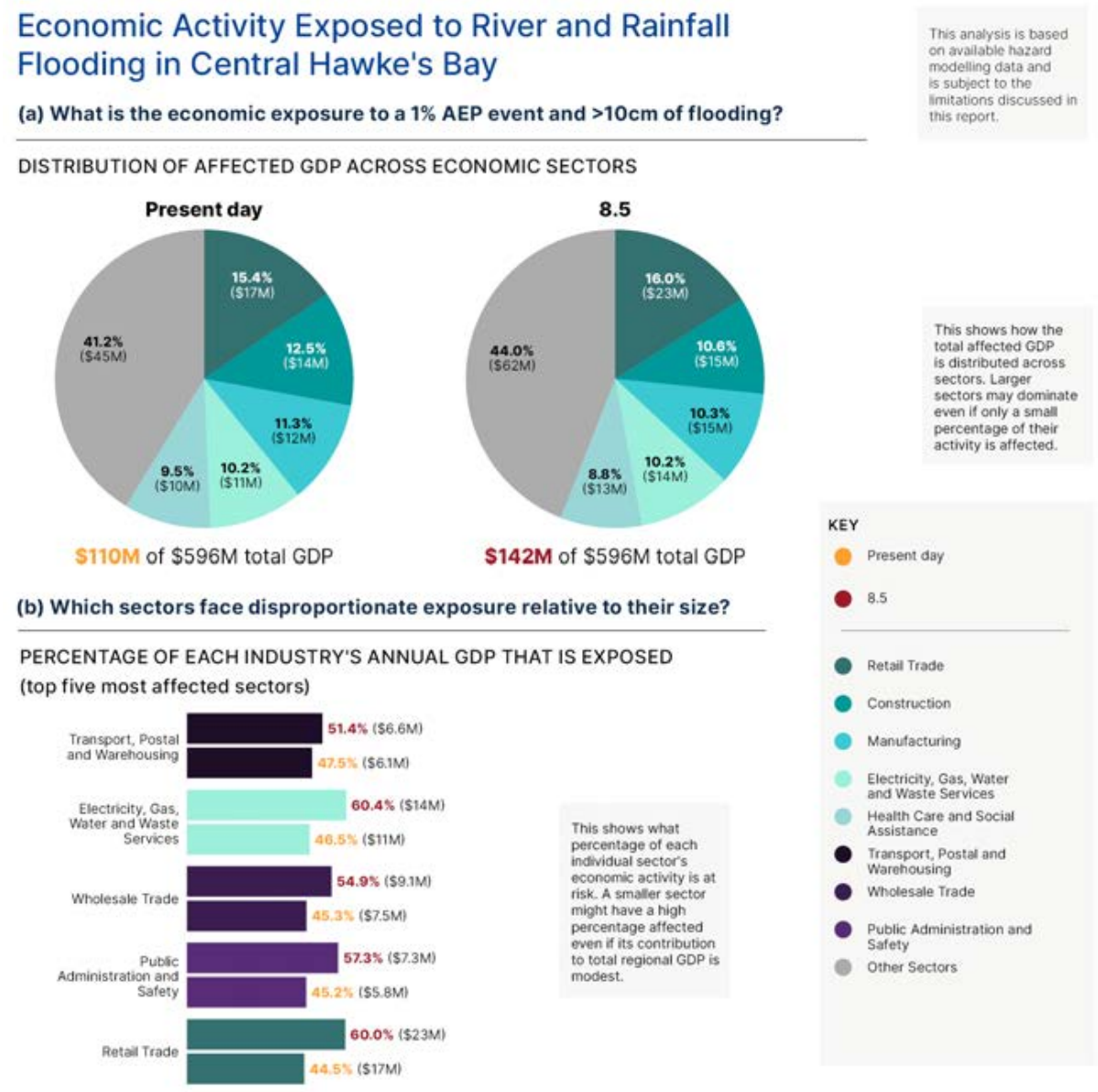

Economic Activity Exposed to River and Rainfall Flooding in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% AEP event and >10cm of flooding?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
Present day
15.4% ($17M)
12.5% ($14M)
11.3% ($12M)
10.2% ($11M)
9.5% ($10M)
41.2% ($45M)
$110M of $596M total GDP
8.5
16.0% ($23M)
10.6% ($15M)
10.3% ($15M)
10.2% ($14M)
8.8% ($13M)
44.0% ($62M)
$142M of $596M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
Present day
8.5
Retail Trade
Construction
Manufacturing
Electricity, Gas, Water and Waste Services
Health Care and Social Assistance
Transport, Postal and Warehousing
Wholesale Trade
Public Administration and Safety
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Transport, Postal and Warehousing
51.4% ($6.6M)
47.5% ($6.1M)
Electricity, Gas, Water and Waste Services
60.4% ($14M)
46.5% ($11M)
Wholesale Trade
54.9% ($9.1M)
45.3% ($7.5M)
Public Administration and Safety
57.3% ($7.3M)
45.2% ($5.8M)
Retail Trade
60.0% ($23M)
44.5% ($17M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 23.

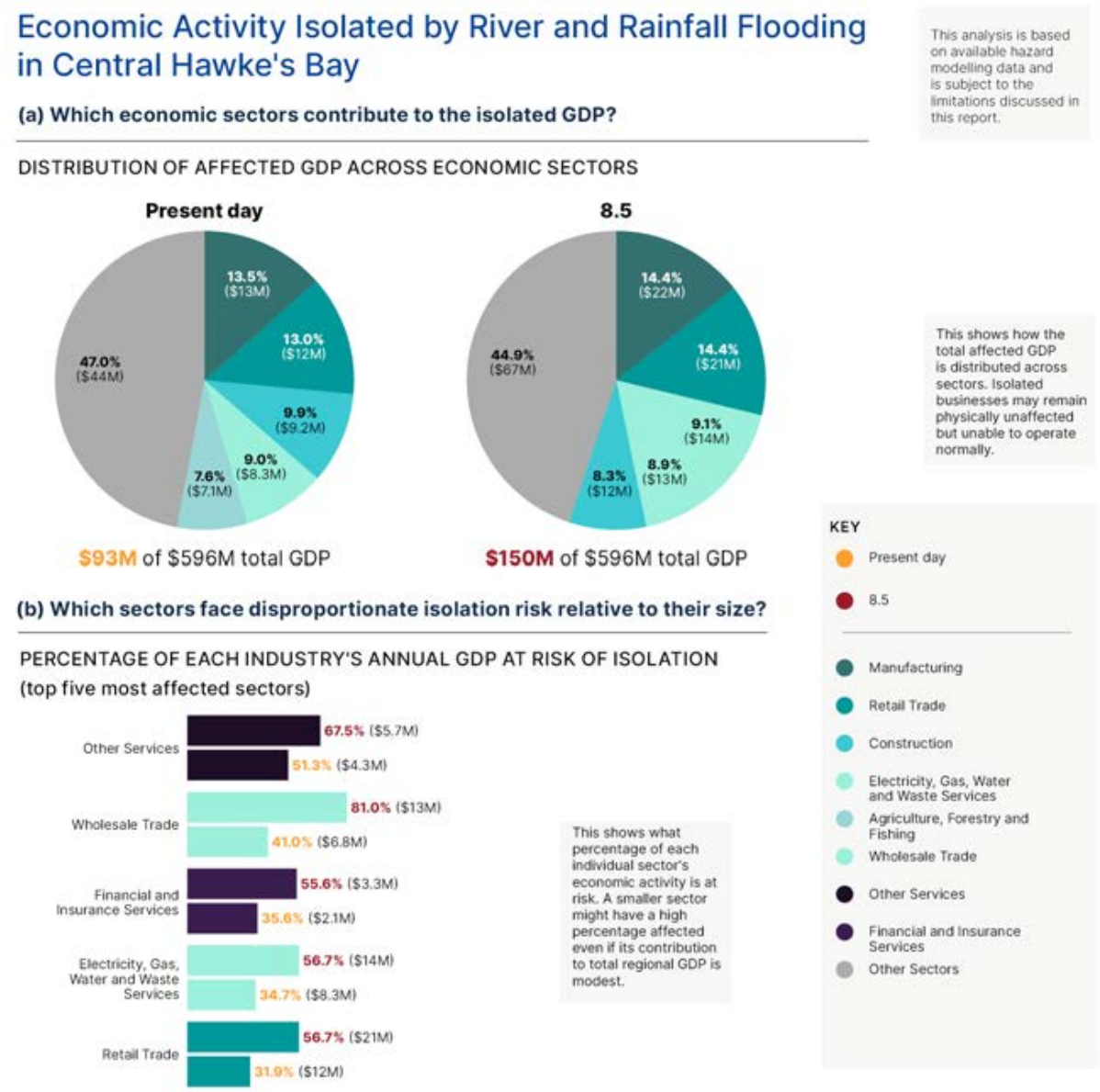

Economic Activity Isolated by River and Rainfall Flooding in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
Present day
13.5% ($13M)
13.0% ($12M)
9.9% ($9.2M)
9.0% ($8.3M)
7.6% ($7.1M)
47.0% ($44M)
$93M of $596M total GDP
8.5
14.4% ($22M)
14.4% ($21M)
9.1% ($14M)
8.9% ($13M)
8.3% ($12M)
44.9% ($67M)
$150M of $596M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
Present day
8.5
Manufacturing
Retail Trade
Construction
Electricity, Gas, Water and Waste Services
Agriculture, Forestry and Fishing
Wholesale Trade
Other Services
Financial and Insurance Services
Other Sectors
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Other Services
67.5% ($5.7M)
51.3% ($4.3M)
Wholesale Trade
81.0% ($13M)
41.0% ($6.8M)
Financial and Insurance Services
55.6% ($3.3M)
35.6% ($2.1M)
Electricity, Gas, Water and Waste Services
56.7% ($14M)
34.7% ($8.3M)
Retail Trade
56.7% ($21M)
31.9% ($12M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 24.

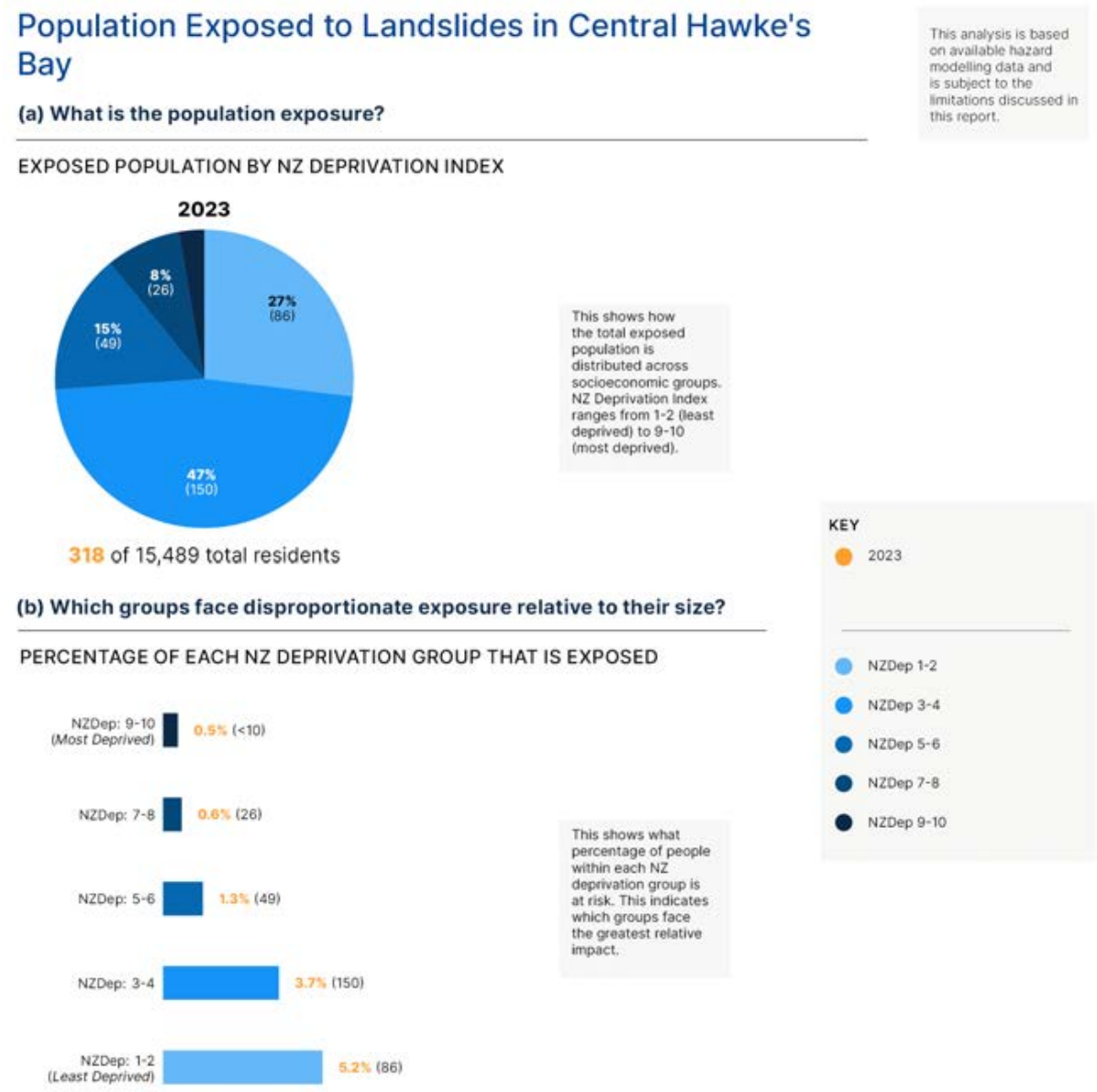

Population Exposed to Landslides in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2023
27% (86)
47% (150)
15% (49)
8% (26)
318 of 15,489 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived) 0.5% (<10)
NZDep: 7-8 0.6% (26)
NZDep: 5-6 1.3% (49)
NZDep: 3-4 3.7% (150)
NZDep: 1-2 (Least Deprived) 5.2% (86)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 25.

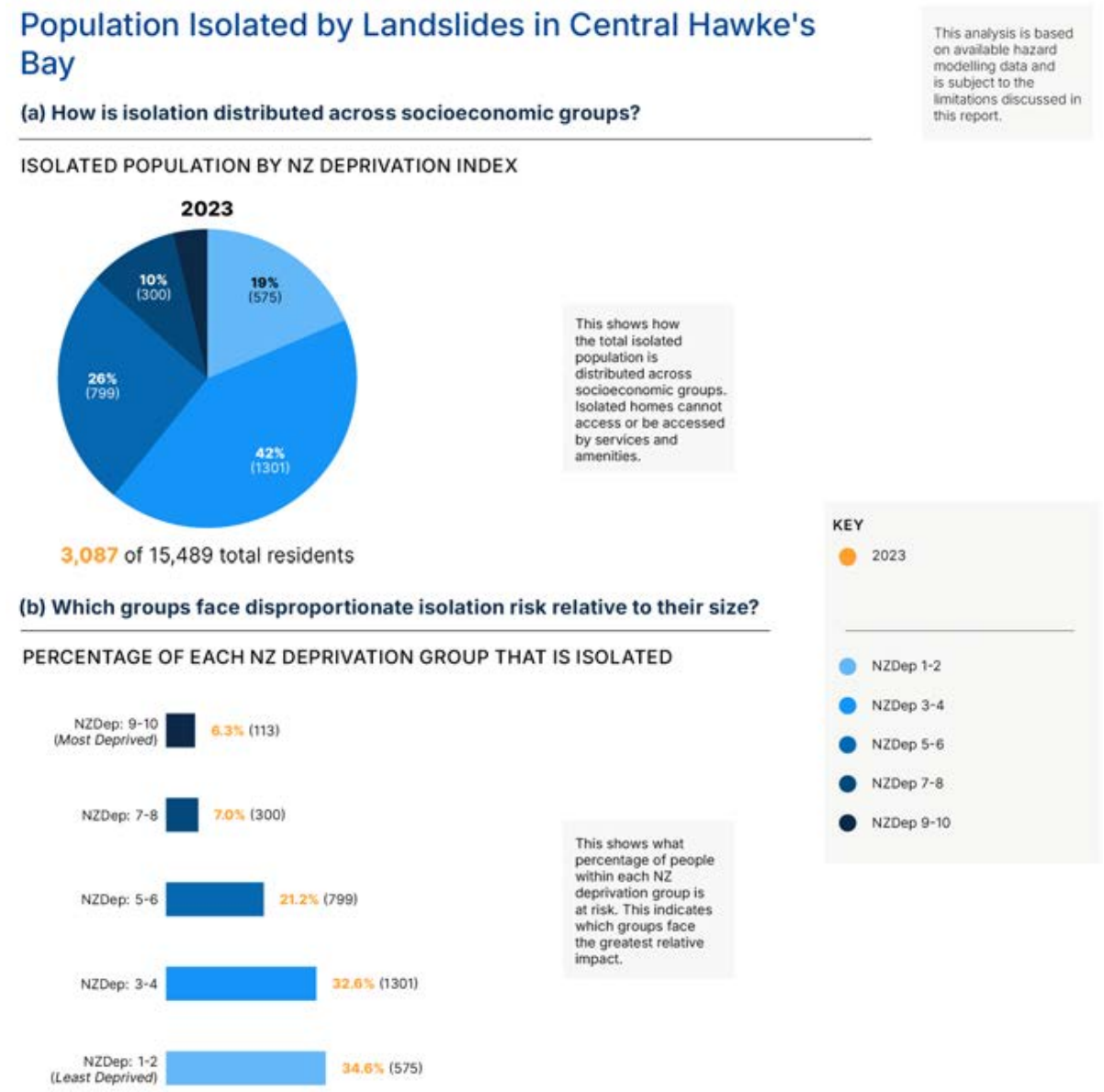

Population Isolated by Landslides in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2023
10% (300)
19% (575)
26% (799)
42% (1301)
3,087 of 15,489 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 6.3% (113)
NZDep: 7-8 7.0% (300)
NZDep: 5-6 21.2% (799)
NZDep: 3-4 32.6% (1301)
NZDep: 1-2 (Least Deprived) 34.6% (575)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 26.

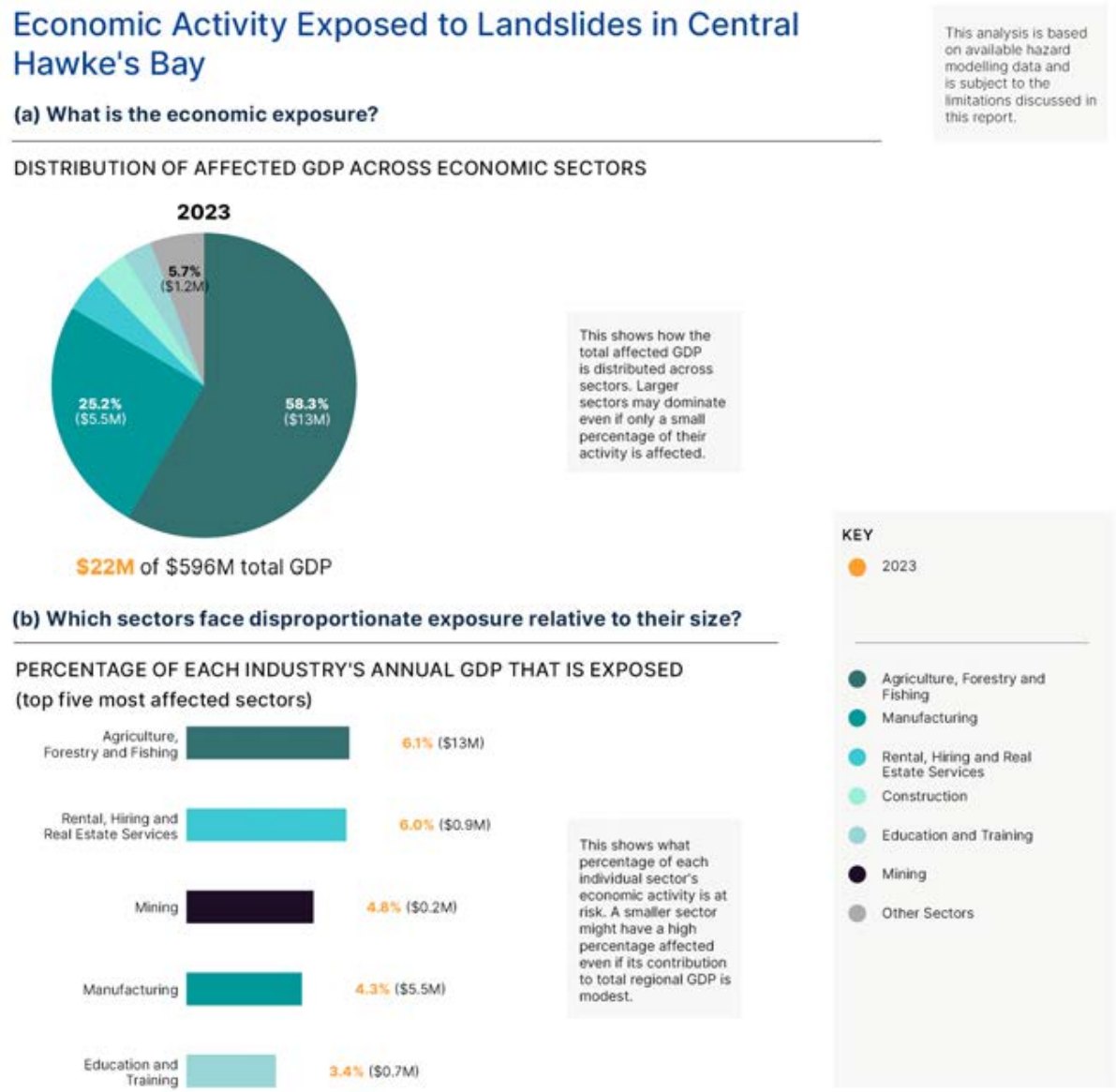

Economic Activity Exposed to Landslides in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
5.7% ($1.2M)
25.2% ($5.5M)
58.3% ($13M)
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
$22M of $596M total GDP
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Agriculture, Forestry and Fishing
6.1% ($13M)
Rental, Hiring and Real Estate Services
6.0% ($0.9M)
Mining
4.8% ($0.2M)
Manufacturing
4.3% ($5.5M)
Education and Training
3.4% ($0.7M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.
KEY
2023
Agriculture, Forestry and Fishing
Manufacturing
Rental, Hiring and Real Estate Services
Construction
Education and Training
Mining
Other Sectors

Figure A - 27.

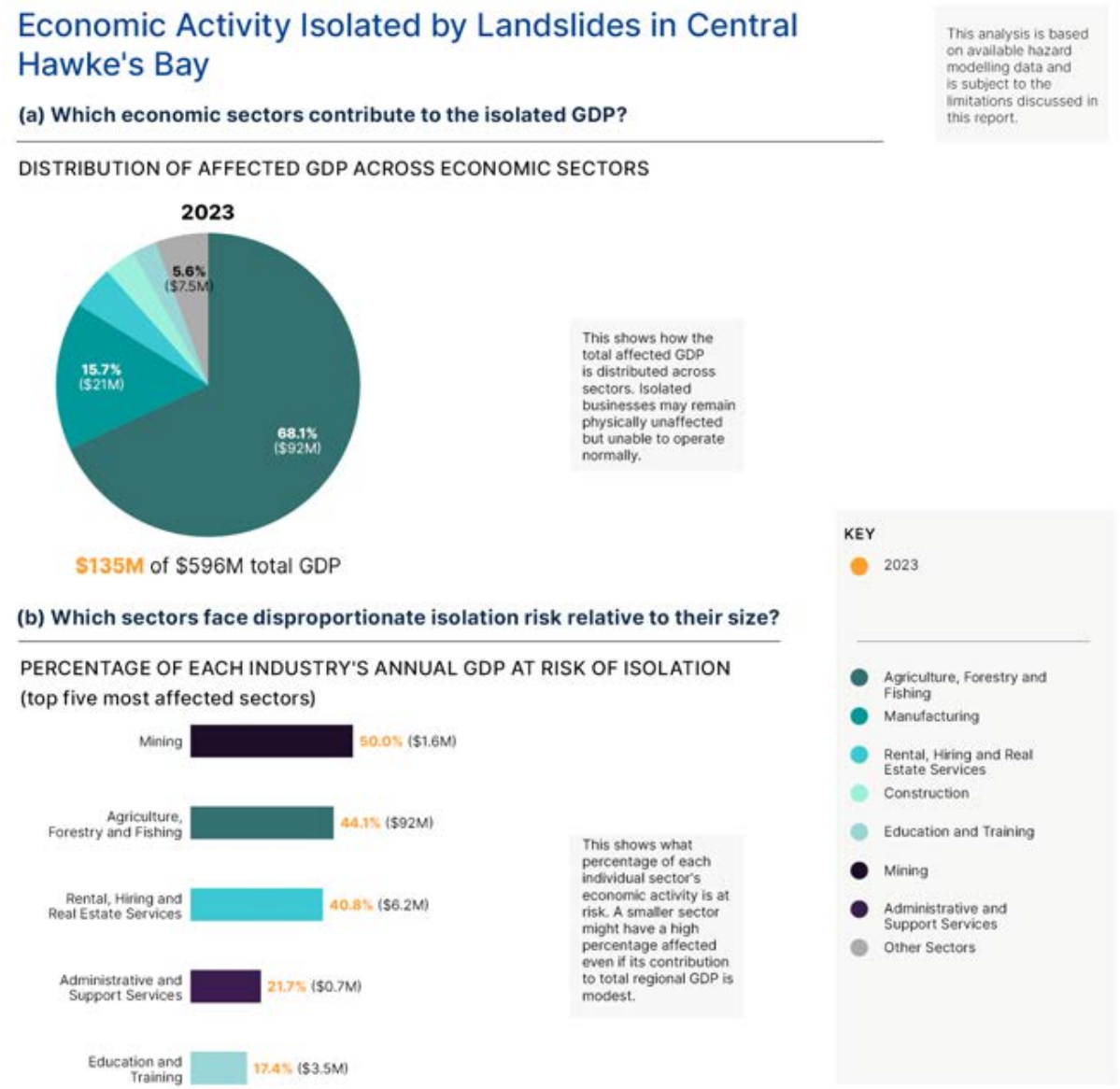

Economic Activity Isolated by Landslides in Central Hawke's Bay
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
5.6% ($7.5M)
15.7% ($21M)
68.1% ($92M)
$135M of $596M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2023
Agriculture, Forestry and Fishing
Manufacturing
Rental, Hiring and Real Estate Services
Construction
Education and Training
Mining
Administrative and Support Services
Other Sectors
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Mining 50.0% ($1.6M)
Agriculture, Forestry and Fishing 44.1% ($92M)
Rental, Hiring and Real Estate Services 40.8% ($6.2M)
Administrative and Support Services 21.7% ($0.7M)
Education and Training 17.4% ($3.5M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 28.

4.3 Hastings District

Figure A - 29 to Figure A - 40 illustrates the risk to residents and economic activity in Hastings based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects across different socioeconomic groups and industry sectors. The assessment methodology is detailed in Section 3 and Appendix A1.

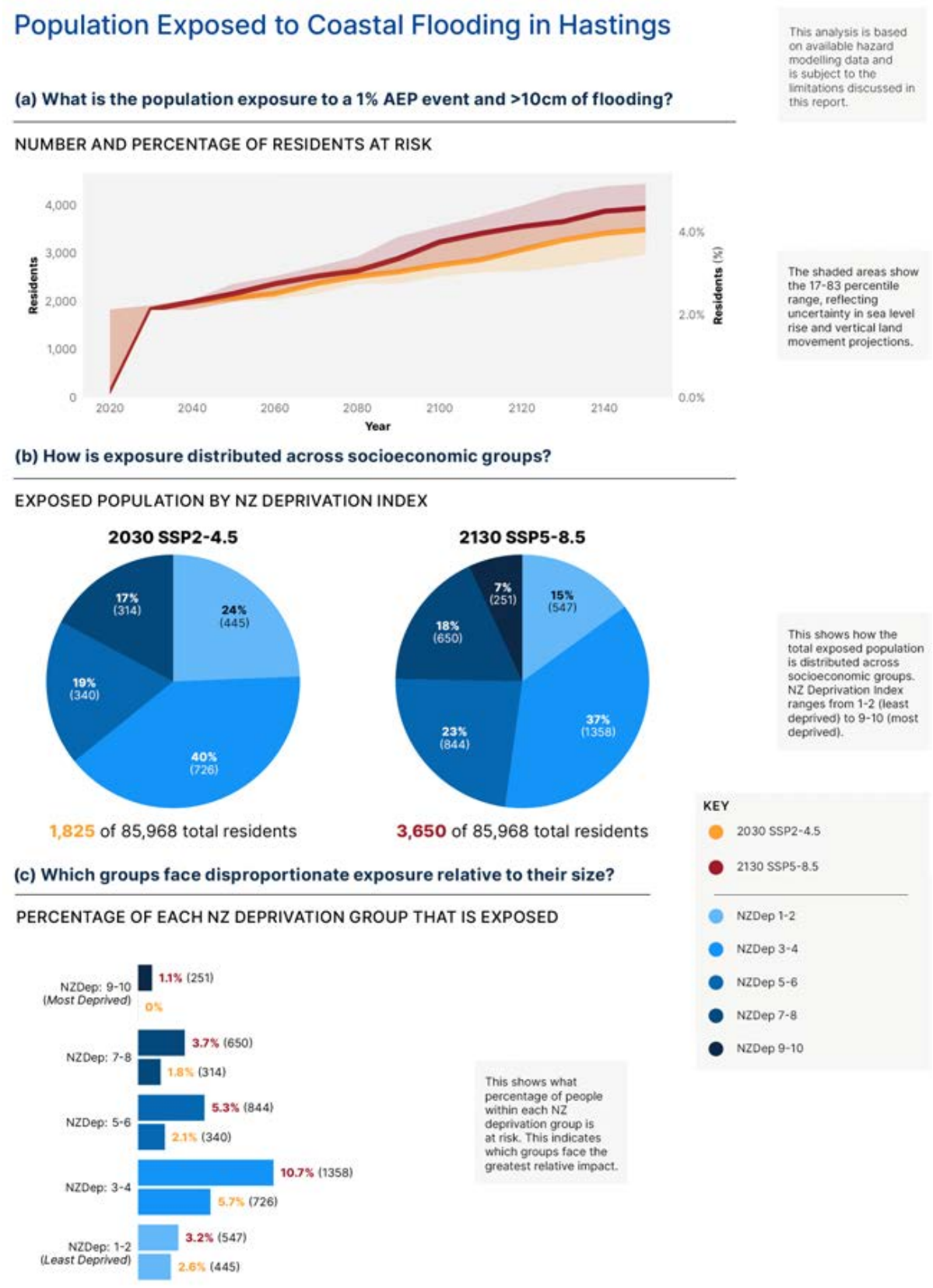

Population Exposed to Coastal Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
Residents
Residents (%)
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is exposure distributed across socioeconomic groups?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
2130 SSP5-8.5
1,825 of 85,968 total residents
3,650 of 85,968 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived)
NZDep: 7-8
NZDep: 5-6
NZDep: 3-4
NZDep: 1-2 (Least Deprived)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 29.

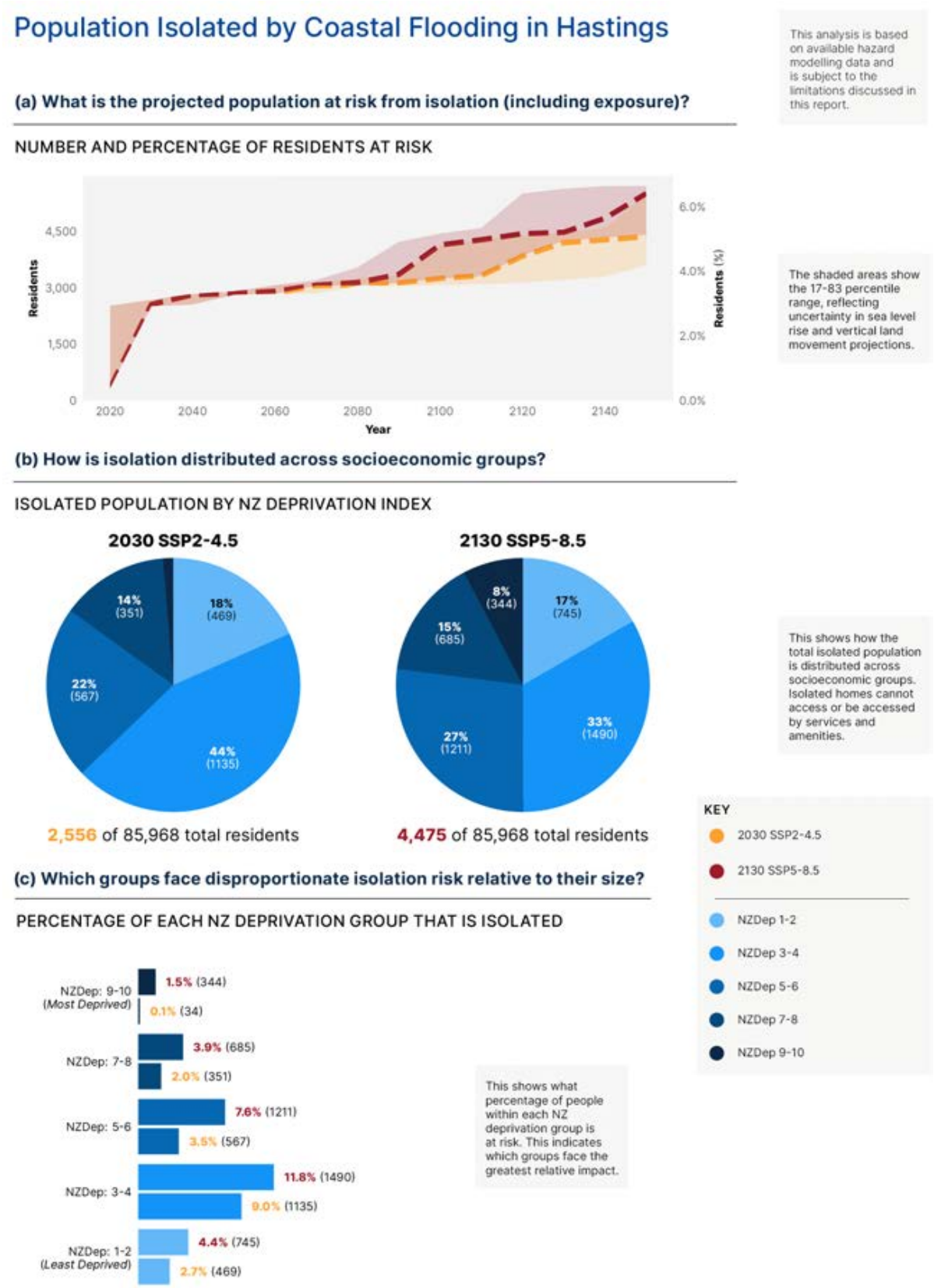

Population Isolated by Coastal Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the projected population at risk from isolation (including exposure)?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
Residents
4,500
3,000
1,500
0
6.0%
4.0%
2.0%
0.0%
Residents (%)
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
18% (469)
44% (1135)
22% (567)
14% (351)
2,556 of 85,968 total residents
2130 SSP5-8.5
17% (745)
33% (1490)
27% (1211)
15% (685)
8% (344)
4,475 of 85,968 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived)
1.5% (344)
0.1% (34)
NZDep: 7-8
3.9% (685)
2.0% (351)
NZDep: 5-6
7.6% (1211)
3.5% (567)
NZDep: 3-4
11.8% (1490)
9.0% (1135)
NZDep: 1-2 (Least Deprived)
4.4% (745)
2.7% (469)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 30.

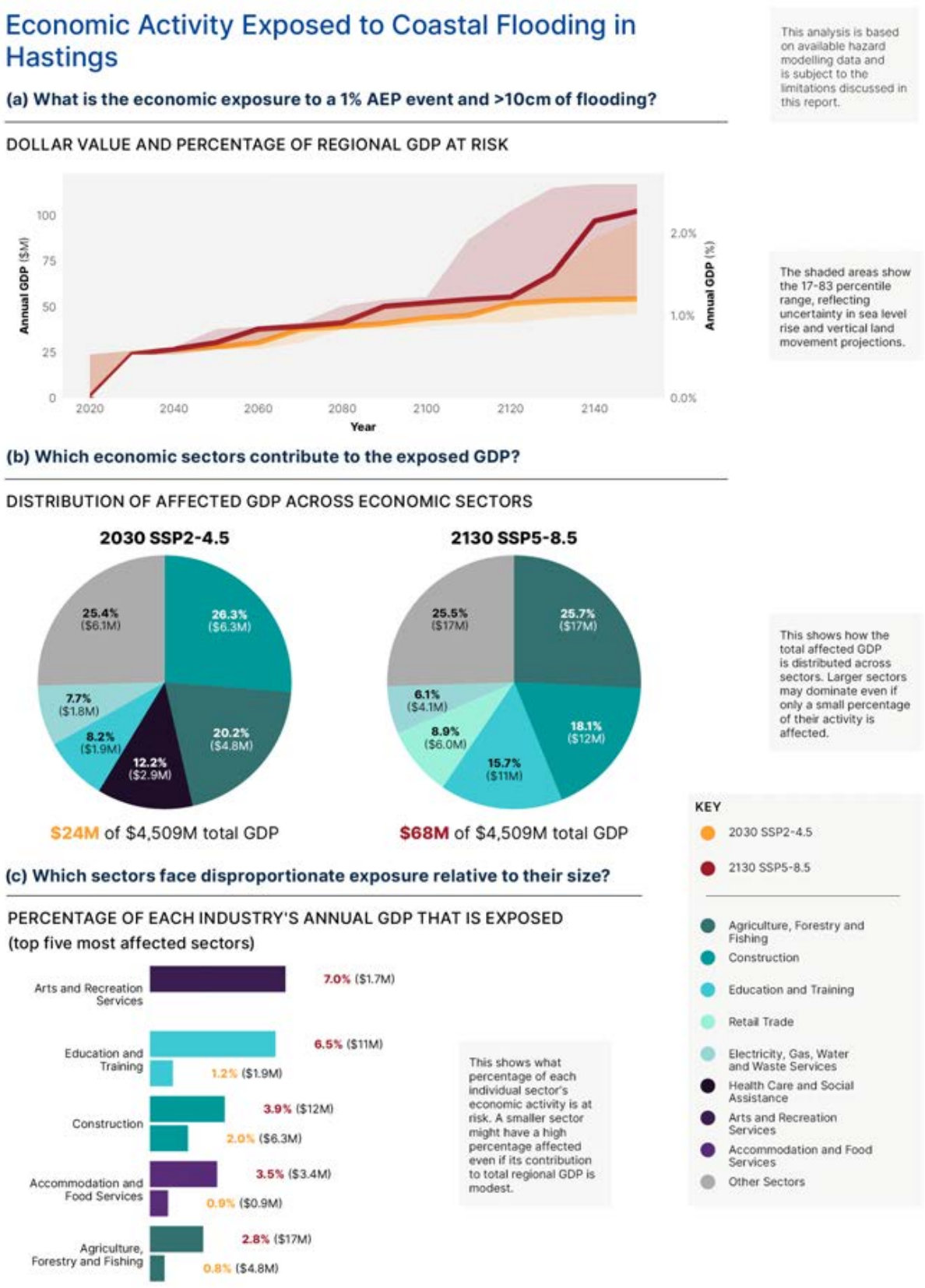

Economic Activity Exposed to Coastal Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% AEP event and >10cm of flooding?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
100
75
50
25
0
2020
2040
2060
2080
2100
2120
2140
Year
2.0%
1.0%
0.0%
Annual GDP (%)
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the exposed GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2030 SSP2-4.5
25.4% ($6.1M)
26.3% ($6.3M)
7.7% ($1.8M)
8.2% ($1.9M)
12.2% ($2.9M)
20.2% ($4.8M)
$24M of $4,509M total GDP
2130 SSP5-8.5
25.5% ($17M)
25.7% ($17M)
6.1% ($4.1M)
8.9% ($6.0M)
15.7% ($11M)
18.1% ($12M)
$68M of $4,509M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Agriculture, Forestry and Fishing
Construction
Education and Training
Retail Trade
Electricity, Gas, Water and Waste Services
Health Care and Social Assistance
Arts and Recreation Services
Accommodation and Food Services
Other Sectors
(c) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Arts and Recreation Services
7.0% ($1.7M)
Education and Training
6.5% ($11M)
1.2% ($1.9M)
Construction
3.9% ($12M)
2.0% ($6.3M)
Accommodation and Food Services
3.5% ($3.4M)
0.9% ($0.9M)
Agriculture, Forestry and Fishing
2.8% ($17M)
0.8% ($4.8M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 31.

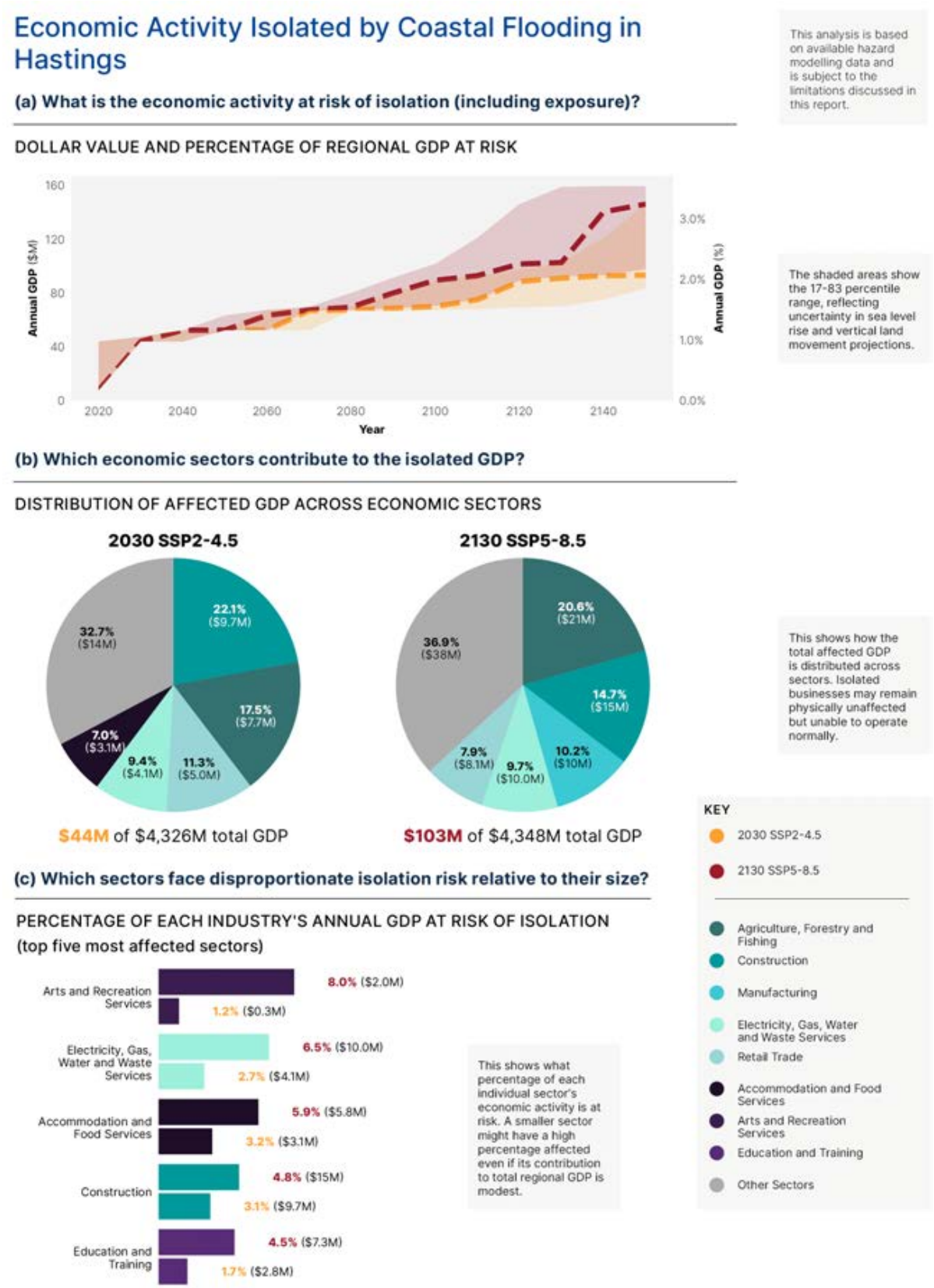

Economic Activity Isolated by Coastal Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic activity at risk of isolation (including exposure)?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
Annual GDP (%)
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2030 SSP2-4.5
2130 SSP5-8.5
22.1% ($9.7M)
32.7% ($14M)
17.5% ($7.7M)
7.0% ($3.1M)
9.4% ($4.1M)
11.3% ($5.0M)
20.6% ($21M)
36.9% ($38M)
14.7% ($15M)
7.9% ($8.1M)
9.7% ($10.0M)
10.2% ($10M)
$44M of $4,326M total GDP
$103M of $4,348M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Agriculture, Forestry and Fishing
Construction
Manufacturing
Electricity, Gas, Water and Waste Services
Retail Trade
Accommodation and Food Services
Arts and Recreation Services
Education and Training
Other Sectors
(c) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Arts and Recreation Services
8.0% ($2.0M)
1.2% ($0.3M)
Electricity, Gas, Water and Waste Services
6.5% ($10.0M)
2.7% ($4.1M)
Accommodation and Food Services
5.9% ($5.8M)
3.2% ($3.1M)
Construction
4.8% ($15M)
3.1% ($9.7M)
Education and Training
4.5% ($7.3M)
1.7% ($2.8M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 32.

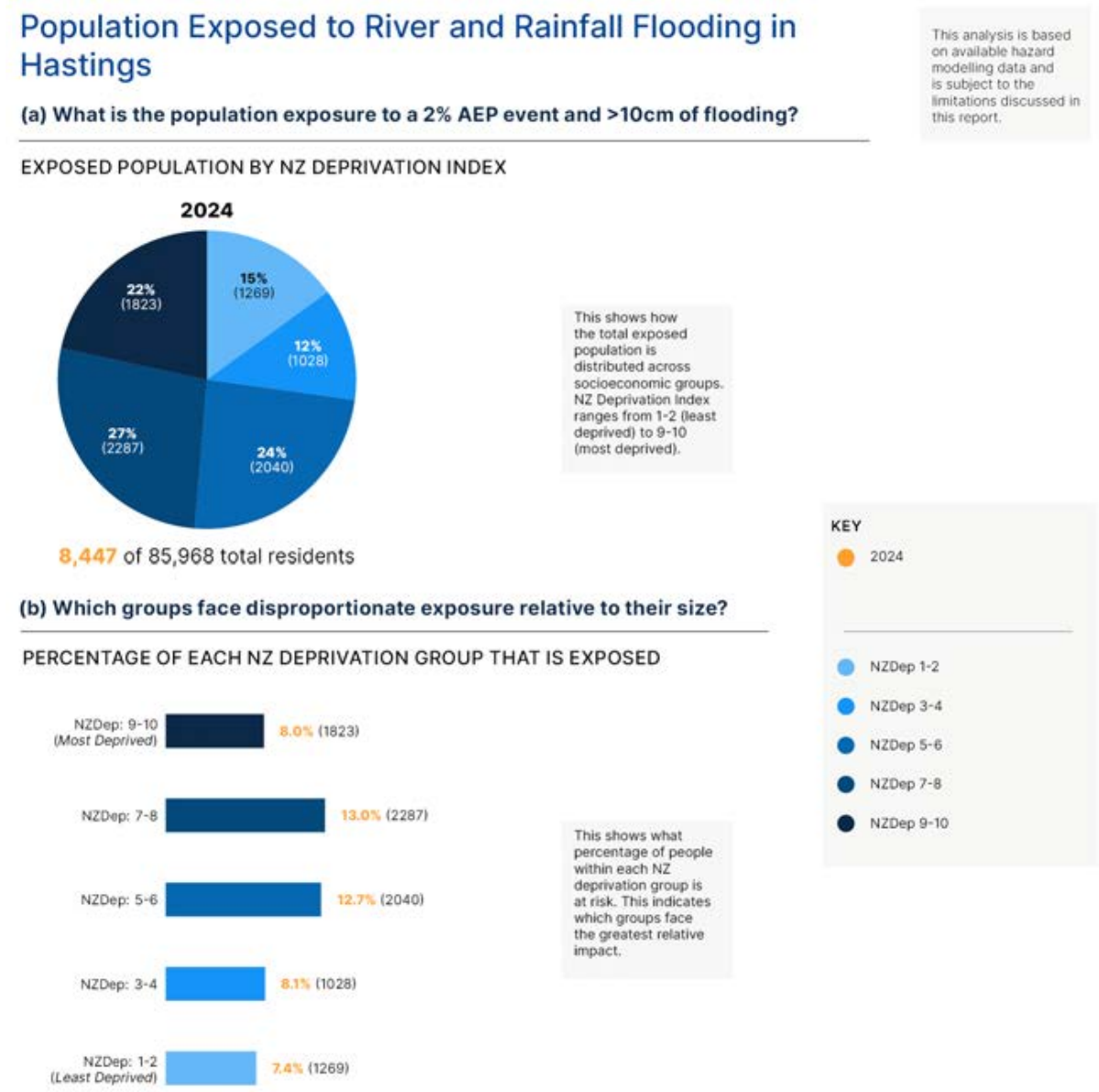

Population Exposed to River and Rainfall Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 2% AEP event and >10cm of flooding?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2024
15% (1269)
12% (1028)
24% (2040)
27% (2287)
22% (1823)
8,447 of 85,968 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2024
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived) 8.0% (1823)
NZDep: 7-8 13.0% (2287)
NZDep: 5-6 12.7% (2040)
NZDep: 3-4 8.1% (1028)
NZDep: 1-2 (Least Deprived) 7.4% (1269)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 33.

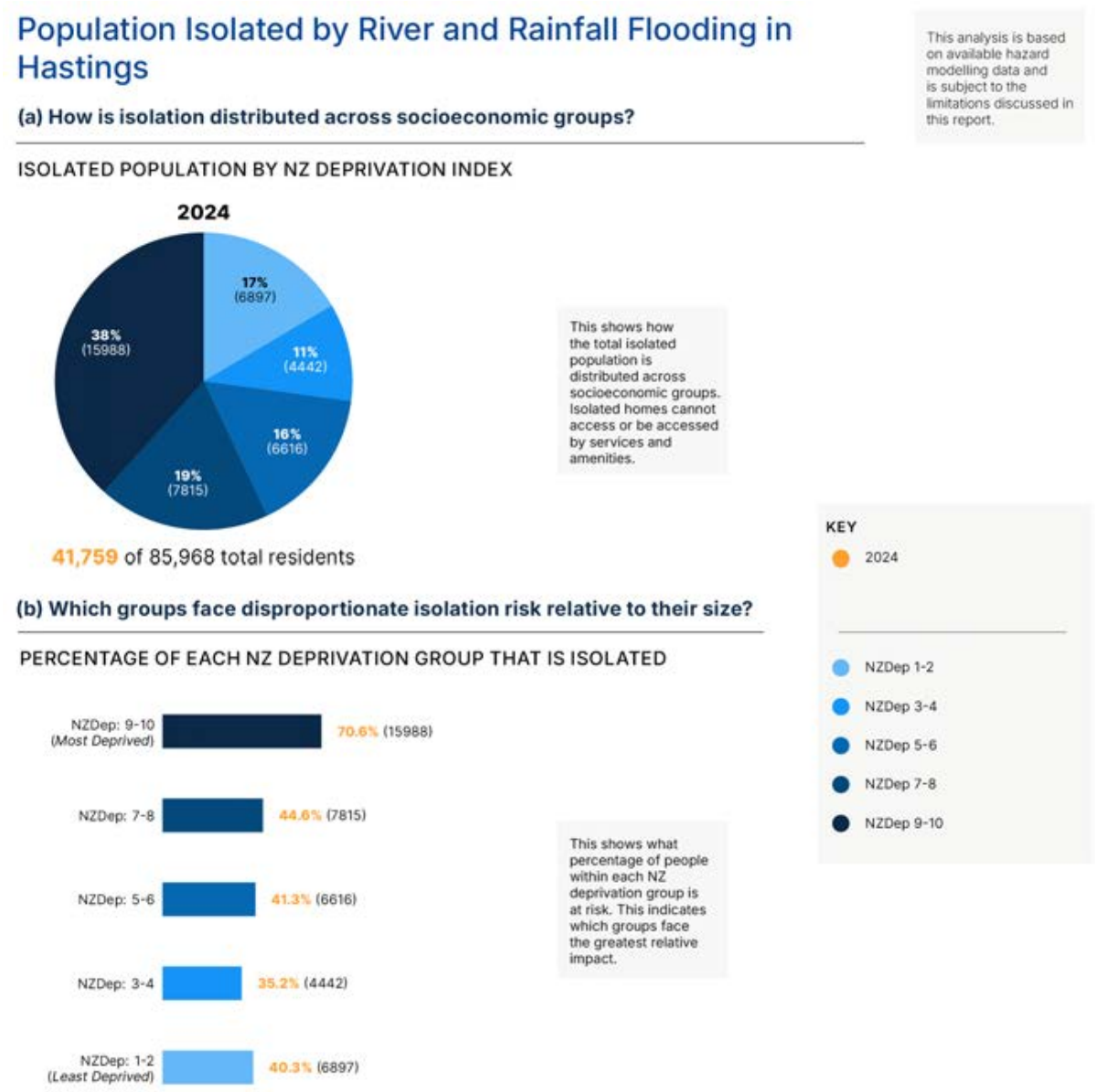

Population Isolated by River and Rainfall Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2024
17% (6897)
11% (4442)
16% (6616)
19% (7815)
38% (15988)
41,759 of 85,968 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2024
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 70.6% (15988)
NZDep: 7-8 44.6% (7815)
NZDep: 5-6 41.3% (6616)
NZDep: 3-4 35.2% (4442)
NZDep: 1-2 (Least Deprived) 40.3% (6897)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 34.

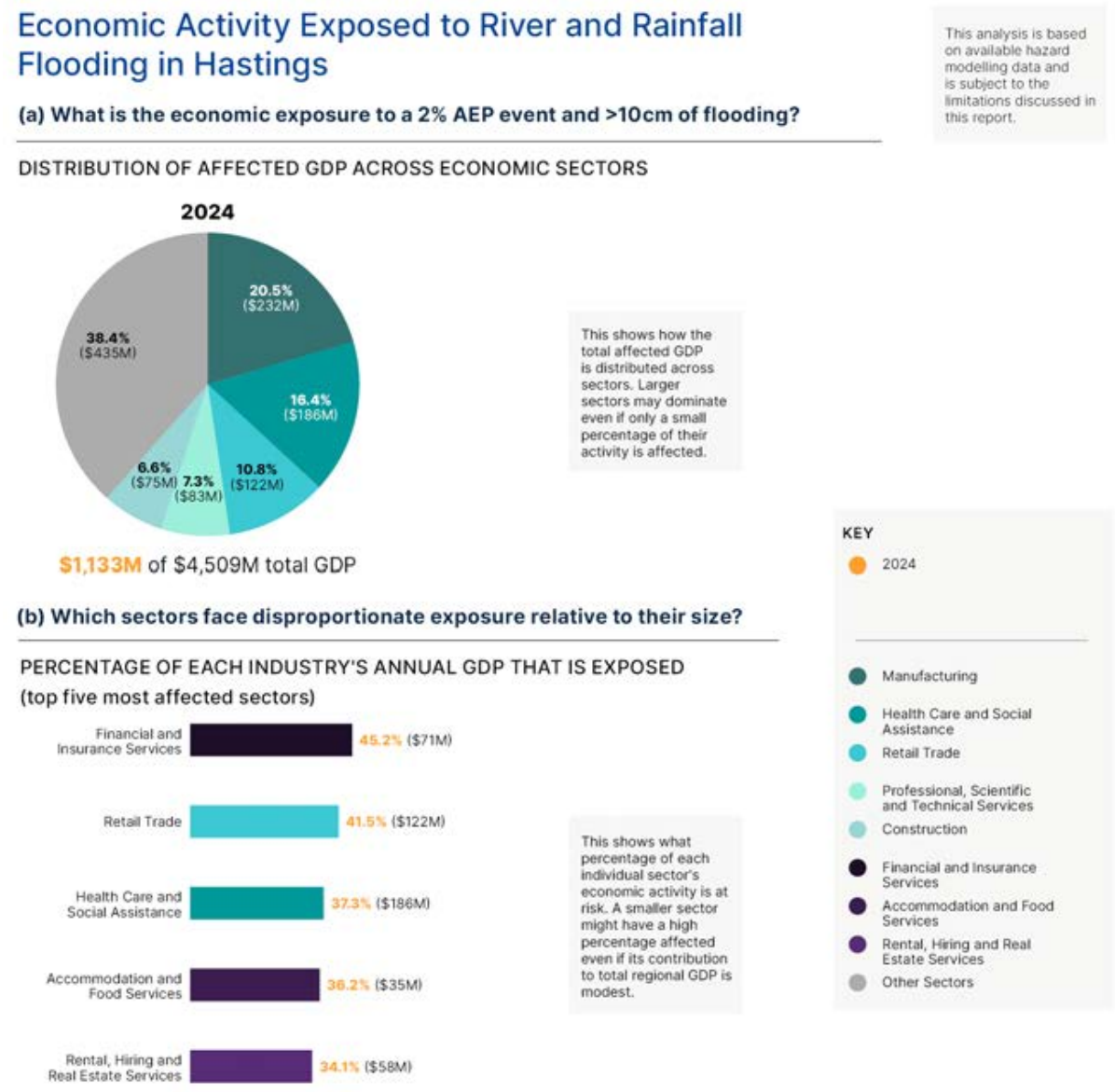

Economic Activity Exposed to River and Rainfall Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 2% AEP event and >10cm of flooding?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2024
20.5% ($232M)
16.4% ($186M)
10.8% ($122M)
7.3% ($83M)
6.6% ($75M)
38.4% ($435M)
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
$1,133M of $4,509M total GDP
KEY
2024
Manufacturing
Health Care and Social Assistance
Retail Trade
Professional, Scientific and Technical Services
Construction
Financial and Insurance Services
Accommodation and Food Services
Rental, Hiring and Real Estate Services
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Financial and Insurance Services
45.2% ($71M)
Retail Trade
41.5% ($122M)
Health Care and Social Assistance
37.3% ($186M)
Accommodation and Food Services
36.2% ($35M)
Rental, Hiring and Real Estate Services
34.1% ($58M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 35.

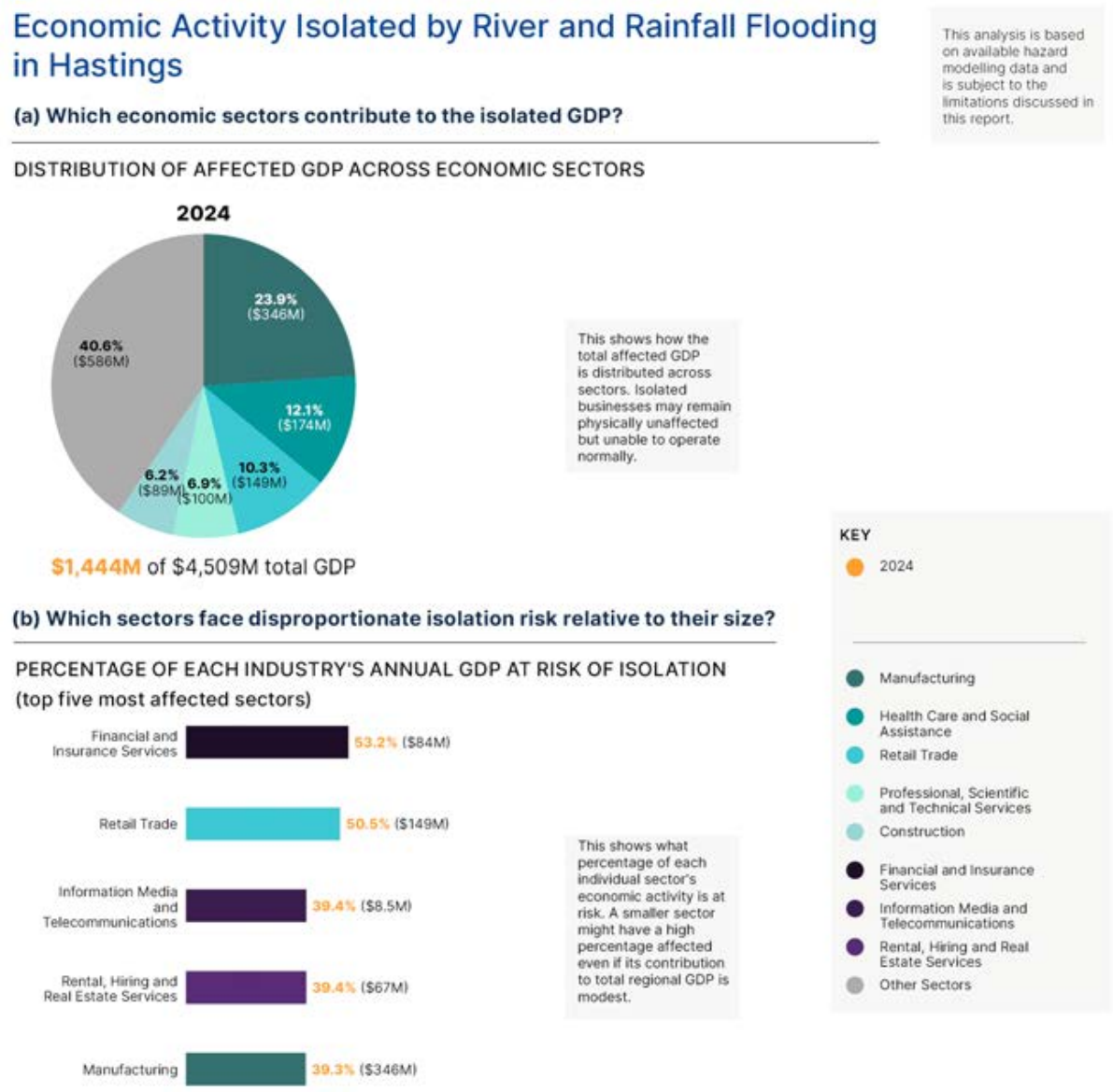

Economic Activity Isolated by River and Rainfall Flooding in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2024
23.9% ($346M)
12.1% ($174M)
10.3% ($149M)
6.9% ($100M)
6.2% ($89M)
40.6% ($586M)
$1,444M of $4,509M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2024
Manufacturing
Health Care and Social Assistance
Retail Trade
Professional, Scientific and Technical Services
Construction
Financial and Insurance Services
Information Media and Telecommunications
Rental, Hiring and Real Estate Services
Other Sectors
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Financial and Insurance Services
53.2% ($84M)
Retail Trade
50.5% ($149M)
Information Media and Telecommunications
39.4% ($8.5M)
Rental, Hiring and Real Estate Services
39.4% ($67M)
Manufacturing
39.3% ($346M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 36.

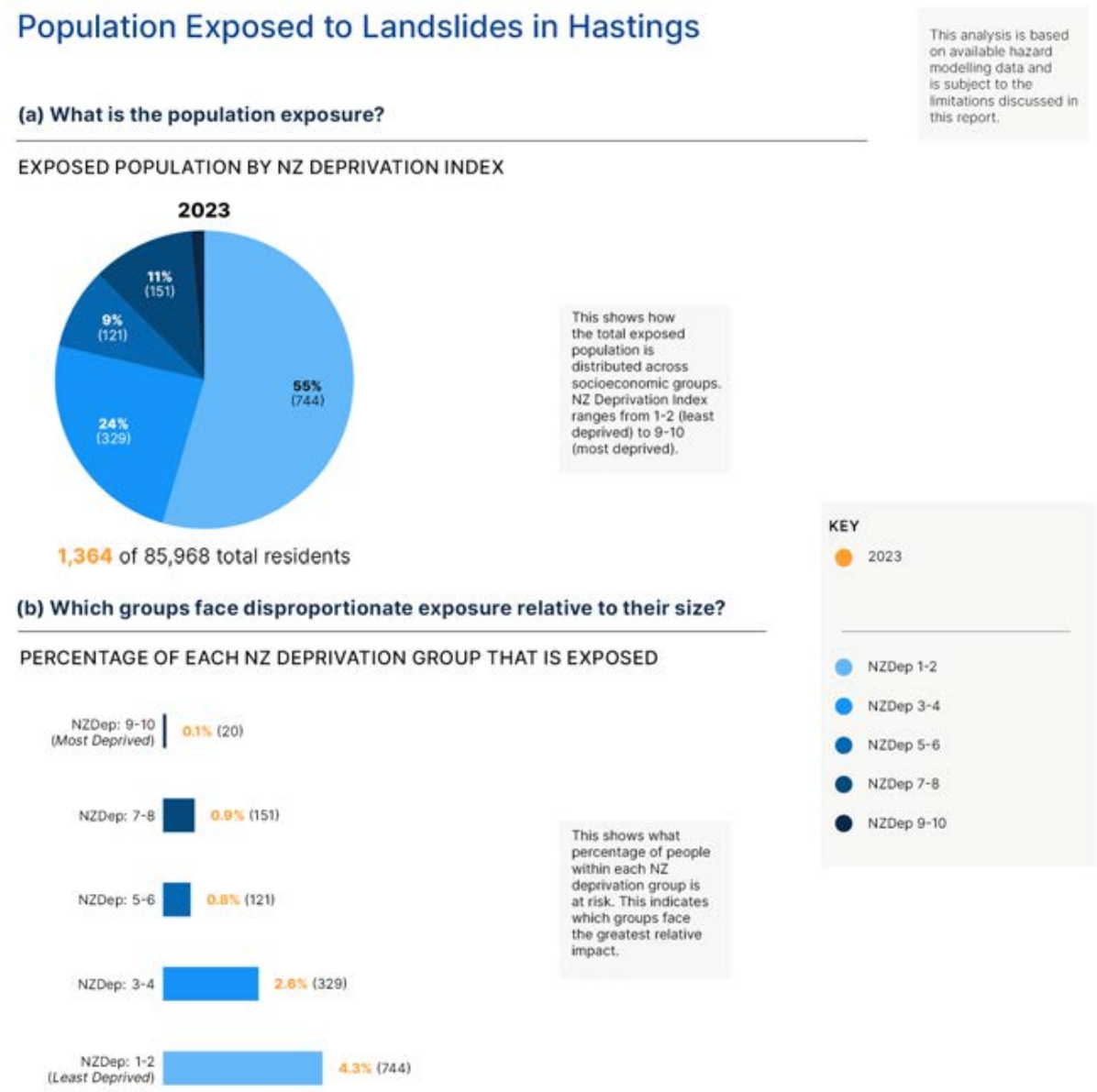

Population Exposed to Landslides in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2023
11% (151)
9% (121)
55% (744)
24% (329)
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
1,364 of 85,968 total residents
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived) 0.1% (20)
NZDep: 7-8 0.9% (151)
NZDep: 5-6 0.8% (121)
NZDep: 3-4 2.6% (329)
NZDep: 1-2 (Least Deprived) 4.3% (744)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 37.

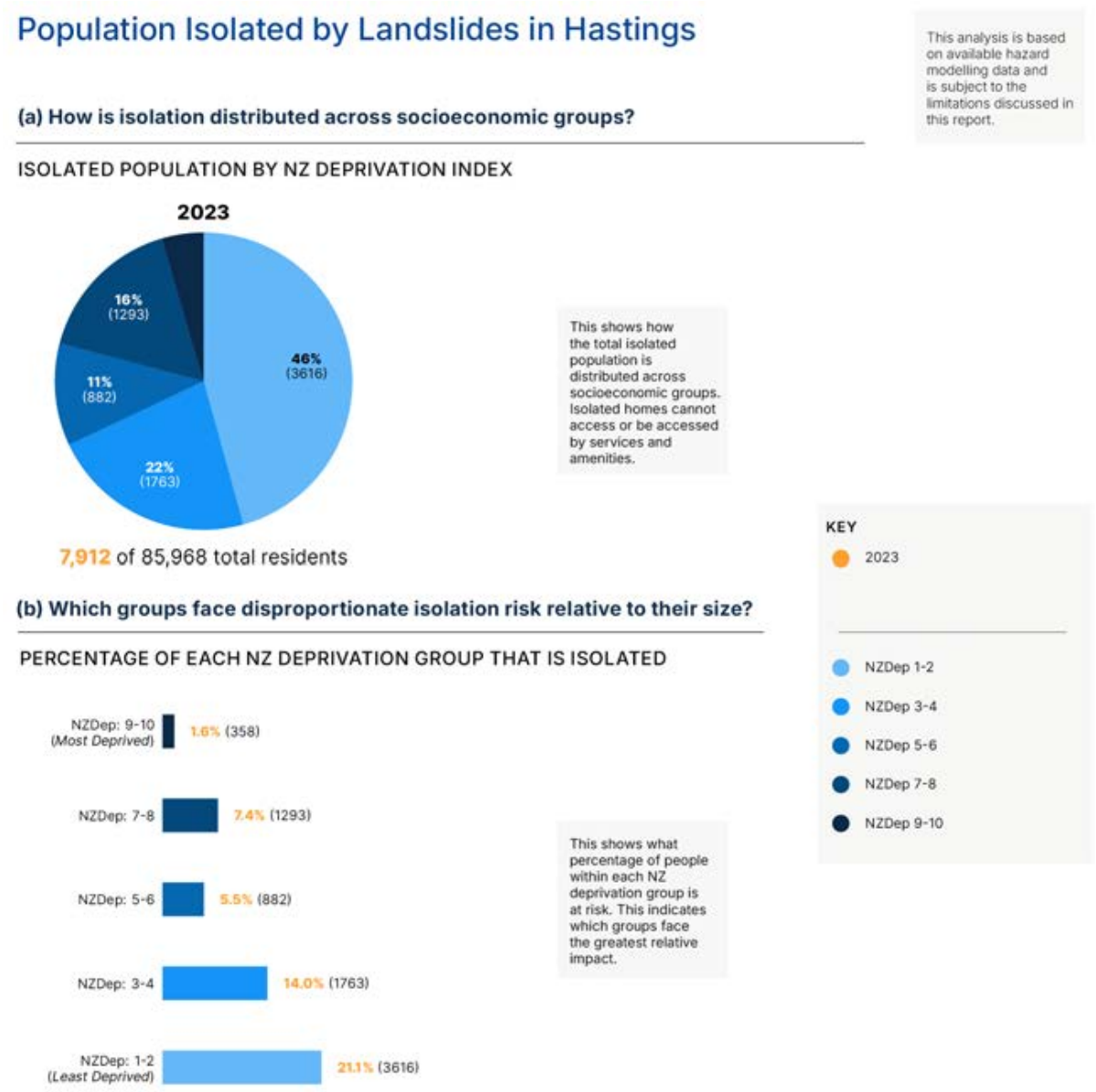

Population Isolated by Landslides in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2023
16% (1293)
46% (3616)
11% (882)
22% (1763)
7,912 of 85,968 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 1.6% (358)
NZDep: 7-8 7.4% (1293)
NZDep: 5-6 5.5% (882)
NZDep: 3-4 14.0% (1763)
NZDep: 1-2 (Least Deprived) 21.1% (3616)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 38.

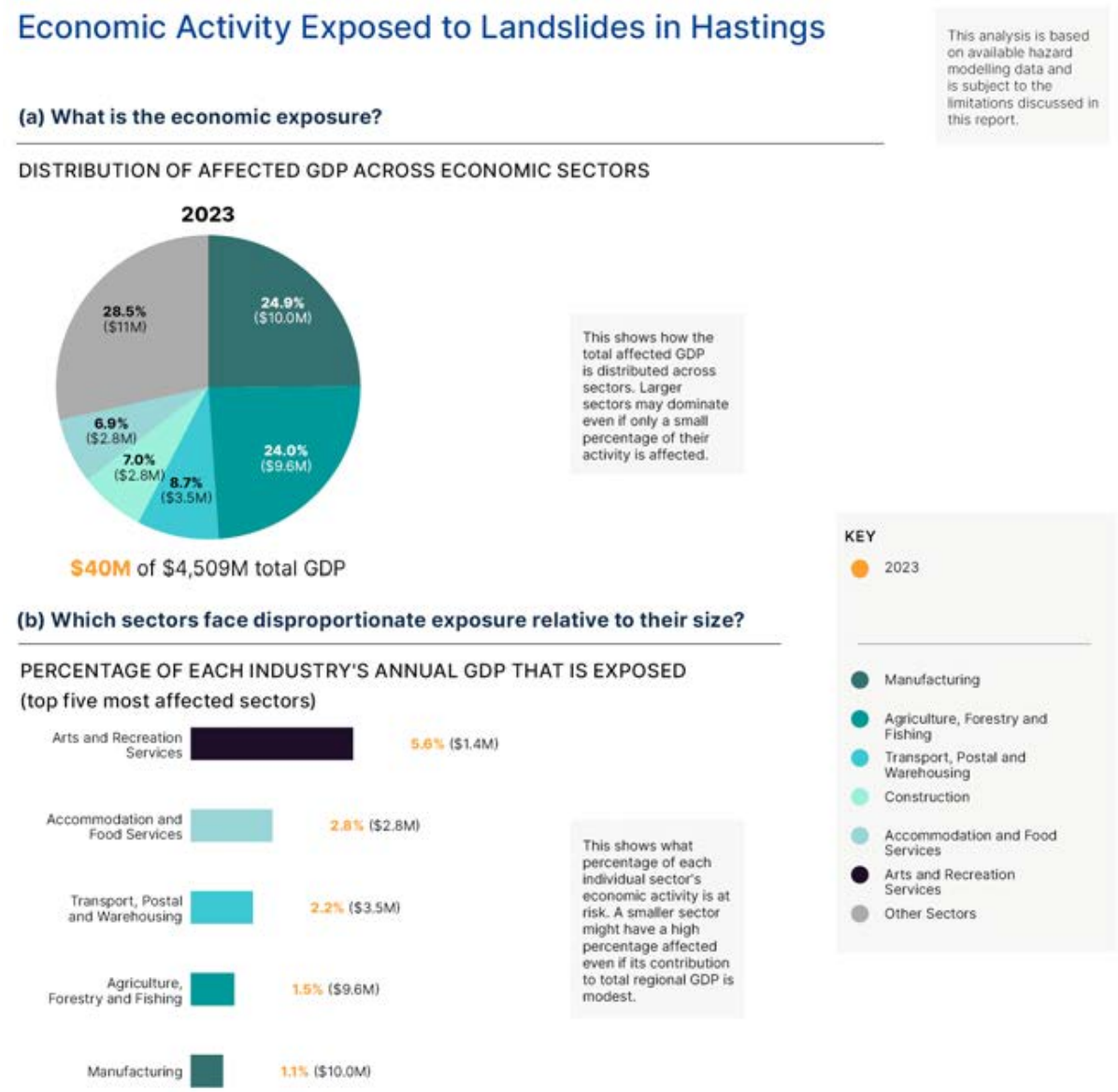

Economic Activity Exposed to Landslides in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
24.9% ($10.0M)
24.0% ($9.6M)
8.7% ($3.5M)
7.0% ($2.8M)
6.9% ($2.8M)
28.5% ($11M)
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
$40M of $4,509M total GDP
KEY
2023
Manufacturing
Agriculture, Forestry and Fishing
Transport, Postal and Warehousing
Construction
Accommodation and Food Services
Arts and Recreation Services
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Arts and Recreation Services
5.6% ($1.4M)
Accommodation and Food Services
2.8% ($2.8M)
Transport, Postal and Warehousing
2.2% ($3.5M)
Agriculture, Forestry and Fishing
1.5% ($9.6M)
Manufacturing
1.1% ($10.0M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 39.

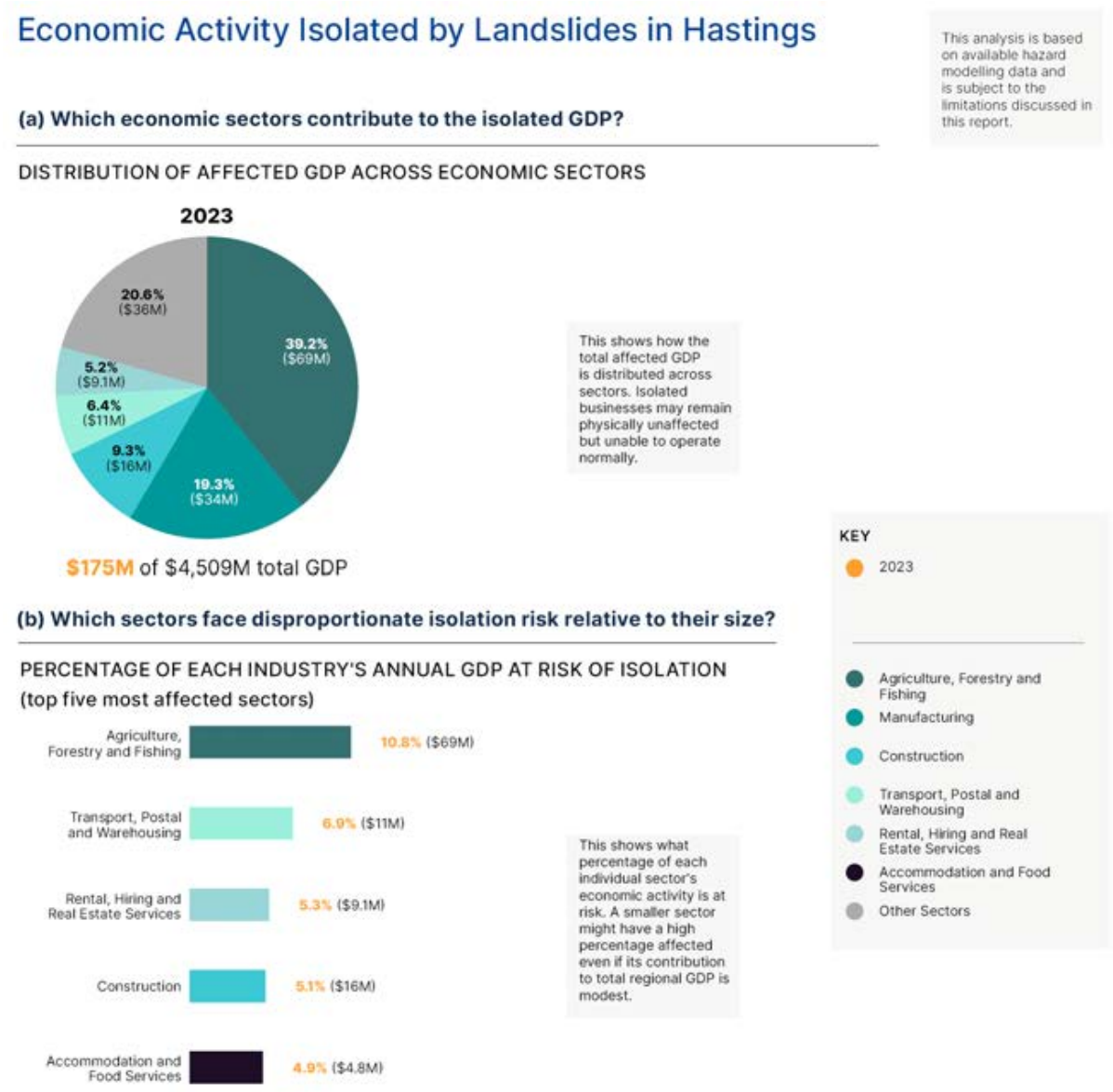

Economic Activity Isolated by Landslides in Hastings
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
20.6% ($36M)
39.2% ($69M)
5.2% ($9.1M)
6.4% ($11M)
9.3% ($16M)
19.3% ($34M)
$175M of $4,509M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2023
Agriculture, Forestry and Fishing
Manufacturing
Construction
Transport, Postal and Warehousing
Rental, Hiring and Real Estate Services
Accommodation and Food Services
Other Sectors
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Agriculture, Forestry and Fishing
10.8% ($69M)
Transport, Postal and Warehousing
6.9% ($11M)
Rental, Hiring and Real Estate Services
5.3% ($9.1M)
Construction
5.1% ($16M)
Accommodation and Food Services
4.9% ($4.8M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 40.

4.4 Napier City

Figure A - 41 to Figure A - 48illustrates the risk to residents and economic activity in Napier based on exposure to and isolation resulting from coastal flooding, and river and rainfall flooding. Due to limited landslide data provided/available for this assessment, landslide results are not included. These visualisations include both direct exposure and potential isolation effects across different socioeconomic groups and industry sectors. The assessment methodology is detailed in Section 3 and Appendix A1.

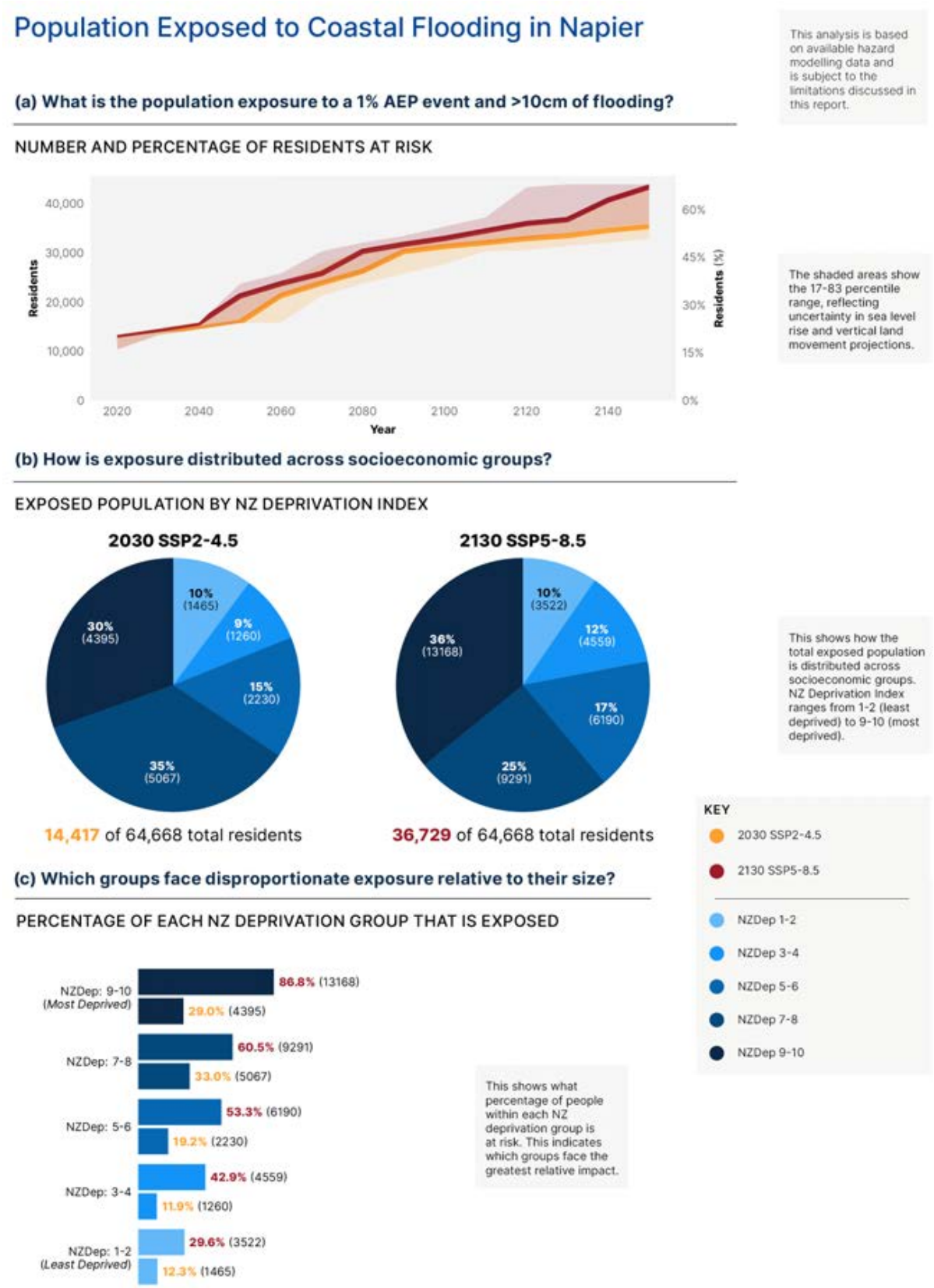

Population Exposed to Coastal Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
Residents
Residents (%)
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is exposure distributed across socioeconomic groups?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
2130 SSP5-8.5
10% (1465)
9% (1260)
15% (2230)
35% (5067)
30% (4395)
10% (3522)
12% (4559)
17% (6190)
25% (9291)
36% (13168)
14,417 of 64,668 total residents
36,729 of 64,668 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived)
86.8% (13168)
29.0% (4395)
NZDep: 7-8
60.5% (9291)
33.0% (5067)
NZDep: 5-6
53.3% (6190)
19.2% (2230)
NZDep: 3-4
42.9% (4559)
11.9% (1260)
NZDep: 1-2 (Least Deprived)
29.6% (3522)
12.3% (1465)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 41.

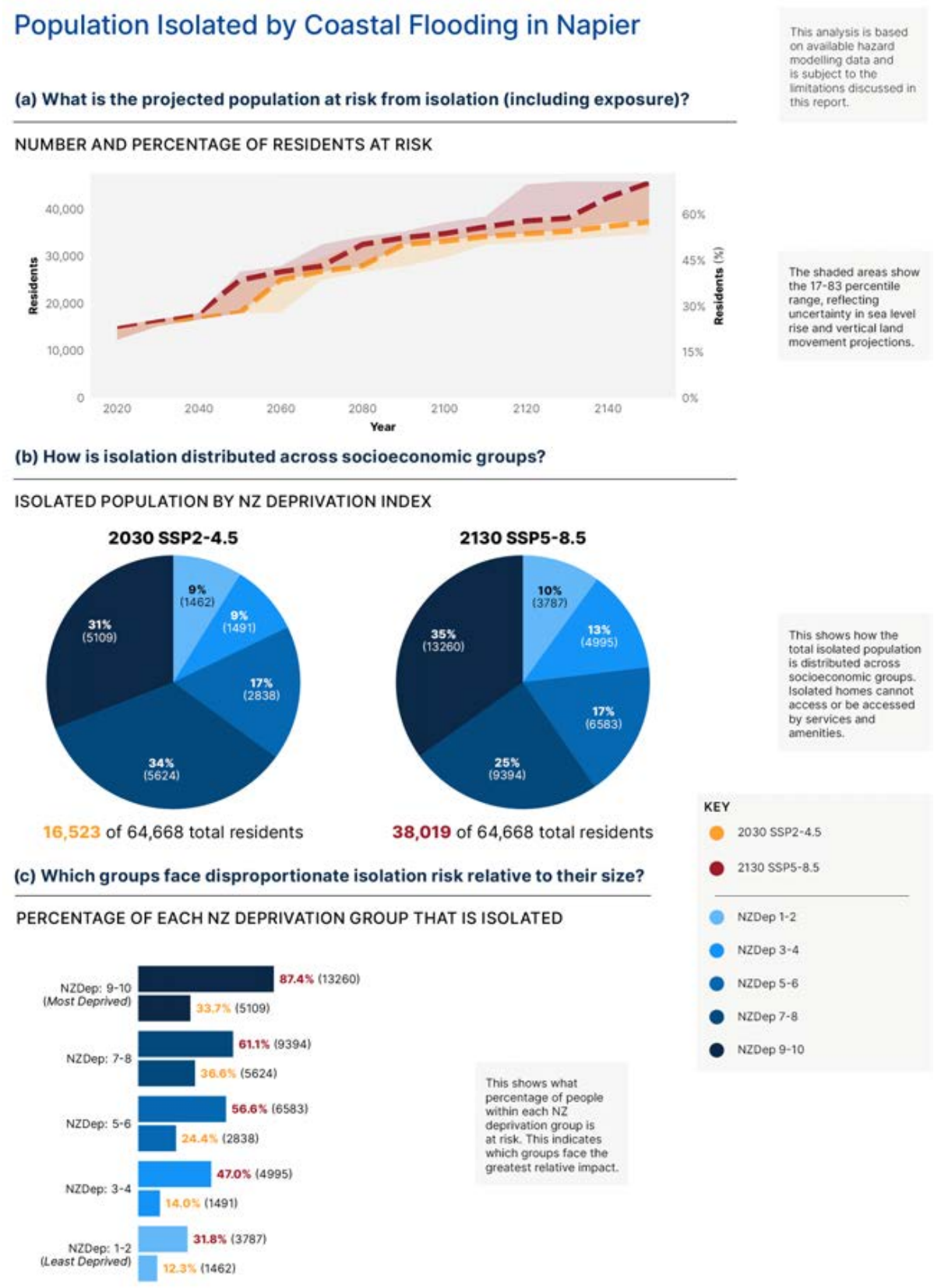

Population Isolated by Coastal Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the projected population at risk from isolation (including exposure)?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
40,000
30,000
20,000
10,000
0
Residents
60%
45%
30%
15%
0%
Residents (%)
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
9% (1462)
9% (1491)
17% (2838)
34% (5624)
31% (5109)
16,523 of 64,668 total residents
2130 SSP5-8.5
10% (3787)
13% (4995)
17% (6583)
25% (9394)
35% (13260)
38,019 of 64,668 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived)
87.4% (13260)
33.7% (5109)
NZDep: 7-8
61.1% (9394)
36.6% (5624)
NZDep: 5-6
56.6% (6583)
24.4% (2838)
NZDep: 3-4
47.0% (4995)
14.0% (1491)
NZDep: 1-2 (Least Deprived)
31.8% (3787)
12.3% (1462)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 42.

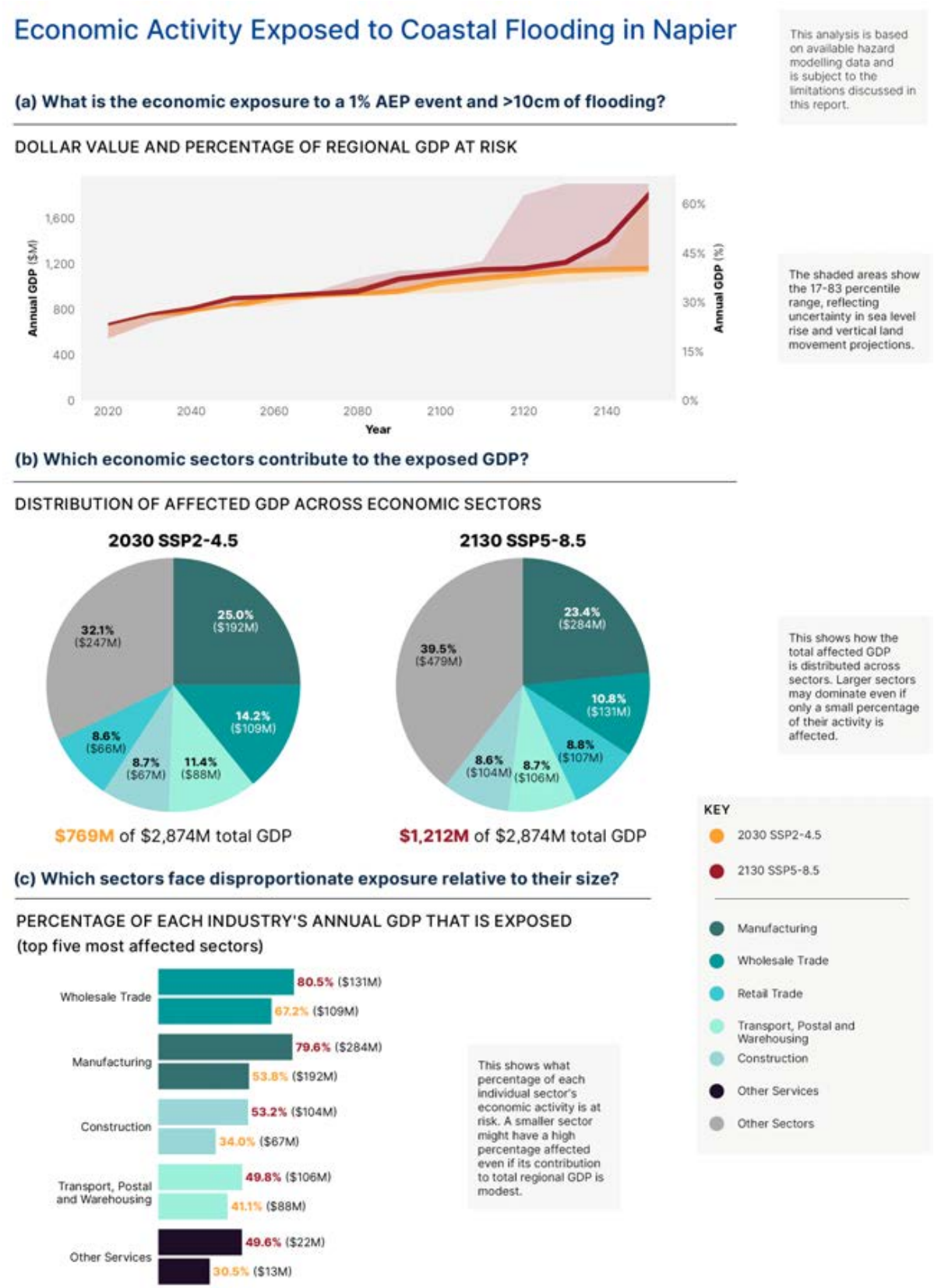

Economic Activity Exposed to Coastal Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% AEP event and >10cm of flooding?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
1,600
1,200
800
400
0
Annual GDP (%)
60%
45%
30%
15%
0%
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the exposed GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2030 SSP2-4.5
25.0% ($192M)
14.2% ($109M)
11.4% ($88M)
8.7% ($67M)
8.6% ($66M)
32.1% ($247M)
$769M of $2,874M total GDP
2130 SSP5-8.5
23.4% ($284M)
10.8% ($131M)
8.8% ($107M)
8.7% ($106M)
8.6% ($104M)
39.5% ($479M)
$1,212M of $2,874M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Manufacturing
Wholesale Trade
Retail Trade
Transport, Postal and Warehousing
Construction
Other Services
Other Sectors
(c) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Wholesale Trade
80.5% ($131M)
67.2% ($109M)
Manufacturing
79.6% ($284M)
53.8% ($192M)
Construction
53.2% ($104M)
34.0% ($67M)
Transport, Postal and Warehousing
49.8% ($106M)
41.1% ($88M)
Other Services
49.6% ($22M)
30.5% ($13M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 43.

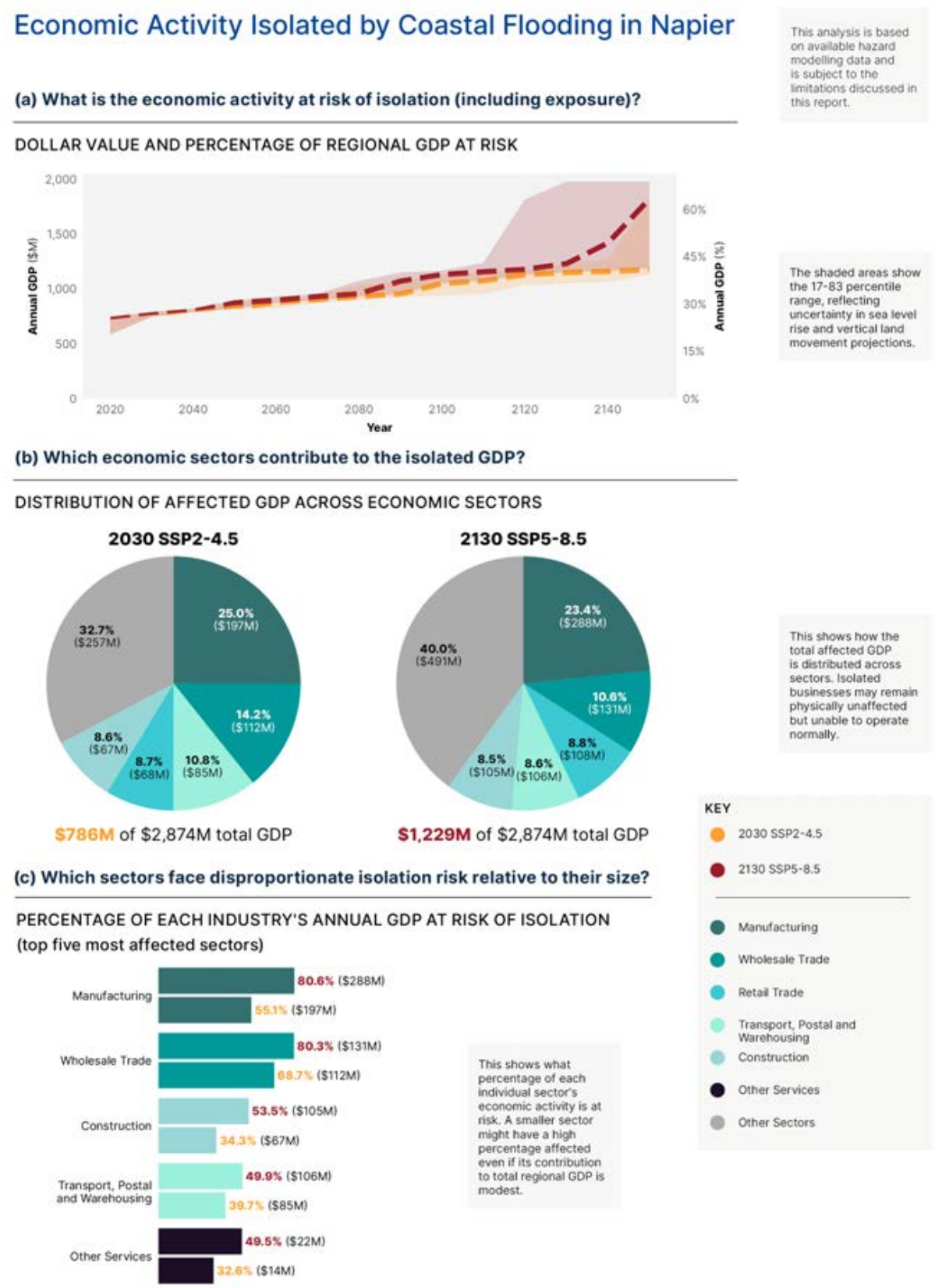

Economic Activity Isolated by Coastal Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic activity at risk of isolation (including exposure)?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
Annual GDP (%)
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2030 SSP2-4.5
2130 SSP5-8.5
$786M of $2,874M total GDP
$1,229M of $2,874M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Manufacturing
Wholesale Trade
Retail Trade
Transport, Postal and Warehousing
Construction
Other Services
Other Sectors
(c) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Manufacturing
Wholesale Trade
Construction
Transport, Postal and Warehousing
Other Services
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 44.

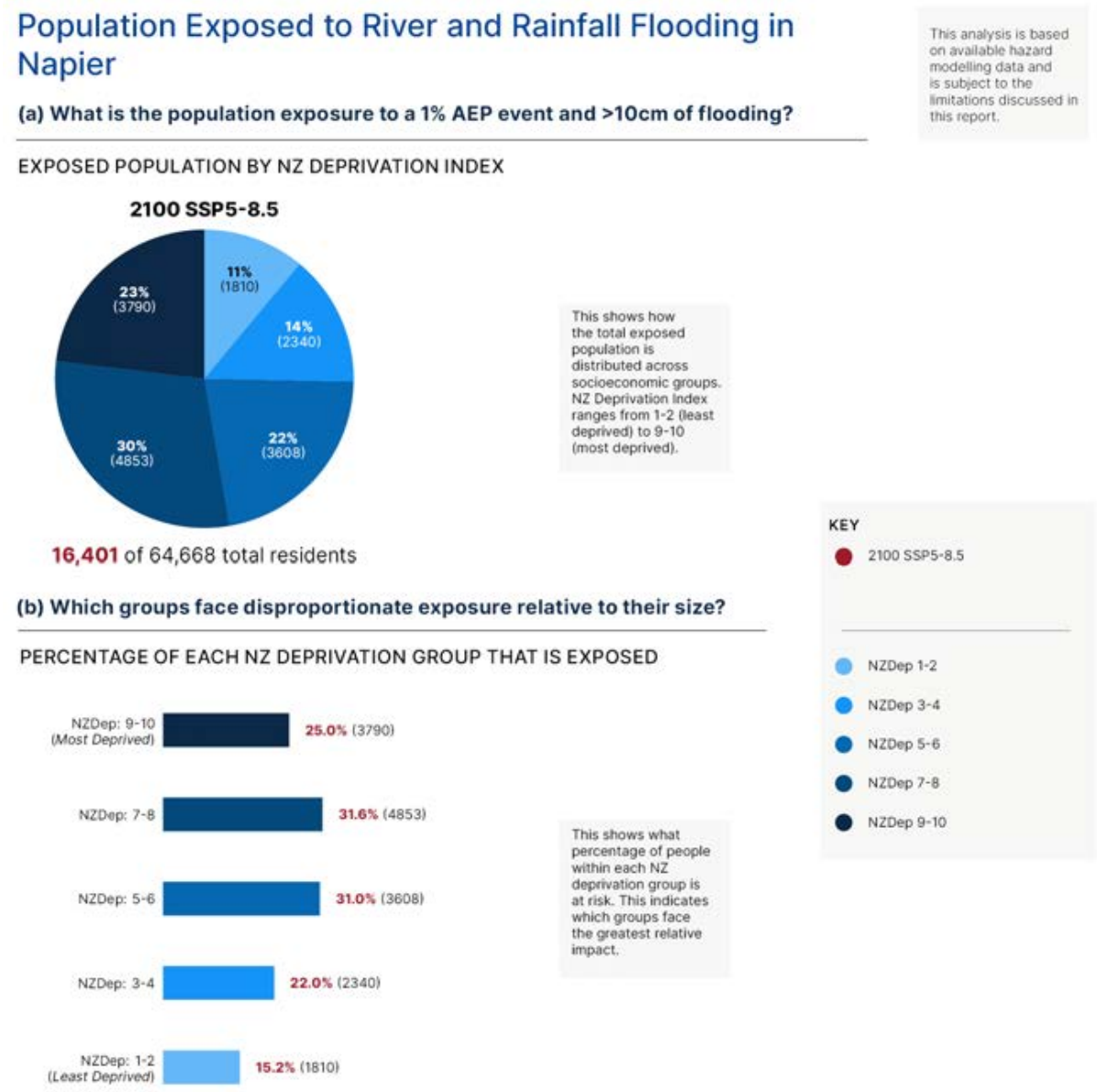

Population Exposed to River and Rainfall Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2100 SSP5-8.5
11% (1810)
14% (2340)
22% (3608)
30% (4853)
23% (3790)
16,401 of 64,668 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2100 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived) 25.0% (3790)
NZDep: 7-8 31.6% (4853)
NZDep: 5-6 31.0% (3608)
NZDep: 3-4 22.0% (2340)
NZDep: 1-2 (Least Deprived) 15.2% (1810)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 45.

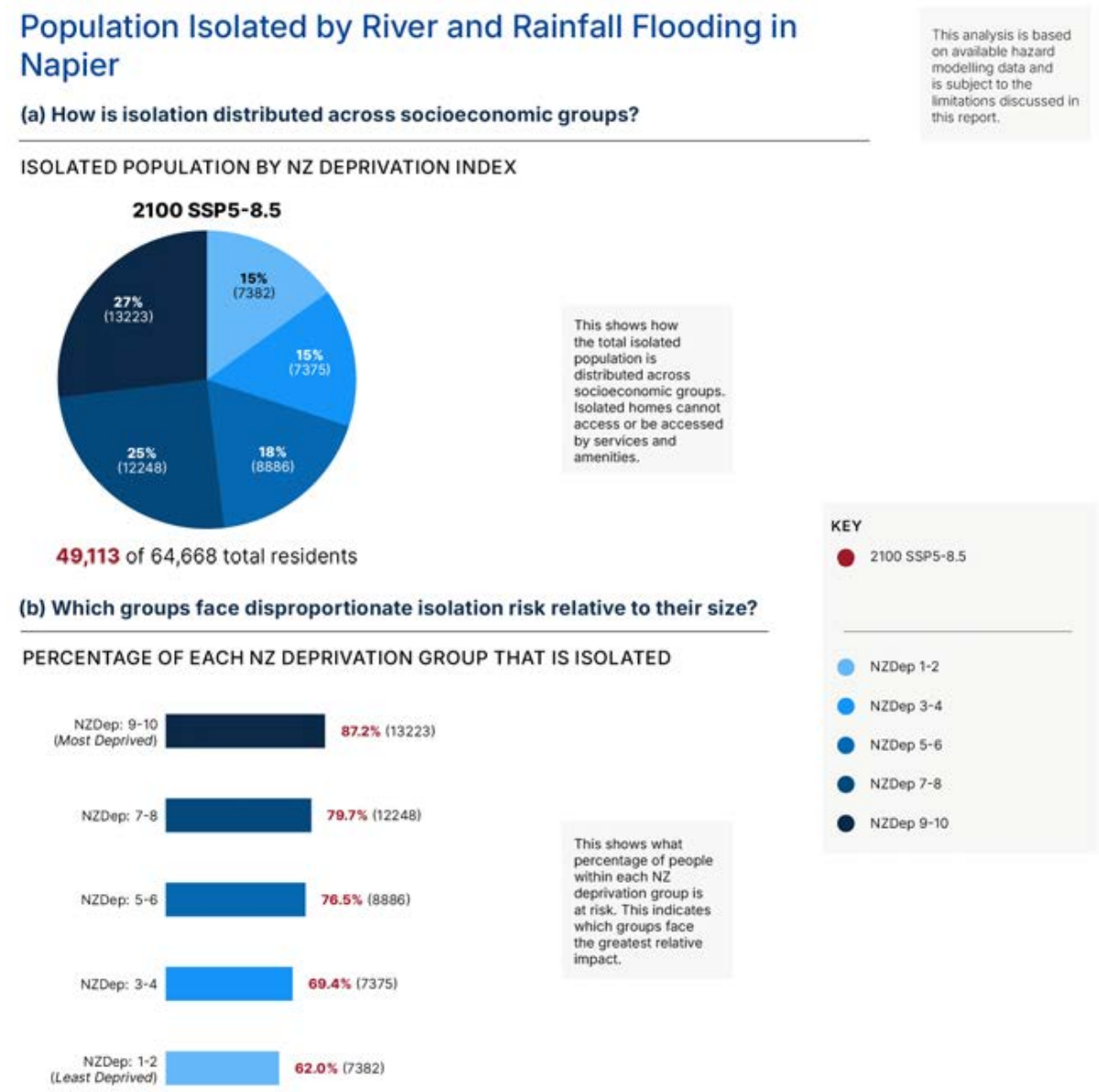

Population Isolated by River and Rainfall Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2100 SSP5-8.5
15% (7382)
15% (7375)
18% (8886)
25% (12248)
27% (13223)
49,113 of 64,668 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2100 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 87.2% (13223)
NZDep: 7-8 79.7% (12248)
NZDep: 5-6 76.5% (8886)
NZDep: 3-4 69.4% (7375)
NZDep: 1-2 (Least Deprived) 62.0% (7382)
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 46.

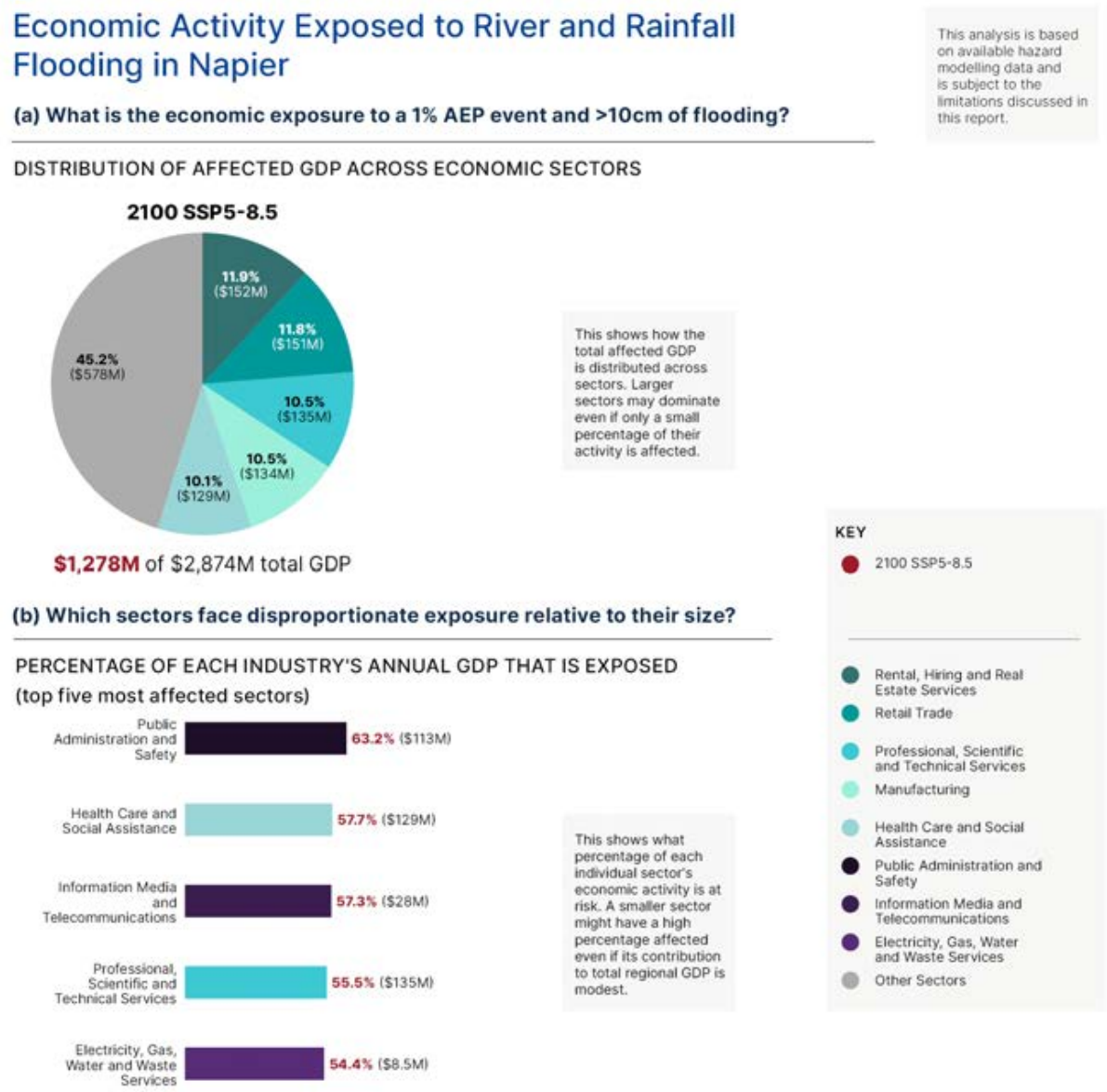

Economic Activity Exposed to River and Rainfall Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% AEP event and >10cm of flooding?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2100 SSP5-8.5
11.9% ($152M)
11.8% ($151M)
10.5% ($135M)
10.5% ($134M)
10.1% ($129M)
45.2% ($578M)
$1,278M of $2,874M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2100 SSP5-8.5
Rental, Hiring and Real Estate Services
Retail Trade
Professional, Scientific and Technical Services
Manufacturing
Health Care and Social Assistance
Public Administration and Safety
Information Media and Telecommunications
Electricity, Gas, Water and Waste Services
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Public Administration and Safety
63.2% ($113M)
Health Care and Social Assistance
57.7% ($129M)
Information Media and Telecommunications
57.3% ($28M)
Professional, Scientific and Technical Services
55.5% ($135M)
Electricity, Gas, Water and Waste Services
54.4% ($8.5M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 47.

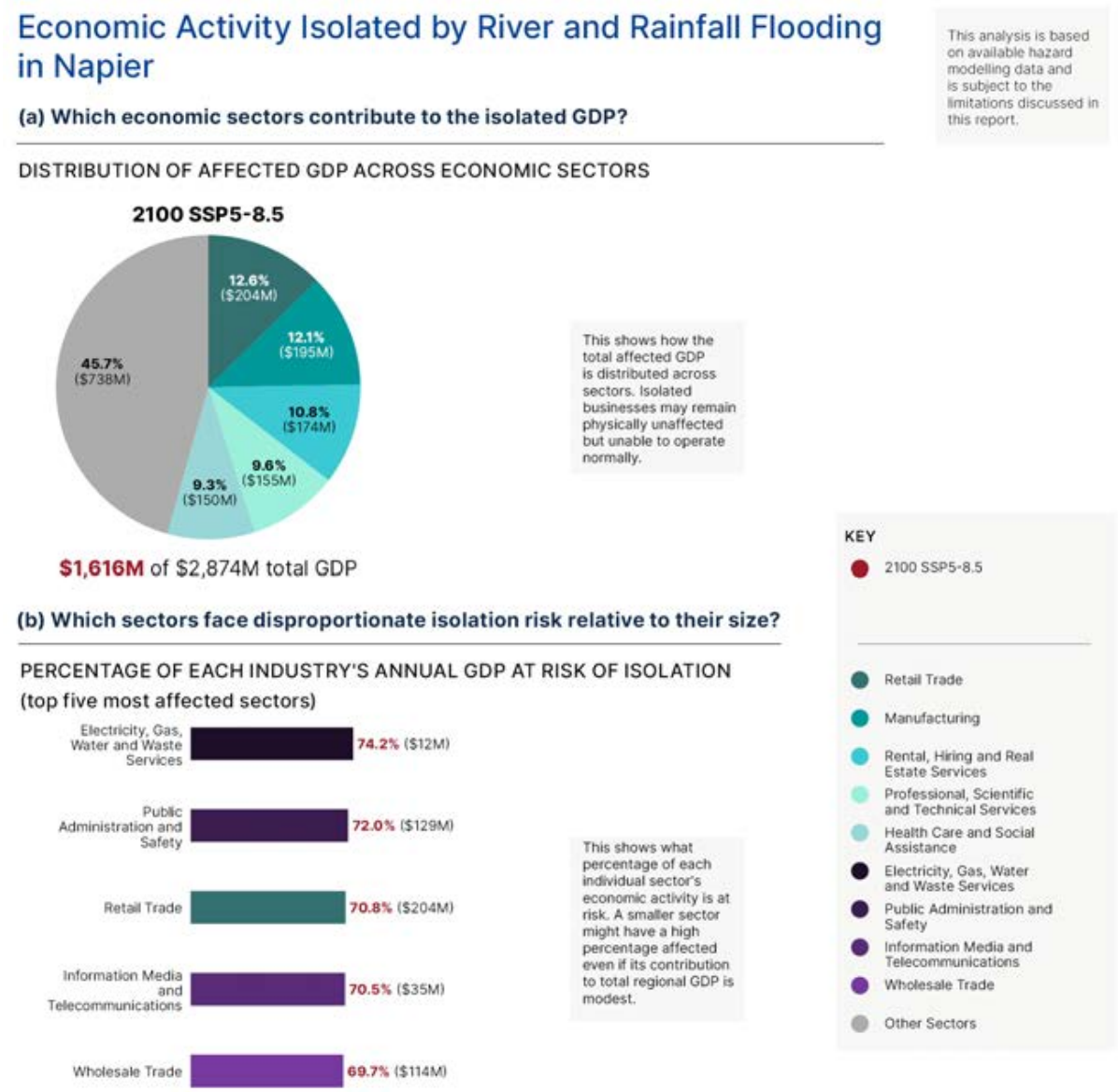

Economic Activity Isolated by River and Rainfall Flooding in Napier
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2100 SSP5-8.5
12.6% ($204M)
12.1% ($195M)
10.8% ($174M)
9.6% ($155M)
9.3% ($150M)
45.7% ($738M)
$1,616M of $2,874M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2100 SSP5-8.5
Retail Trade
Manufacturing
Rental, Hiring and Real Estate Services
Professional, Scientific and Technical Services
Health Care and Social Assistance
Electricity, Gas, Water and Waste Services
Public Administration and Safety
Information Media and Telecommunications
Wholesale Trade
Other Sectors
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Electricity, Gas, Water and Waste Services
74.2% ($12M)
Public Administration and Safety
72.0% ($129M)
Retail Trade
70.8% ($204M)
Information Media and Telecommunications
70.5% ($35M)
Wholesale Trade
69.7% ($114M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 48.

4.5 Wairoa District

Figure A - 49 to Figure A - 60 illustrates the risk to residents and economic activity in Wairoa based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects across different socioeconomic groups and industry sectors. The assessment methodology is detailed in Section 3 and Appendix A1.

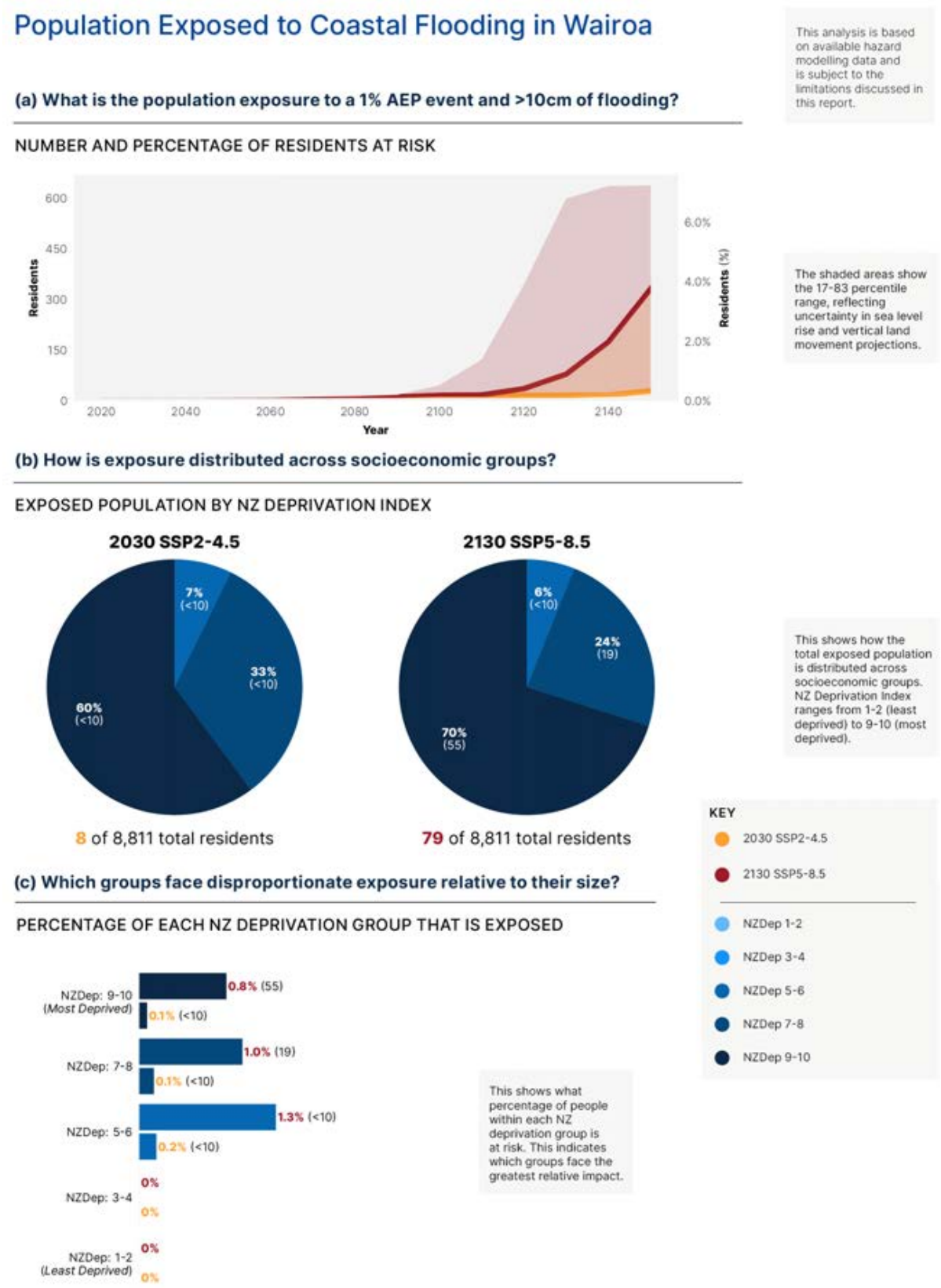

Population Exposed to Coastal Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
Residents
600
450
300
150
0
6.0%
4.0%
2.0%
0.0%
Residents (%)
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is exposure distributed across socioeconomic groups?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
7% (<10)
33% (<10)
60% (<10)
8 of 8,811 total residents
2130 SSP5-8.5
6% (<10)
24% (19)
70% (55)
79 of 8,811 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived)
0.8% (55)
0.1% (<10)
NZDep: 7-8
1.0% (19)
0.1% (<10)
NZDep: 5-6
1.3% (<10)
0.2% (<10)
NZDep: 3-4
0%
0%
NZDep: 1-2 (Least Deprived)
0%
0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 49.

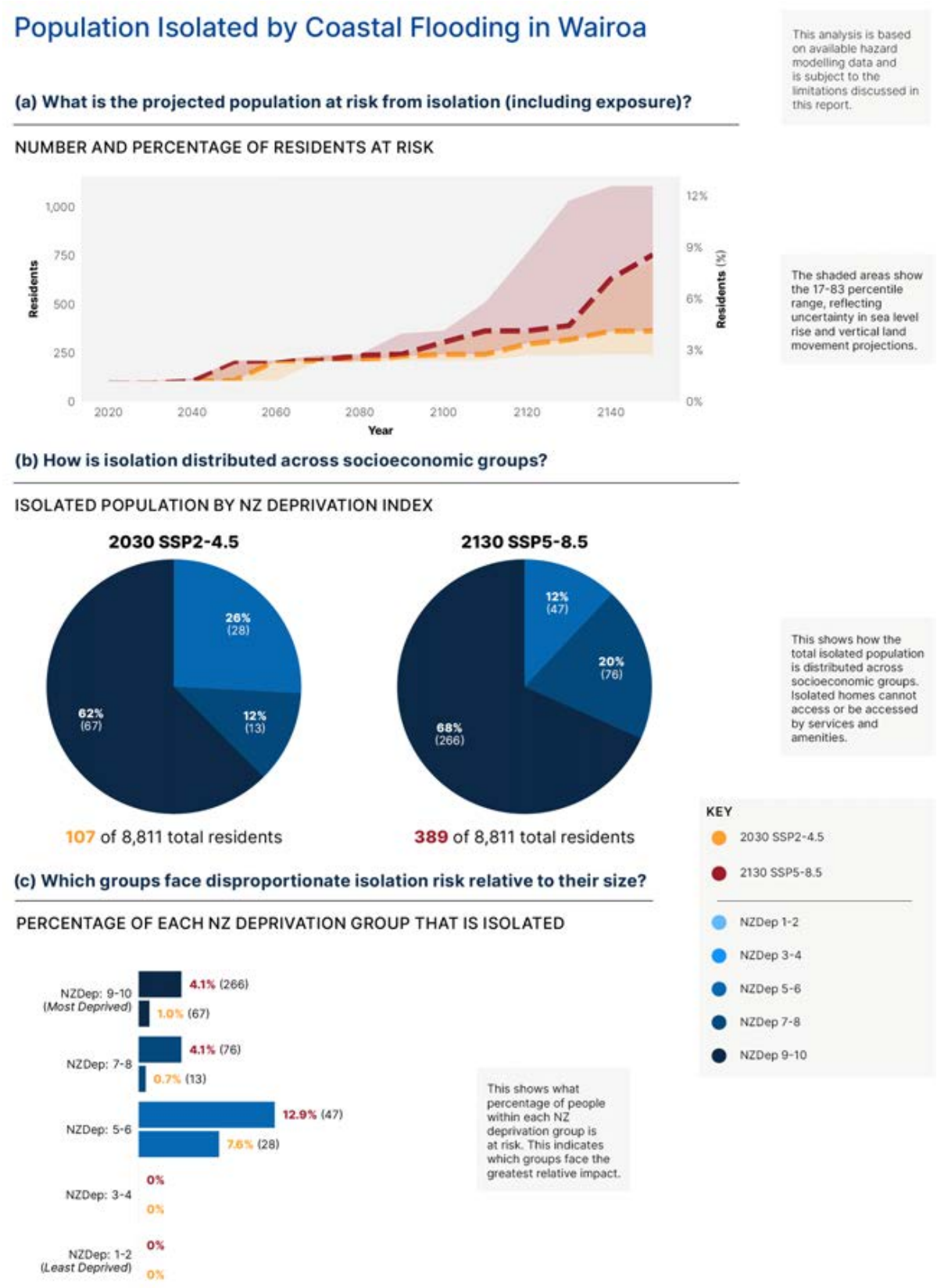

Population Isolated by Coastal Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the projected population at risk from isolation (including exposure)?
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK
Residents
1,000
750
500
250
0
12%
9%
6%
3%
0%
Residents (%)
2020
2040
2060
2080
2100
2120
2140
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2030 SSP2-4.5
26% (28)
12% (13)
62% (67)
107 of 8,811 total residents
2130 SSP5-8.5
12% (47)
20% (76)
68% (266)
389 of 8,811 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(c) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived)
4.1% (266)
1.0% (67)
NZDep: 7-8
4.1% (76)
0.7% (13)
NZDep: 5-6
12.9% (47)
7.6% (28)
NZDep: 3-4
0%
0%
NZDep: 1-2 (Least Deprived)
0%
0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 50.

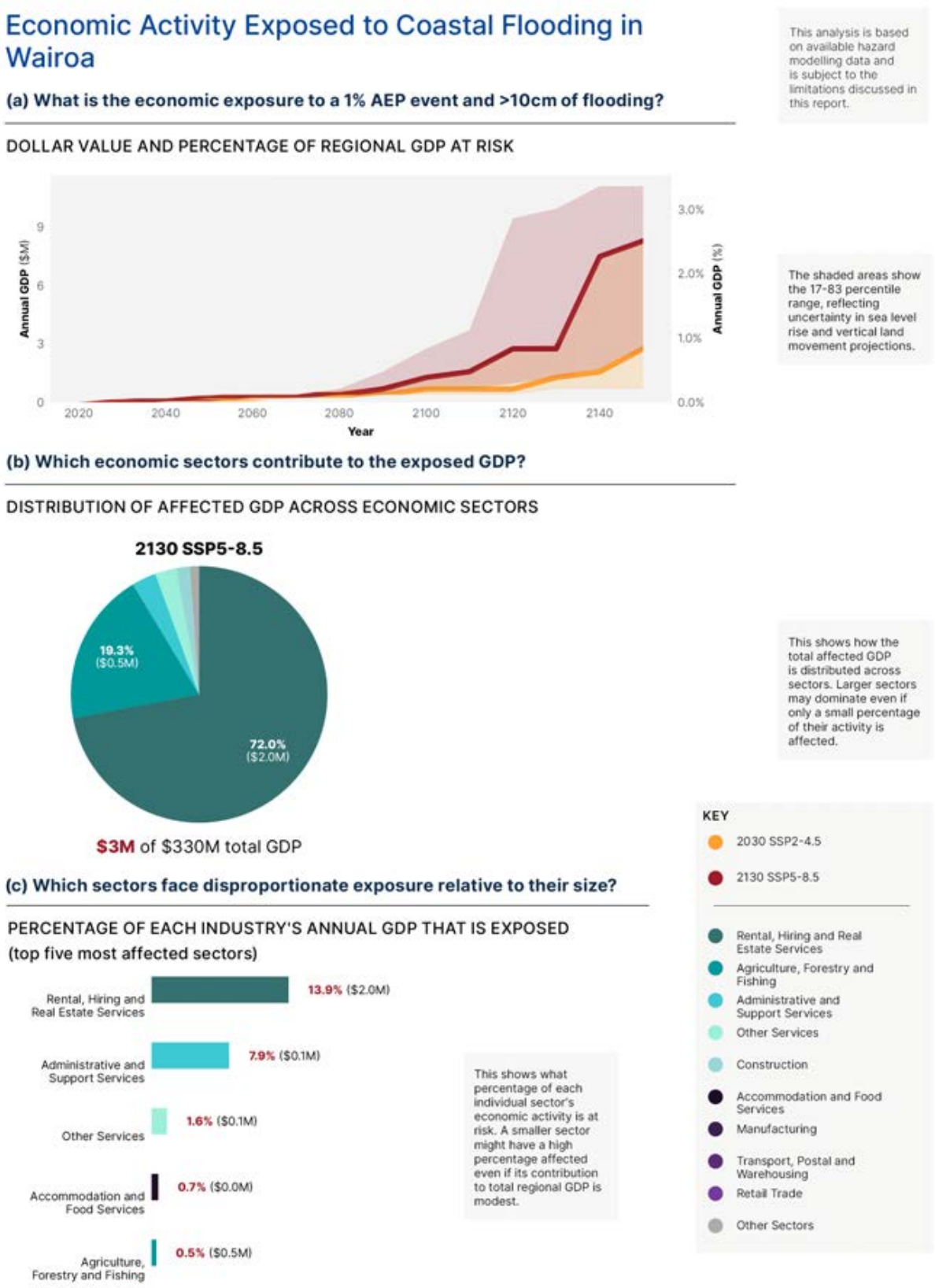

Economic Activity Exposed to Coastal Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% AEP event and >10cm of flooding?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
Annual GDP (%)
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the exposed GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2130 SSP5-8.5
19.3% ($0.5M)
72.0% ($2.0M)
$3M of $330M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Rental, Hiring and Real Estate Services
Agriculture, Forestry and Fishing
Administrative and Support Services
Other Services
Construction
Accommodation and Food Services
Manufacturing
Transport, Postal and Warehousing
Retail Trade
Other Sectors
(c) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Rental, Hiring and Real Estate Services 13.9% ($2.0M)
Administrative and Support Services 7.9% ($0.1M)
Other Services 1.6% ($0.1M)
Accommodation and Food Services 0.7% ($0.0M)
Agriculture, Forestry and Fishing 0.5% ($0.5M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 51.

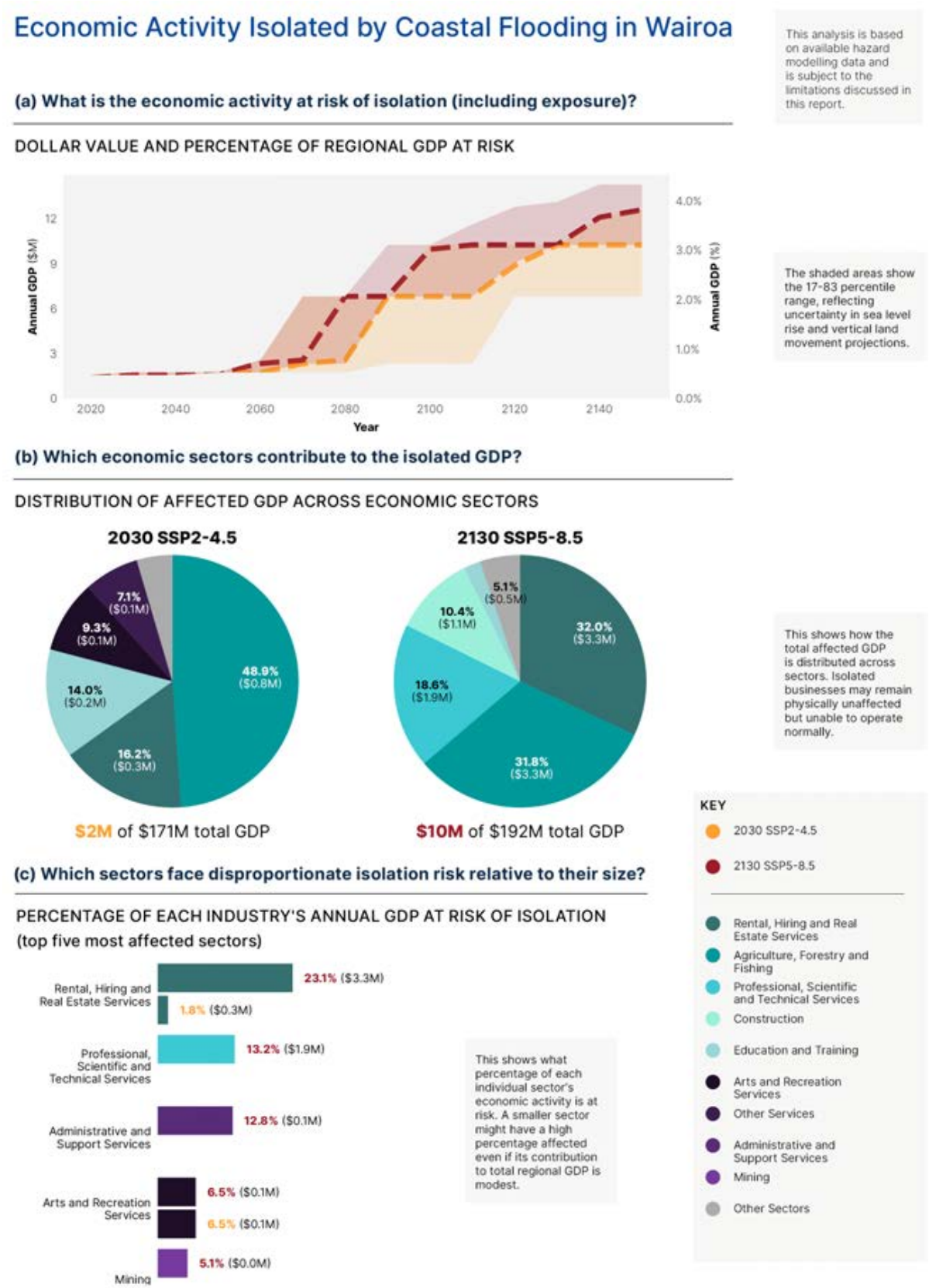

Economic Activity Isolated by Coastal Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic activity at risk of isolation (including exposure)?
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK
Annual GDP ($M)
Annual GDP (%)
Year
The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.
(b) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2030 SSP2-4.5
2130 SSP5-8.5
48.9% ($0.8M)
14.0% ($0.2M)
16.2% ($0.3M)
9.3% ($0.1M)
7.1% ($0.1M)
32.0% ($3.3M)
31.8% ($3.3M)
18.6% ($1.9M)
10.4% ($1.1M)
5.1% ($0.5M)
$2M of $171M total GDP
$10M of $192M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2030 SSP2-4.5
2130 SSP5-8.5
Rental, Hiring and Real Estate Services
Agriculture, Forestry and Fishing
Professional, Scientific and Technical Services
Construction
Education and Training
Arts and Recreation Services
Other Services
Administrative and Support Services
Mining
Other Sectors
(c) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Rental, Hiring and Real Estate Services
23.1% ($3.3M)
1.8% ($0.3M)
Professional, Scientific and Technical Services
13.2% ($1.9M)
Administrative and Support Services
12.8% ($0.1M)
Arts and Recreation Services
6.5% ($0.1M)
6.5% ($0.1M)
Mining
5.1% ($0.0M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 52.

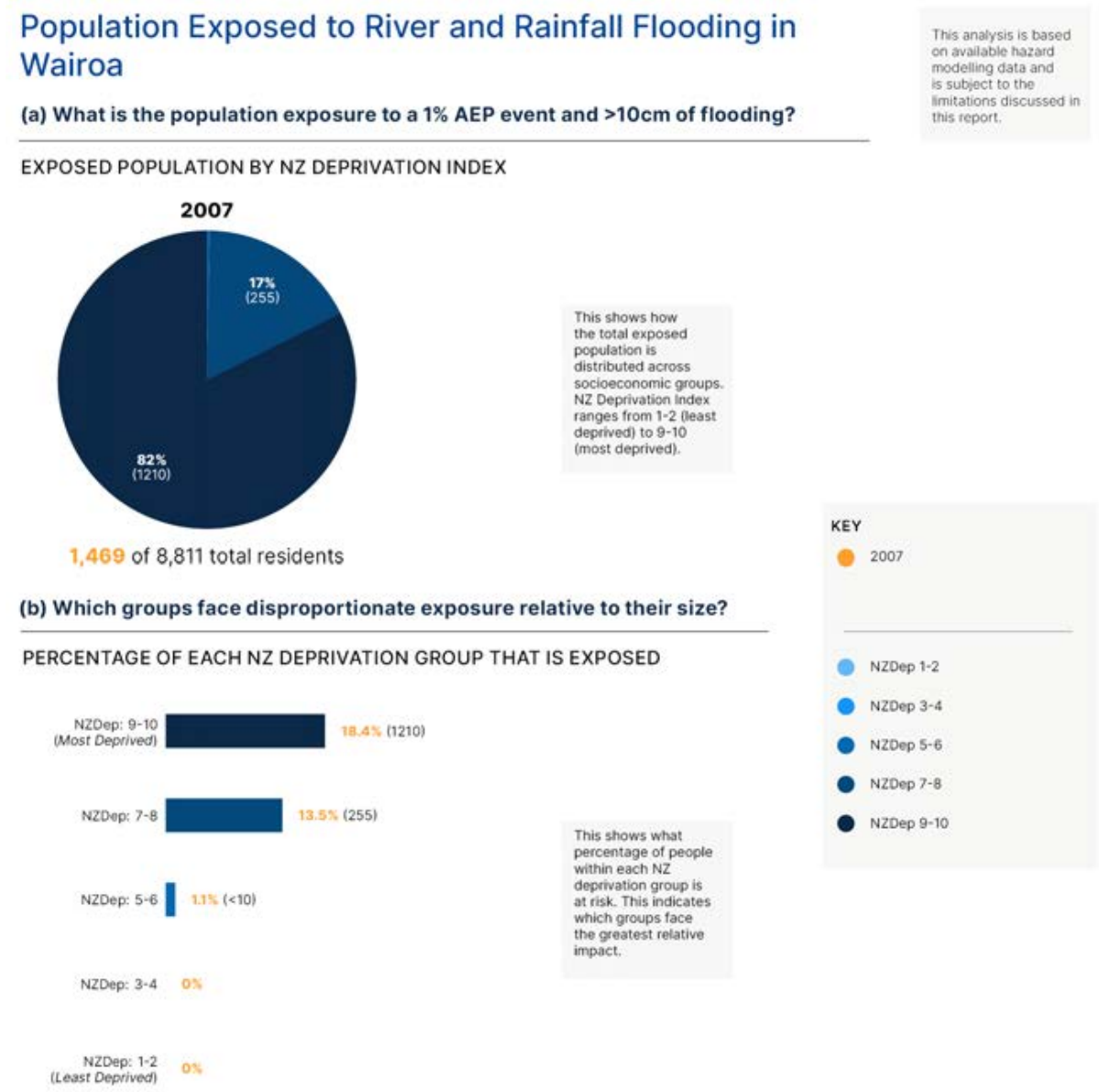

Population Exposed to River and Rainfall Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure to a 1% AEP event and >10cm of flooding?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2007
17% (255)
82% (1210)
1,469 of 8,811 total residents
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
KEY
2007
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived) 18.4% (1210)
NZDep: 7-8 13.5% (255)
NZDep: 5-6 1.1% (<10)
NZDep: 3-4 0%
NZDep: 1-2 (Least Deprived) 0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 53.

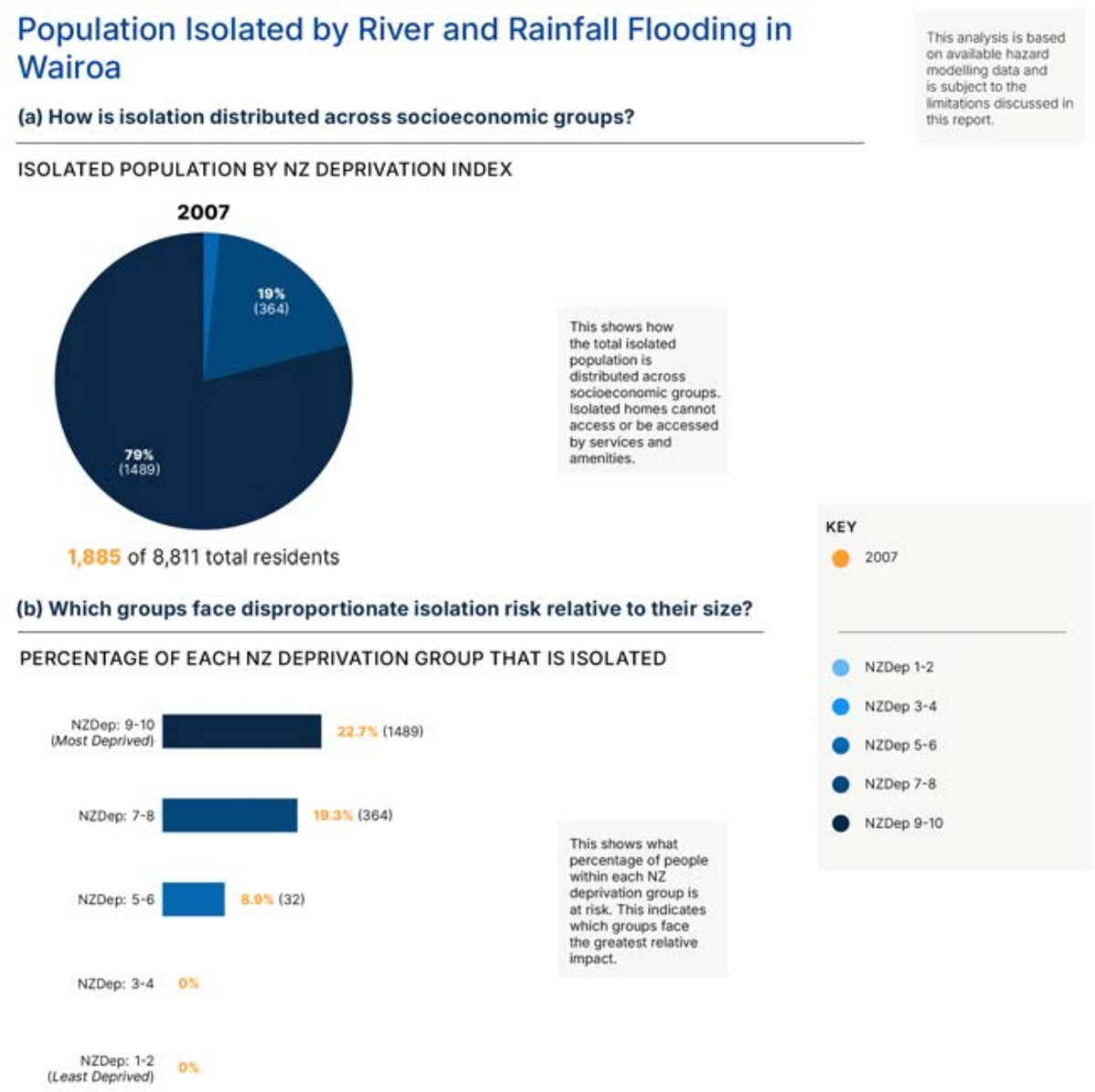

Population Isolated by River and Rainfall Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2007
19% (364)
79% (1489)
1,885 of 8,811 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2007
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 22.7% (1489)
NZDep: 7-8 19.3% (364)
NZDep: 5-6 8.9% (32)
NZDep: 3-4 0%
NZDep: 1-2 (Least Deprived) 0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 54.

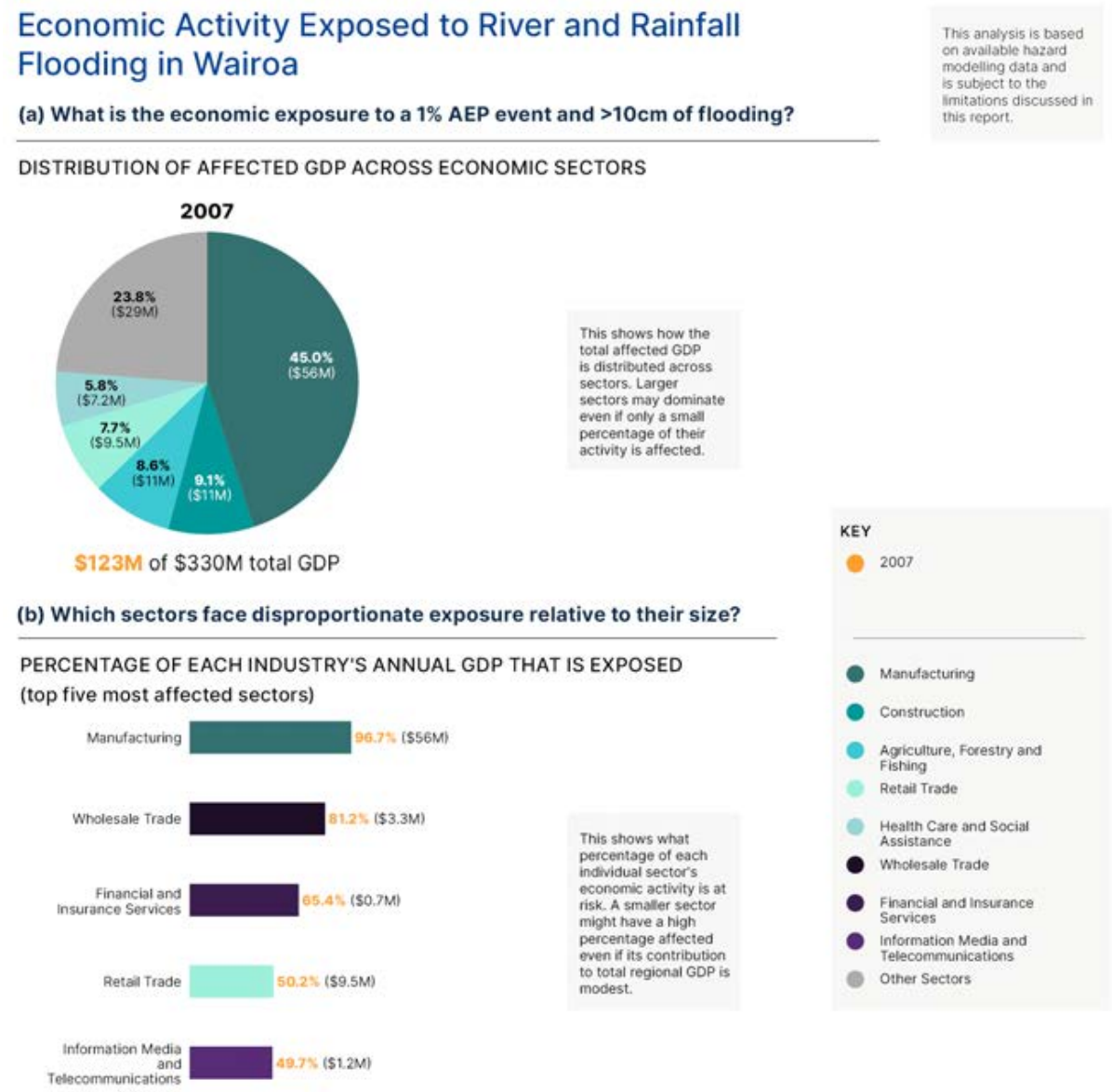

Economic Activity Exposed to River and Rainfall Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure to a 1% AEP event and >10cm of flooding?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2007
23.8% ($29M)
45.0% ($56M)
5.8% ($7.2M)
7.7% ($9.5M)
8.6% ($11M)
9.1% ($11M)
$123M of $330M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2007
Manufacturing
Construction
Agriculture, Forestry and Fishing
Retail Trade
Health Care and Social Assistance
Wholesale Trade
Financial and Insurance Services
Information Media and Telecommunications
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Manufacturing 96.7% ($56M)
Wholesale Trade 81.2% ($3.3M)
Financial and Insurance Services 65.4% ($0.7M)
Retail Trade 50.2% ($9.5M)
Information Media and Telecommunications 49.7% ($1.2M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 55.

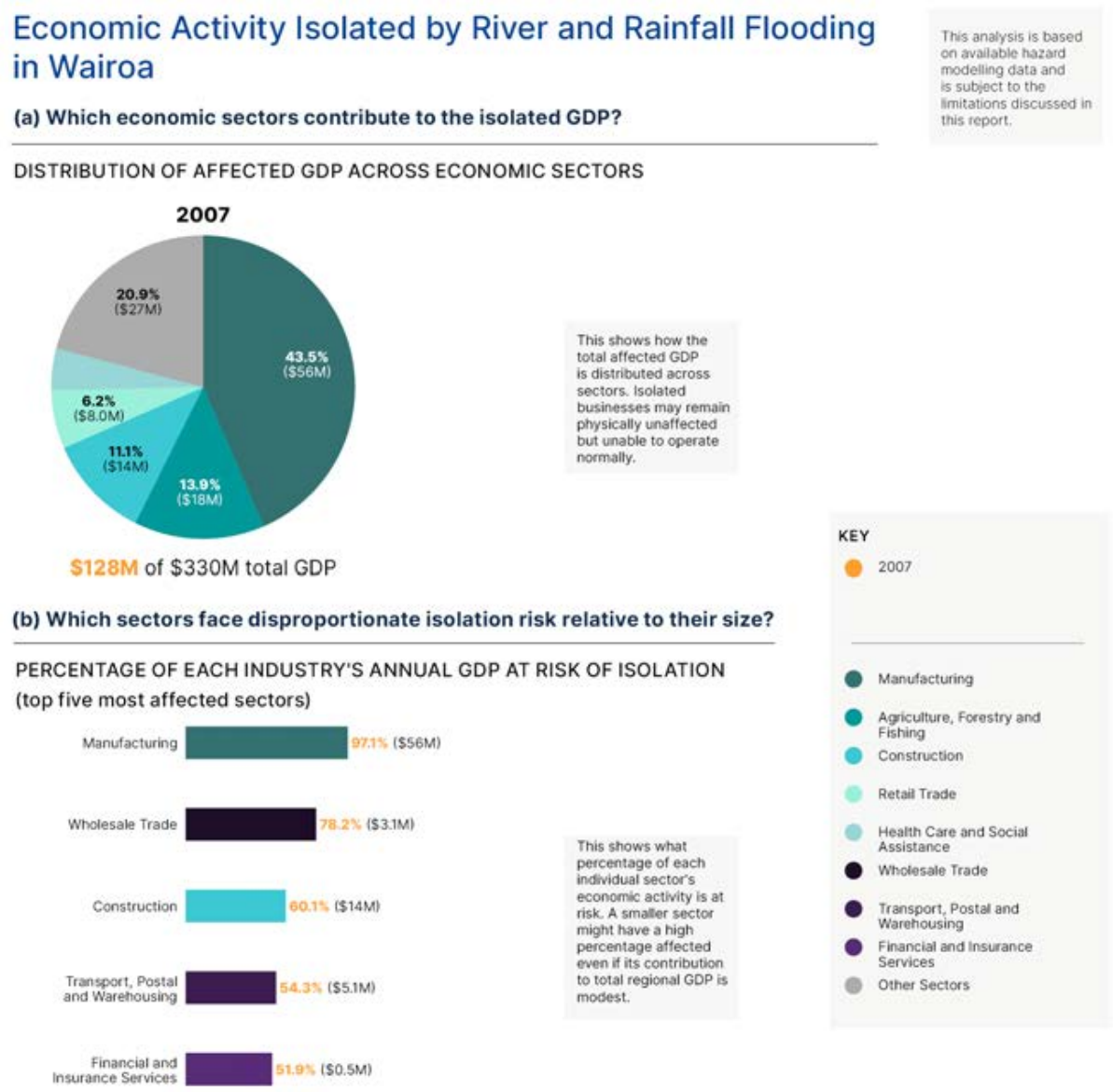

Economic Activity Isolated by River and Rainfall Flooding in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2007
20.9% ($27M)
43.5% ($56M)
6.2% ($8.0M)
11.1% ($14M)
13.9% ($18M)
$128M of $330M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2007
Manufacturing
Agriculture, Forestry and Fishing
Construction
Retail Trade
Health Care and Social Assistance
Wholesale Trade
Transport, Postal and Warehousing
Financial and Insurance Services
Other Sectors
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Manufacturing 97.1% ($56M)
Wholesale Trade 78.2% ($3.1M)
Construction 60.1% ($14M)
Transport, Postal and Warehousing 54.3% ($5.1M)
Financial and Insurance Services 51.9% ($0.5M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 56.

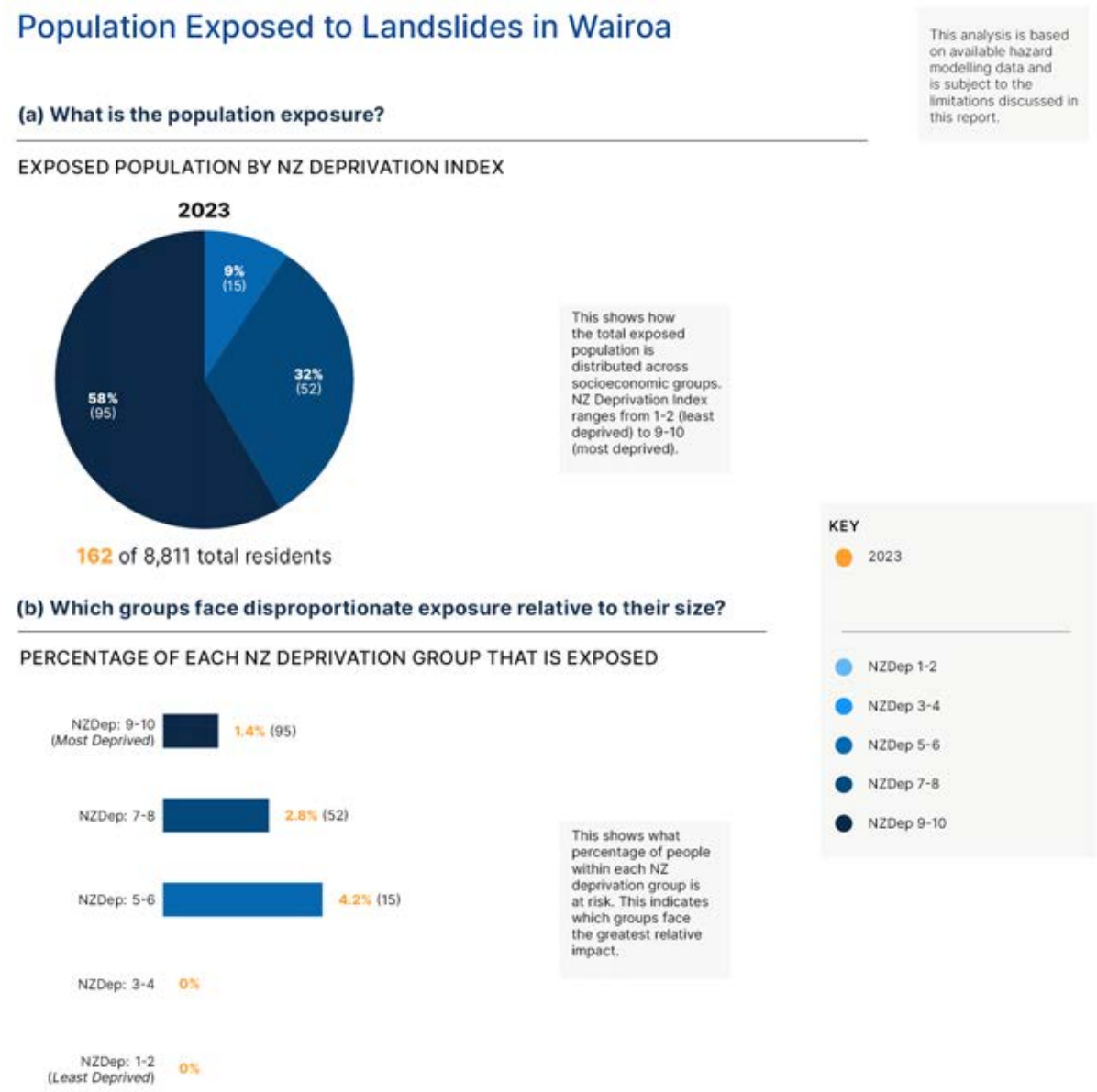

Population Exposed to Landslides in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the population exposure?
EXPOSED POPULATION BY NZ DEPRIVATION INDEX
2023
9% (15)
32% (52)
58% (95)
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).
162 of 8,811 total residents
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate exposure relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS EXPOSED
NZDep: 9-10 (Most Deprived)
1.4% (95)
NZDep: 7-8
2.8% (52)
NZDep: 5-6
4.2% (15)
NZDep: 3-4
0%
NZDep: 1-2 (Least Deprived)
0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 57.

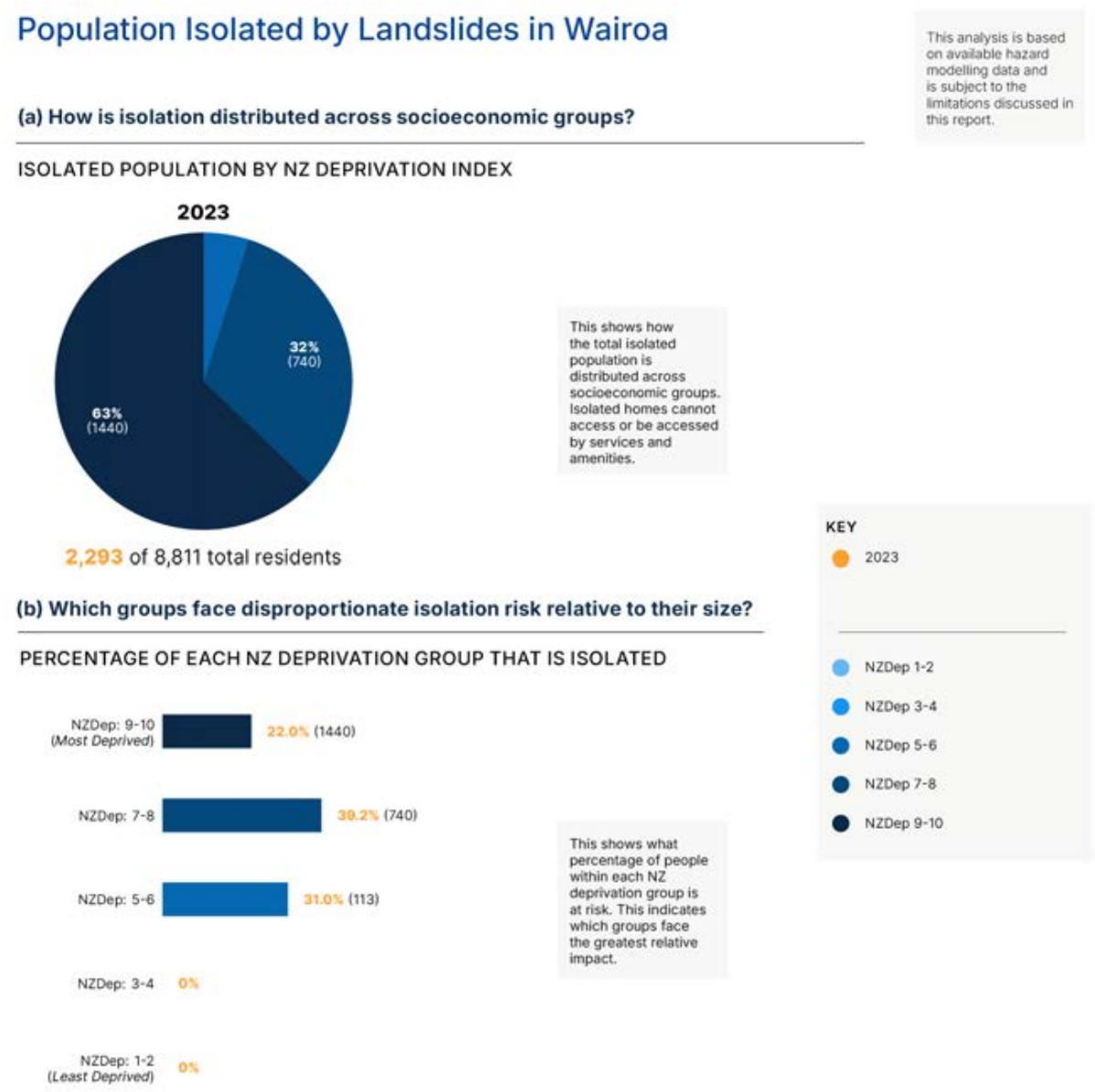

Population Isolated by Landslides in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) How is isolation distributed across socioeconomic groups?
ISOLATED POPULATION BY NZ DEPRIVATION INDEX
2023
32% (740)
63% (1440)
2,293 of 8,811 total residents
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.
KEY
2023
NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10
(b) Which groups face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED
NZDep: 9-10 (Most Deprived) 22.0% (1440)
NZDep: 7-8 39.2% (740)
NZDep: 5-6 31.0% (113)
NZDep: 3-4 0%
NZDep: 1-2 (Least Deprived) 0%
This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure A - 58.

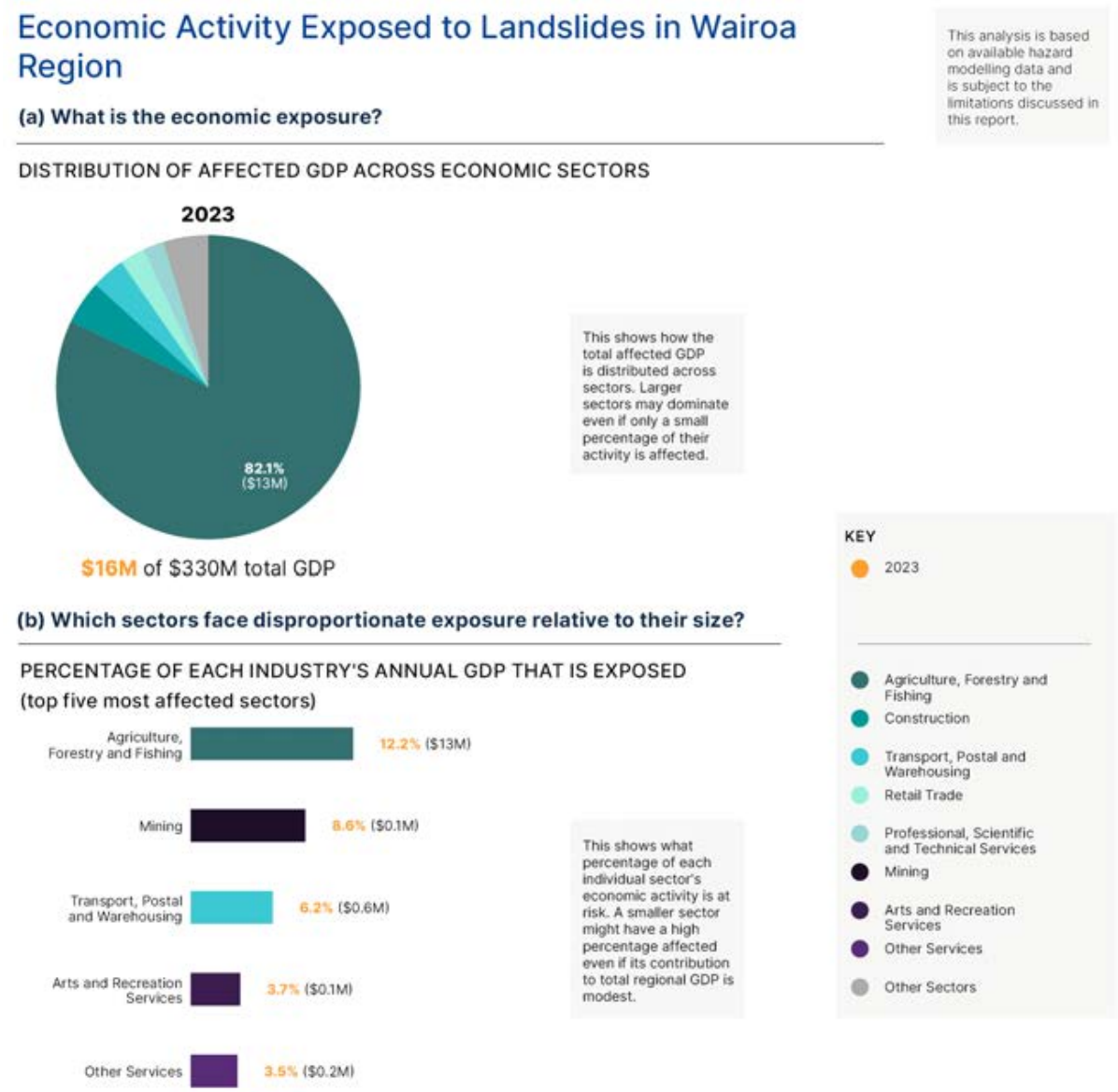

Economic Activity Exposed to Landslides in Wairoa Region
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) What is the economic exposure?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
82.1% ($13M)
$16M of $330M total GDP
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.
KEY
2023
Agriculture, Forestry and Fishing
Construction
Transport, Postal and Warehousing
Retail Trade
Professional, Scientific and Technical Services
Mining
Arts and Recreation Services
Other Services
Other Sectors
(b) Which sectors face disproportionate exposure relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP THAT IS EXPOSED
(top five most affected sectors)
Agriculture, Forestry and Fishing
12.2% ($13M)
Mining
8.6% ($0.1M)
Transport, Postal and Warehousing
6.2% ($0.6M)
Arts and Recreation Services
3.7% ($0.1M)
Other Services
3.5% ($0.2M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 59.

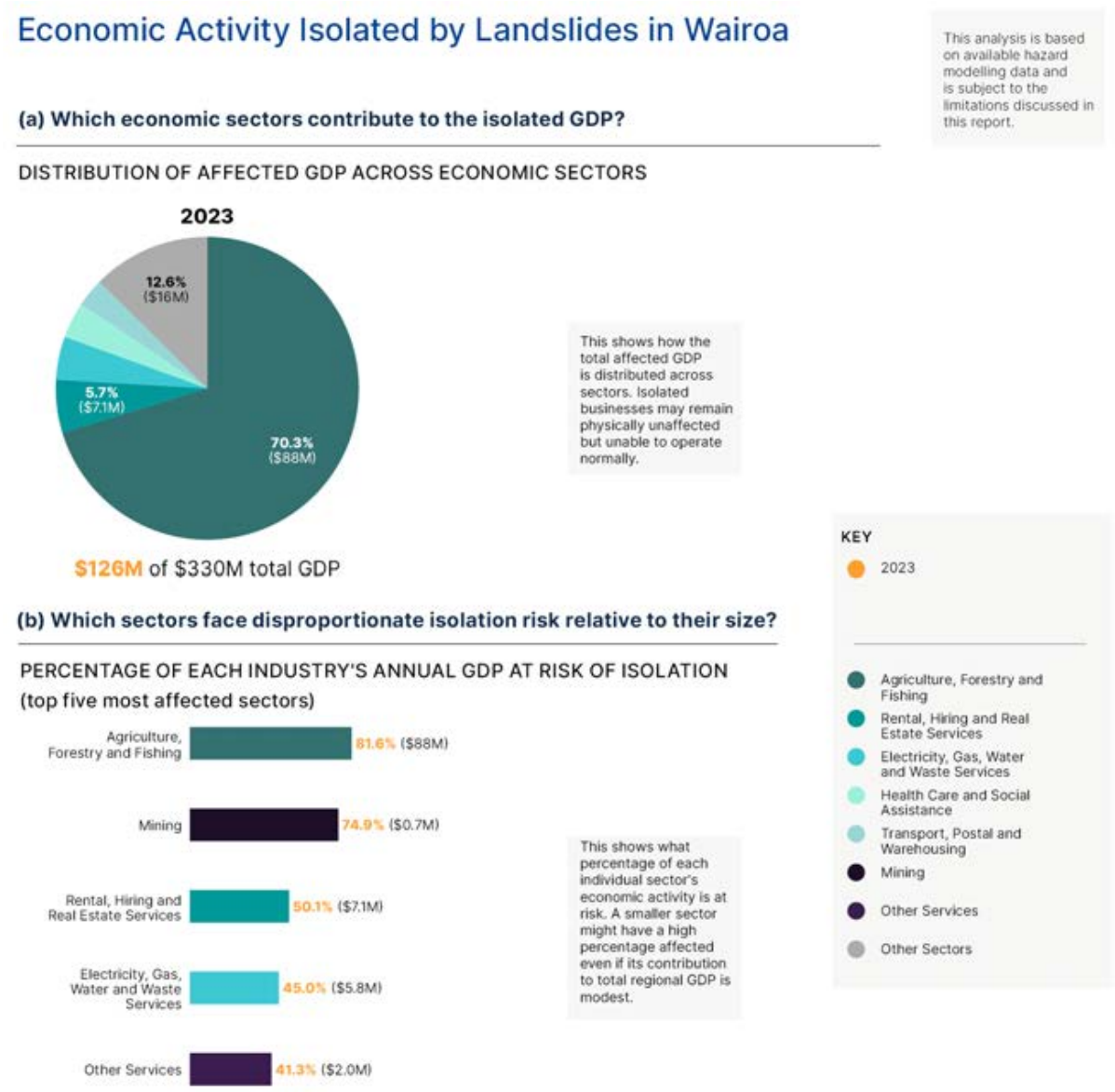

Economic Activity Isolated by Landslides in Wairoa
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
(a) Which economic sectors contribute to the isolated GDP?
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS
2023
12.6% ($16M)
5.7% ($7.1M)
70.3% ($88M)
$126M of $330M total GDP
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.
KEY
2023
Agriculture, Forestry and Fishing
Rental, Hiring and Real Estate Services
Electricity, Gas, Water and Waste Services
Health Care and Social Assistance
Transport, Postal and Warehousing
Mining
Other Services
Other Sectors
(b) Which sectors face disproportionate isolation risk relative to their size?
PERCENTAGE OF EACH INDUSTRY'S ANNUAL GDP AT RISK OF ISOLATION
(top five most affected sectors)
Agriculture, Forestry and Fishing
81.6% ($88M)
Mining
74.9% ($0.7M)
Rental, Hiring and Real Estate Services
50.1% ($7.1M)
Electricity, Gas, Water and Waste Services
45.0% ($5.8M)
Other Services
41.3% ($2.0M)
This shows what percentage of each individual sector's economic activity is at risk. A smaller sector might have a high percentage affected even if its contribution to total regional GDP is modest.

Figure A - 60.

URBAN INTELLIGENCE

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CLIMATE ACTION JOINT COMMITTEE

Hawke's Bay Climate Change Risk Assessment Report

May 2025

NAPIER CITY SNAPSHOT



The Regional Climate Change Risk Assessment is the first of its kind for Te Matau a Maui Hawke's Bay.

It was commissioned by the Climate Action Joint Committee to help inform decisions about how we adapt and build resilience to climate change.

It shows the broad range of climate change risks we and future generations are facing and their likely impacts at regional and district levels.

Here you'll find a snapshot of the climate change risk assessment for Napier City.

WHY IS A CLIMATE CHANGE RISK ASSESSMENT FOR OUR REGION IMPORTANT?

Climate change means our environment is changing. We need to understand those changes and how they could impact our way of life.

There is a lot of climate adaptation work already underway across the region such as water security, land management, flood resilience, coastal hazards, biodiversity protection, and so forth.

The regional climate change risk assessment will help inform further future climate adaptation work, including community conversations about where and how we prioritise actions to address our climate risks over time.

ABOUT THE HAWKE'S BAY REGIONAL CLIMATE CHANGE RISK ASSESSMENT

For the first time, the risk assessment report combines data and information with expert analysis to show the broad range of climate risks (not just flooding) we are exposed to here in Hawke's Bay, and their likely impacts. The report also shows us where our information gaps are, so we can keep building our knowledge over time.

It means we can all make more informed decisions about how we reduce risks and adapt in ways that will have positive intergenerational impacts.

The report helps inform all of us – councils, mana whenua and communities, public services, businesses and industries, and critical lifeline services.

ABOUT THE CLIMATE ACTION JOINT COMMITTEE

The Climate Change Risk Assessment report was commissioned by the Climate Action Joint Committee.

The Committee is made up of local and regional council representatives and tāngata whenua leaders, working together to drive action and help our region tackle the complex challenge of climate change.

To find out more about the Committee, its terms of reference and membership, visit https://www.hbrc.govt.nz/assets/Document-Library/Council-Documents/Joint-Committees/2023-25-Climate-Action-Joint-Committee-ToR.pdf

CLIMATE RISKS AND IMPACTS FOR NAPIER CITY

SNAPSHOT OF NAPIER CITY

Land area
105 km^2, surrounded by Hastings District

Population
64,695 (2023)

- 24.2% of the population identify as Māori and 26.2% are of Māori descent
- 21.1% of the population is aged 65 or older

Median household income
$82,900 (December 2024)

Average house price
$753,155 (January 2025)

GDP
$3.6 billion with the main industries being Manufacturing (contributing 10% to the district's GDP), Rental, Hiring & Real Estate Services (9%), and Professional, Scientific & Technical Services (8%)

Marae
Six traditional marae affiliate to Ahuriri but sit within the Hastings District Council boundary. One marae (Pukemokimoki) sits within Napier City for community and tangata whenua of Ahuriri

Extensive coastal frontage including beaches and Te Whanganui ā Orotu (Ahuriri Estuary), bounded by rivers to the north and south

KEY FINDINGS FOR NAPIER CITY

- Coastal flooding is a significant and increasing risk with approximately 71% of residential buildings, 66% of commercial properties and 86% of industrial buildings exposed to a 1%AEP coastal flooding event with 1m of sea level rise.
- Future (2100 SSP5-8.5) river and surface flooding also poses a significant risk to all building types and lifeline infrastructure, including 25.6% of residential properties, 52.8% of commercial properties and 41.2% of industrial buildings exposed.
- Three waters infrastructure is significantly vulnerable by 2100 to all types of flooding. In particular, water supply with 26.1% of pumps and 35.1% of pipes exposed in a 1% AEP river and surface flood event. Wastewater systems are exposed with 36 wastewater pumps exposed to coastal flooding with 1m of sea level rise.
- High risk of business isolation during river, rainfall, and coastal flooding, with the potential for significant disruption to Napier's economy, even in areas not directly flooded.
- Increasing risk of economic shocks and disruptions from seasonal variability with a 3.0–3.5°C temperature increase by 2081-2100 under SSP3-7.0, and increased water stress affecting primary industries (winter rainfall decreasing by 14.4%, PED increasing by 114.5mm).
- Areas of high deprivation are more exposed to flooding and isolation risks, with those living in areas of high deprivation (NZDep7-10) the most directly exposed to more than 10cm of river and rainfall flooding (53% of exposed properties by 2100 SSP5-8.5), and coastal flooding (61% of exposed residents by 2130 SSP5-8.5).

Hazard data limitations and opportunities

The availability of quality hazard data differs across the region, with some districts having detailed information for certain hazards while others have gaps. This means the assessment should not be used to compare risks between the districts. Instead, it identifies climate risks within each district that need attention. The assessment usefully identifies where our information gaps are, so we can keep building our knowledge over time.

For the full Hawke's Bay Regional Climate Change Risk Assessment report, along with other district- and regional-level snapshots and frequently asked questions, visit http://www.hbrc.govt.nz/climate-change-risk-assessment.

NAPIER CITY COUNCIL: RESPONDING TO CLIMATE CHANGE

NAPIER CITY COUNCIL
Te Kaunihera o Ahuriri

Napier City Council has multiple workstreams underway to address, mitigate or alleviate the effects of climate change. These include strategic work such as the Napier spatial picture, asset management plans, active participation in the Future Development Strategy, masterplans for all 'three waters', coastal hazards strategy, a masterplan for Ahuriri Regional Park, and reserve management plans.

Regulatory work includes the district plan and the code of practice for subdivision and infrastructure. Operational and capital projects include those in infrastructure, CDEM readiness, and parks and reserves projects such as stormwater detention and ecological enhancement.

Specific projects that will benefit Napier's preparedness and resilience are the Maraenui to Te Awa stormwater improvements, Taradale Road and Herrick Street culvert upgrades (due for construction in late 2025), improved flood mapping for floor levels for future builds, and a groundwater monitoring project to better understand Napier's water footprint. Napier City Council has also purchased 21 new generators, including some that are trailer mounted for easy relocation during times of high need.

Recent projects include the Rangatira revetment at Westshore, Westshore renourishment programme, pump station upgrades, a new screen and cleaning platform installed at Onehunga Pumpstation, culvert gates at Pūrimu pumpstation, tetratraps to catch rubbish and sediment, and the installation of flood barriers on some stormwater pump stations.

Internal policies and strategies include an emission reduction plan (working towards a target of net zero by 2050), use of low carbon materials for infrastructure projects and live-capture condition assessments of above-ground assets. Napier has also built a strong data capturing system and processes including weather monitoring stations, installing remote monitoring cameras on stormwater stations and SCADA upgrades with real-time data from all stormwater sites.



LGNZ four-monthly report for member councils

// March - June 2025

Ko Tātou LGNZ.

This report summarises LGNZ's work on behalf of member councils and is produced three times a year. It's structured around LGNZ's purpose: to serve local government by **championing**, **connecting** and **supporting** members.

Please consider putting this report on the agenda for your next council meeting so that all councillors can review it and provide feedback. Sam, Susan or other National Council members are very happy to join council meetings online to discuss the report or any aspect of it – just let us know.

This report complements our regular communication channels, including *Keeping it Local* (our fortnightly e-newsletter), providing a more in-depth look at what we do.

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Introduction

March to June has been intensely busy for LGNZ, as we advocated around reform and other issues like council metrics/profiles, engaged with the Government, and launched new products and services for members.

In early April, LGNZ launched our new *Local Government Quarterly Economic Insights*. This report is exclusive to member councils. It's designed to ensure elected members are the best-informed people on local government economic data. Developed in partnership with Infometrics, *Insights* will be released quarterly, with the second issue published in early July.

Our Ratepayers Assistance Scheme is advancing in leaps and bounds. The RAS would allow ratepayers to borrow cheaply for ratepayer charges like development contributions/levies and rates postponement, and could be used for specific property improvements (like solar panels). It leverages the high credit quality of local government rates to access capital market financing. Minister Watts has written to LGNZ expressing his support and confirming DIA will begin policy work on RAS in August. As well as successfully securing capital commitments from councils and third parties, we are seeing growing media interest in RAS.

Membership was top of mind during this period. Before Easter we sent out invoices alongside our value of LGNZ membership report. This report provided a comprehensive summary of our advocacy wins over the last year, a specific list of how we save councils money, and a summary of all the other work we do for members. While Western Bay of Plenty voted to leave before invoicing started, all other members have since renewed, with the exception of Waikato Regional Council, which is voting again on membership in July.

Other highlights of these four months included:

- We launched pre-elected learning for anyone considering standing for council. This interactive course steps potential candidates through what it means to be an elected member. It's freely available without an Ākona log-in and has proved very popular.
- Our well-attended 1 May All-of-local-government meeting, focused on delivering infrastructure for growth, featuring an engaging q+a with Minister Watts. Other speakers included Minister for Building and Construction Chris Penk and Simplicity's Sam Stubbs, as well as the Infrastructure Commission, S&P Global Ratings and the Treasury.
- In June we secured funding from councils to sustain Policy.nz, which otherwise would have ceased to exist. This platform allows candidates to upload their profiles and policies so that voters have easy access to this information.
- We have had strong media engagement on issues of the day – from electoral reform to rates capping and benchmarking and the safety of elected members, as well as facilitating the Candidates Corner pre-election series with the Sunday Star-Times.

We always welcome your comments and feedback.

Ngā mihi
Sam and Susan

Champion

Government relations

Because our relationships with individual Ministers are now stronger and more mature, we're increasingly able to have robust and constructive discussions with them. For example, on resource management reform and potential implications for local government's functions/structure, rates capping, and ensuring that funding and financing tools announced as part of Pillar 2 of the Going for Housing Growth programme actually deliver the desired outcomes for councils and communities.

We've been staying closely in touch with Minister Watts on benchmarking (including DIA's metrics release) and rates capping through informal discussion and formal meetings, including in late June.

LGNZ met with the Prime Minister in early April and discussed our approach to the rates capping conversation. We all agree that no one wants high rates increases. We all agree that rates rises need to come down. However, we also set out rates capping's potential unintended consequences for councils and ratepayers (see more on rates capping below). We also note that recent rates increases have been driven by the need to fund essential infrastructure and services – and because of the increasing volume of unfunded mandates from central government.

We met again with the Prime Minister for another of regular meetings in early June. We raised cross-portfolio issues such as pressures on growth councils and low voter turnout in local elections.

Voter authorisation of major projects has been floated by several politicians. This refers to running public referenda to make key decisions, like large infrastructure purposes. We will explore with Ministers whether there is any real commitment to this approach from the Government. We'll also have conversations about this idea with members.

We've also begun quarterly meetings with other political parties, which currently in the policy development phase. We met with Labour's local government spokesperson Tangi Utikere and sought cross-party support for our electoral reform work. We also briefed him on LGNZ's funding and financing tools project, and received an update on Labour's "no unfunded mandates" policy work. We had a meeting with the Green Party in June and we are working to lock in dates with NZ First and ACT. We have a date secured with ACT's local government spokesperson for after SuperLocal.

We have requested to meet with the Justice Select Committee to brief them on our electoral reform work after it is launched at SuperLocal

Media

We have had significant engagement with the media on a range of topics – and are proactive or reactive in our approach depending on the issue at hand.

Late February saw Housing Minister Chris Bishop announce some of the new funding and financing tools we've been calling for, at our Metro and Rural & Provincial sector meetings. This resulted

in stories appearing on 1News, ThreeNews, RNZ, Stuff, NZ Herald, Gisborne Herald, The Press, The Post and the Waikato Times.

The All-of-local-government meeting also saw media cover topics LGNZ has been championing, from talking about alternatives to rates capping and four-year terms to a new stalking bill and housing growth. Local Government Minister Simon Watt's speech and rates capping took centre stage, with stories on Newsroom, NBR, BusinessDesk, RNZ, The Press and The Post.

Four-year terms for local government has been a popular discussion point. Sam appeared on Mike Hosking breakfast on Newstalk ZB to discuss the issue, with his comments included in The Post and Waikato Times. Mayors Alex Walker and Hon Dr Nick Smith also publicly addressed the issue via the NZ Herald, 1News and 95bFM.

Then in March the release of LGNZ's Electoral Reform Working Group's (ERWG) draft position paper swiftly become one of local government's biggest stories this year. Media were intrigued by the proposed move to booth voting, with stories appearing in the Post, the Press, Waikato Times, ODT and NZ Herald, and Mayor Nick speaking with RNZ, Newstalk ZB (also here) and on 95bFM. The announcement continued to spark debate across Newstalk ZB, the Post and the Press.

Rates capping continued to be a topic of discussion, with LGNZ President Sam Broughton speaking to RNZ and Newstalk ZB on the recent S&P downgrading decision for 18 councils. Rates capping articles also appeared in the Press, the Post and Waikato Times, with Mayor Neil Holdom appearing on the Platform.

The stalking and harassment of elected members remains in the spotlight. In February LGNZ Chief Executive Susan Freeman-Greene and Invercargill councillor Alex Crackett spoke with Stuff/ThreeNews and Newstalk ZB about the Government's proposed stalking legislation, with RNZ also running a story on this issue. In recent weeks LGNZ's position has carried in stories on 1News and Stuff. LGNZ CE Susan Freeman-Greene spoke alongside multiple councillors and Mayors on TVNZ Breakfast about the impact this has on members. There have been a large number of follow-up stories in April, driven by a University of Otago study, setting out disturbing behaviour experienced by elected members.

LGNZ also weighed in on the RMA reforms, expressing cautious support while signalling to the Government it needs to ensure that communities have a voice and regional councils play a key role in the changes going forward.

In other funding and financing coverage, LGNZ President Sam Broughton spoke with the Press about LGNZ's position on a bed tax, while also covering how GST sharing on new builds could help bring rates down.

Stuff news and RNZ covered the Te Maruata hui in April.

We sent out a media toolkit to Mayors, Chairs and CEs when we released our new Infometrics' quarterly economic insights, with ideas on how councils can use this data to encourage local discussion.

Electoral reform has been a hot topic, with Wellington City Council calling for a lowering of the voting age, Invercargill City Council supporting the report's call for improved civics education, and Ashburton District Council supporting a shift to four-year terms for local and central government. LGNZ partnered with Infrastructure New Zealand to urge the Government to include a move to four-year terms for local and central government in the referendum.

Susan's announcement about moving on from LGNZ in August was covered by the Post, the Press and NBR.

Ex-Grey Power Vice-President Peter Matcham wrote an opinion piece in April on why a rates cap should be opposed at all costs. Elected member abuse and harassment also continued to dominate the headlines, with stories appearing on TVNZ, RNZ, the Press and ODT.

LGNZ waded into the truancy debate, with LGNZ President Sam Broughton saying that the Government asking mayors to help lift school attendance doesn't align with its "back to basics" direction for councils. This was a lead story in the Post, Press and the Waikato Times. Sam also spoke to ThreeNews about the Government's new scheme to allow self-assessment for some trade work.

Elected member safety was in the spotlight following our All-of-local-government meeting in May, where we shared a new guide for members on how to stay safe. This media advocacy led to the Remuneration Authority asking us for the guide, to aid their work towards considering an allowance to support elected members' home safety.

LGNZ's oral submission on congestion charging, led by Transport Forum Chair Mayor Neil Holdom, also resulted in a number of stories across various outlets calling for more local input.

Following the Budget, LGNZ spoke out in support of the Government's Rates Rebate Scheme expansion to cover all SuperGold card holders, and how increased support for local journalism will positively impact elections later this year.

We've been working closely with the Sunday Star Times on a "Candidates Corner" series detailing key issues ahead of elections. Recent articles covered rates capping along with the case for and against council mergers, with Mayor Neil Holdom and Mayor Nick Smith sharing their thoughts.

Rates – and the lack of other revenue-raising options for local government – were the focus of an article by LGNZ Vice President Campbell Barry.

LGNZ's How to stay safe' guide continued to receive positive press in the Otago Daily Times, Stuff, The Press and 1News, while our submission on congestion charging appeared in the Herald and RNZ. Mayor's Taskforce for Jobs was also in the spotlight, thanks to an article in the Otago Daily Times.

Local government funding and financing

Ratepayer Assistance Scheme (RAS)

On 21 March, Minister Watts wrote to LGNZ expressing his support for the RAS and confirming DIA will begin policy work on the initiative in August. The Minister has asked LGNZ to update the RAS business case to help the work progress quickly. We are working on this with project partners as well as seeking the necessary council capital commitments. With RM reform meaning a move away from development contributions (more on this below), the RAS could support financing of development levies as an alternative to other structures for this purpose (such as the IFFA). The RAS would be cheaper, more efficient and more flexible than the IFFA.

Since then significant progress has been made towards making a decision to establish the RAS. The RAS Steering group has been meeting with local authorities to affirm support for the RAS and secure establishment funding for the scheme. At the request of the Minister for Local Government, the group has also been meeting with developers to test the scheme's design with them. We have secured preliminary equity pledges from councils, and developers are supportive of the scheme.

We have secured a $400k repayable grant from the Energy Efficiency & Conservation Authority. We have raised the $2.5 million to progress to a stop/go decision – and with several councils taking decisions in the next few weeks, we may be a little oversubscribed. This demonstrates the high level of support for the RAS.

DIA continues to engage on the scheme: their substantive policy work is set to begin in August.

Infrastructure funding and financing

The Infrastructure Minister announced changes to New Zealand's infrastructure funding and financing settings at our late February All-of-local-government meeting. The Government will replace development contributions with a development levy system, allowing councils to charge developers a share of long-term infrastructure costs. There will be regulatory oversight of these development levies to ensure charges are fair and appropriate. Councils will also have more flexibility to set targeted rates based on the date of subdivision, allowing them to apply to new developments. Finally, the Infrastructure Funding and Financing (IFF) Act will be improved for developer-led projects and expanded to support major transport projects like those led by NZTA.

LGNZ welcomed these changes, which were in our funding and financing toolkit. We will work with officials to ensure these reforms make sense on the ground for councils.

This legislation likely to be introduced in September. DIA is unlikely to issue a substantive consultation on the changes, although they have engaged with technical experts from high-growth councils, and an early draft may be circulated to some individuals for feedback. While DIA is open to input from councils, given the Government's direction there may be limited scope for changes.

We will continue to engage on the development levy regulation when introduced, and with the regulatory regime. We understand this is likely to be in two stages: initial information disclosure requirements, followed by the creation of a regulator (or empowering an existing regulator with oversight of development levies).

We have raised with Under-secretary Simon Court the importance of balancing local democracy and the needs of communities with changes to the Infrastructure Funding and Financing Act. Potential

changes include limiting councils' ability to withhold endorsements of developer-led special purpose vehicles. We also discussed the need to disentangle the proposed new functions of the IFFA with the RAS, thresholds and legal frameworks for regulatory takings under the forthcoming RMA, and our support for ACT's proposed GST-sharing policy.

Budget 2025

LGNZ was in the Budget lock up so we could analyse the impact of the Budget on local government. There were no significant new local government funding initiatives launched or changes to funding and financing tools. Points of note included the Government:

- Raising the threshold for the rates rebate scheme and increasing the maximum rebate.
- Introducing regionally specific transport funding boosts.
- Announcing new funding for the 2023 North Island weather events recovery.
- Cutting public transport and transport resilience funds.

The Government's accelerated depreciation policy and increases to employer contribution for KiwiSaver will also have impacts for councils.

Local Government Quarterly Economic Insights

On 7 April, LGNZ launched our new Local Government Quarterly Economic Insights report. This report, developed in partnership with Infometrics, will be produced quarterly and provides insights into the economy with specific relevance to local government. The report is exclusive to LGNZ members and is intended to make sure they are the best-informed people on local government economic data. It will also support LGNZ's policy and advocacy work.

The first edition was well received. There were high levels of engagement in the associated zoom, and we received positive and constructive feedback from members. We then worked with Infometrics on the briefing schedule and the next issue, which was released in early July. We are keen to respond to member feedback, and have identified rates capping, contextualising rates against utilities and other charges, and regional sector specific topics as areas to explore in future editions.

DIA metrics release ("council profiles")

These profiles, based on a range of metrics taken from LTPs and annual reports, were originally scheduled to be released on 30 June, although this was later delayed. National Council discussed the profiles and associated issues at a special meeting on 30 May.

In May, LGNZ proactively sought changes from DIA based on a range of concerns. As a result of this advocacy:

- DIA shared group medians and the data of other councils within that council's group.
- Each council profile will now link to that council's website (for example, a page with LTP or other plan data) and councils will be able to specify what page.
- The government metrics website and guide will provide specific context about why some councils might be different from the median; for example, being high growth, high tourism, or recovering from a natural disaster.

While we are pleased that DIA agreed to these changes as a result of our advocacy, we recognise members will remain concerned that there's not enough information about their specific context, including the specific pressures on your council and how you are dealing with them, or what your community gets for this investment.

On 11 June, we released a guide to support councils' communication planning for the launch, which is now expected to be in mid July. We've received positive feedback on the guide from members.

Regional deals

Cabinet announced that the first Regional Deal Memorandum of Understanding will be decided before July (and announcements of the regions selected were subsequently made in early July). These regions will negotiate a final deal, which may require enabling actions to take place. The end of 2025 is the target for signing the deal.

Rates capping

In March, we submitted on a petition before Parliament seeking to limit local authority rates increases to a maximum of the annual inflation rate. We do not expect this petition to progress through Parliament due to its overlap with the Government's local government work programme. However, submitting on the petition was a good opportunity to set out the clear evidence against rates capping and highlight the pressures facing councils to Parliament.

We understand that rates capping was discussed at the Cabinet Economic Policy Committee in the week of 31 March. To support these discussions, LGNZ sent letters to Ministers on this committee highlighting the likely impacts of rates capping on their portfolios and objectives. LGNZ also reiterated concerns about rates capping to the Prime Minister and Minister of Local Government during our regular meetings as discussed above.

In line with direction from the May National Council meeting, we developed a paper on our approach to rates capping, including that a stronger public campaign may be needed, and shared that with members for discussion at this year's AGM. We also held a zoom to help members prepare for the AGM discussion. If the AGM agrees the direction of travel, then we will develop a plan for this campaign and hold an AGM in 2026 to gain a member mandate before launching that campaign.

We have also supported member advocacy against rates capping by developing and distributing a set of messages and a letter template that can be used by elected members.

As part of our advocacy, there needs to be an acknowledgement of the public mood around rates. We also need to clearly set out other approaches to achieving the Government's aims. To take the next step in our advocacy, we want to engage with members on exactly what this response could look like.

Water services reform

During this period, councils were consulting on aspects of their Water Service Delivery Plans with communities. This has included decision making about the future water services delivery model. For many, this has put these reforms (and their implications for councils) in the spotlight. Plans need to be finalised and submitted to the Secretary for Local Government by 3 September 2025. The

Minister has called for councils to consider including other councils in their delivery model – and has made it clear that extensions of time are unlikely to be granted.

LGNZ made its oral submission to the Finance and Expenditure Committee in March on the Local Government (Water Services) Bill. This submission sought a range of improvements to the legislation to provide greater clarity and certainty for councils. The committee reported back to Parliament on 3 July 2025 and adopted several of our suggested changes. These include: adding supporting growth as an objective for water service providers; clarifying the development contribution provisions to ensure a smoother transition of these for councils who set up water organisations; and clarifying the accountability framework to give water organisations greater separation from shareholding councils (as is the case for other CCOs).

Resource management reform

RMA replacement

The Government announced further details of its plan to replace the Resource Management Act, following the reporting back of the Expert Advisory Group tasked with designing a "blueprint" for replacement legislation. This has significant implications for local government in a variety of areas. The current RMA will be replaced with a Planning Act and a Natural Environment Act. Both will be enabling of development.

While there is plenty to support in the reforms, there is a significant move towards standardisation and narrowing of the scope of the resource management, which could mean limiting local input into planning and environmental management decisions.

We developed and shared an explainer identifying key issues for councils, and held an Ako Hour webinar with Buddle Finlay on 16 May. We've recently shared an analysis of what we think councils need from the new system and are seeking member feedback.

Another particular area of note is the implications for regional councils if the proposal to remove compliance, monitoring, and enforcement functions and shift them to a centralised body goes ahead. The Government has noted that this raises questions about the structure and functions of the local government system as a whole, and it will consider this and what should be done to address it later this year.

We have raised the issues flagged above in our regular meetings with Under Secretary Simon Court and Minister Chris Bishop, and are approaching the Ministry for the Environment on how we can work more closely with them as further policy decisions are made.

We're also working closely with Taituarā, Te Uru Kahika, and the New Zealand Planning Institute on our response to the reforms, particularly on how we can collaborate together to input constructively into the new spatial planning system.

National direction changes

The Ministry for the Environment has opened consultation on 16 new or changed pieces of National Direction under the RMA. These are in three packages:

- Package one – infrastructure and development changes (covering electricity generation and network changes, housing changes, and natural hazards)

- Package two – primary sector changes (covering marine aquaculture, highly productive land, commercial forestry, stock exclusion, and mining and quarrying)
- Package three – proposals to amend the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020. Further consultation will be undertaken later this year through an exposure draft process, which will have more detail.

Consultation for the first three packages is open until 11.59pm, Sunday 27 July. We expect a fourth package looking at how the first pillar of the Going for Housing Growth programme could fit into the new resource management system to be consulted on in early June. We're currently reviewing what all this means for councils and will submit on aspects of these proposals.

Transport

We submitted on the Government's legislation to enable time of use (congestion) charging. While we are highly supportive of time of use charging, we have concerns about the highly centralised model that the Government is proposing, which would see councils having little control of the design or operation of the schemes, and how any revenue from them is spent.

Our Transport Forum met virtually on 12 May. They covered a range of topics: potentially proposing alternatives now that NZTA has halted its proposed emergency works changes; transport perspectives on resource management reform; and an update from the Road Efficiency Group.

Looking ahead, the Government has indicated it will be taking Cabinet decisions on transitioning to Road User Charges for all vehicles this quarter, and we'll be looking closely at the details given the implications it will have for asset management and funding and financing in the transport space.

In April, NZTA announced it would no longer be going ahead with changes to its emergency works funding. These changes would have seen a significant reduction in the additional funding made available to councils to repair transport networks following a natural disaster.

The proposed cuts would have significantly affected local transport networks, particularly in rural areas and other isolated communities, and came at a time where many councils were grappling with the cost of repairing damage caused by the severe weather events of early 2023.

LGNZ advocated strongly on this issue, including through speaking directly with the Minister of Transport and NZTA, submitting on the consultation document, and raising our concerns in the media. NZTA has signalled they will now work on alternative reform options, and we will engage constructively to ensure they land on an option that works for councils.

Climate change

We engaged with the Climate Change Commission on the second National Climate Change Risk Assessment (NCCRA). The assessment will look at all the climate risks the country faces and identify priorities to focus on. This risk assessment is due to be delivered to the Minister of Climate Change by August 2026 and will inform the Government's National Adaptation Plan.

With the Government's climate adaptation framework set to be released later this year, we are planning member engagement to inform our submission. This legislation is expected to have

significant impacts for local government and the topic is politically sensitive. Collating and mediating divergent member views will require care.

Other policy issues

Seismic strengthening

With the work of the Government's review into the seismic strengthening regime progressing at pace, our reference group chaired by Manawatū District deputy mayor Michael Ford met to get an update from the local government representatives on the MBIE steering group, and to start considering LGNZ's submission on the eventual legislation.

Electoral Reform Working Group

We consulted on the Electoral Reform Working Group's draft position paper, with this closing on Monday 28 April. Engagement included all zone meetings, the Local Government Business Forum, and with members of Auckland Council's local boards.

The Electoral Reform Working Group presented its final recommendations for endorsement by National Council at its May meeting. After National Council agreed to the working group's recommendations, we finalised the position paper. This will be launched at SuperLocal by working group chair Mayor Nick Smith. As well as this plenary session, the working group will host a breakout that explores the final recommendations in depth.

We are now planning post-launch actions, in terms of government relations and concepts like a local government week.

In June we secured funding from councils to sustain Policy.nz, which otherwise would have ceased to exist. The Electoral Reform Working Group's recommendations reinforce the importance of voters being able to access information about candidates and their policies.

Connect

Member visits and zone engagement

We continued our member visits, visiting, Waipa District, Waikato Regional, Waitomo District, Tauranga City, Whanganui District, and Manawatu District during this period as well as connecting with a range of Mayors and CEs.

Sam or Campbell and at least one LT member attended in-person all zone meetings between March and June.

Women in Local Government

In late February we emailed all women elected members with an update on our work, including a link to a Whatsapp group where they can chat with each other, our advocacy on the anti-stalking legislation and a link to Australian research. More recently we have facilitated media around the threats some women are experiencing, with Susan also providing comment as discussed in the media section above. Minister for Women Nicola Grigg launched a toolkit targeted at women leaders at our 1 May All-of-local-government meeting, which has been positively received.

We are planning a breakfast event ahead of SuperLocal, which has strong registrations. The keynote speaker will be former Minister Tracey Martin.

All-of-local-government meetings

The 1 May All-of-local-government meeting was the last before the elections. Before the main programme, we held a session on abuse and harassment that elected members are facing. Minister Nicola Grigg will launch her toolkit, and a guest speaker from Reliance Risk covered practical tools and strategies any elected member can use when you're faced with this behaviour in the community. We also launched a toolkit that pulled together all the work we have done on elected member safety and security in the past 18 months, so that it's easy for members to access and use.

The main programme for that meeting focused on delivering infrastructure for growth. Highlights included Minister Watts participating in an engaging q+a with attendees, speakers including Minister for Building and Construction Chris Penk, industry thought leaders such as Infrastructure Commission and Simplicity's Sam Stubbs, as well as speakers from S&P Global Ratings, the Treasury, and the Opposition – alongside a number of high-quality case studies.

We are having early conversations with current sector chairs to plan for the November sector meetings. These sector meetings will be an opportunity to connect as a sector for the first time in the new triennium and vote on sector chairs. There will be time set aside for priority setting, which will feed into subsequent National Council strategy sessions.

The theme for the first All-of-local-government meeting of the new triennium in February will be "Making an impact in our communities – the role of data, collaboration and innovation". We are currently working to secure Sir Brian Roche as our keynote speaker.

SuperLocal25

We launched promotion and registration for SuperLocal 2025 on 10 April. We have a stellar line up of speakers One NZ's Chief Executive Jason Paris, who will provide his reflections on the value of a strong local government sector to the business community; Google Cloud New Zealand's Natalie de Boursac who heads the local government team and will focus on technology's role in driving efficiencies and high performance; and our final key note speaker Mark Di Somma – a strategist behind LGNZ's first localism campaign. Key political speakers include Deputy Prime Minister David Seymour, Minister Chris Bishop, Minister Simon Watts and Minister James Meager (with Minister Louise Upston speaking to MTFJ), along with the Leader of the Opposition. The Prime Minister will be providing a video.

The programme was finalised in June, with speaker briefings and panel meetings underway. We have a comprehensive breakout programme this year to complement a tightened plenary, with a wide range of topics covering current issues and reforms, driving change, tools for success and benchmarking.

Our three key pieces of LGNZ work launching at Superlocal are an economic data piece which quantifies the contribution of local government's investment to the country's economy; the final recommendations from the Electoral Reform Working Group Chaired by Mayor Nick Smith; and a guide spearheaded by CBEC on improving relationships between councils and community boards.

Sponsorship has been strong despite a difficult economic environment. Similarly, exhibitors have been strong, with booths sold out. We have successfully used all our channels to promote attendance and we are also keeping a close eye on conference costs.

Finalists for the SuperLocal Awards have been announced. We saw an excellent quantity and calibre of entries this year, with the largest category receiving over 20 entries. Winners will be announced at the Awards Night, again sponsored this year by Fulton Hogan. Our judges have been very generous with their time – it has not been a small task to review, score and comment on every entry.

2026 events calendar and forward planning

We have developed a draft events calendar for 2026 that has received National Council feedback and will be circulated to members in July.

Vote25

We updated the Candidates Guide and other material on the Taituarā-hosted VoteLocal website – this has launched with the Ākona pre-elected learning for candidates (discussed further below).

We are rolling out a social media campaign designed to support people to register, stand and vote. This includes a focus on what councils do and why this matters to communities.

We have been engaging with policy.nz, which has struggled to secure funding for its web platform for candidates. We are pleased to report that in June LGNZ coordinated between councils to raise the funding needed to keep the platform in place for the 2025 elections. Policy.nz is the only comprehensive, nationwide source of candidate information that's hosted by a neutral third party. Being able to easily find out information about candidates is an important part of the local

democratic process and policy.nz was identified as a useful tool for voters by our Electoral Reform Working Group.

Regional Sector

The President briefed Chairs, Mayors, and CEs of the Regional Sector in April on his conversation with the PM around potential impacts on local government of RM reform. There was a discussion on the best approach to this issue at the regular LGNZ meeting with Minister Bishop.

The May Regional Sector Meeting focused on the future resource management system, with Secretary for the Environment James Palmer speaking. The meeting also included engagement with the Minister of Conservation, Māori Crown Relations and Māori Development Tama Potaka.

LGNZ has supported planning for Te Uru Kahika's plenary session, which brings together CEs, Chairs and Mayors, and the leaders of the Te Uru Kahika's special interest groups. This will be held on 11 September 2025.

We have been working with the new Chair and co-deputy Chair to help establish them in their new roles. The next Regional Sector meeting will be online on the morning of 8 August. This is likely to focus on the wide range of reforms currently affecting the Regional Sector, including resource management and water.

LGNZ Acting Policy Director Simon Randall will accompany the Regional Sector on their annual pre-conference tour, which will visit the West Coast.

Te Maruata

Te Maruata whānui held an in-person hui in Taupō from 3-4 April with the theme Ngā Maunga Koutuutu. This acknowledges the three tipuna maunga in the rohe and the role they hold in terms of kaitiakitanga. It also references bringing people together to wānanga and share kōrerō and insights to support each other. Over 60 Te Maruata members from across the motu attended the event. Speakers included Tina Porou (Poipoia), Sharon Te Rangi (Tainui Live) and Lauren Fletcher (Tūrangitukua Chair) covering kaupapa such as Taiao, Partnership and Elections. Members visited key locations in Taupō including He Whare Hono o Tūwharetoa – a building owned by Tūwharetoa that brings together the Iwi, council and other key agencies under one roof; and Pūkawa Marae, a significant landmark in the connection between Tūwharetoa and the Kiingitanga. The final evening was a celebration of all the great mahi the network has seen over the last triennium, with Trevor Maxwell and Peter Moeahu being inducted into the Te Maruata Hall of Fame.

Te Maruata Rōpū Whakahaere met in April and are working on several key kaupapa, including supporting the development of a plan that spans Vote25, elections and induction, to support Te Maruata members and councils holding referendum. Also top of mind is Te Maruata involvement in the development and delivery of SuperLocal.

Te Maruata Rōpū Whakahaere met again at the end of May for an in-person hui. Several key kaupapa were discussed, including preparations for SuperLocal 25. The Te Maruata pre-conference hui will be held on 15 July at the Christchurch Town Hall, with the theme being Te ngana o Tū te pou o Rongo – which speaks to the balance of all things and how this intersects the roles and responsibilities of Māori elected members.

Te Maruata rōpū whakahaere will be supporting several aspects of the SuperLocal programme including the whakatau, poroporoaki, awards and breakout sessions.

Also discussed at the hui were opportunities to guide RM reform submissions, the ongoing workplan and the mahi around support heading into elections (specifically around Māori wards referenda), and induction.

Young Elected Members Network

We are producing an induction document for YEM that includes its history, the purpose of the committee, the programme of events and key achievements so far. We are working with the YEM Committee on a plan to release it.

The Young Elected Member Network committee met in early June to sign off the programme for their pre-Conference hui. Former National Minister Paula Bennett and Former Labour Minister Kelvin Davis will be guest speakers.

The committee agreed a fee would apply for all in-person events in the next triennium, apart from the pre-conference hui for member councils. The committee noted that, to stay true to the network's roots, YEM events need to strike the right balance between a structured agenda with time to network and leveraging the safe space YEM has created over the years.

Community Boards

CBEC met in May to discuss a range of issues including their forthcoming guide launch at SuperLocal. CBEC will have a booth in the exhibition space so that this work has maximum visibility and we are working with them on what that will look like.

Support

Ākona and Induction 2025

The pre-election learning was launched on 14 April. This interactive course steps potential candidates through what it means to be an elected member. It offers three videos, two e-modules and a range of downloadable resources designed to educate potential candidates and offer insight to the general public on the reality of being an elected member. The three animated videos look at: 'Structure of Local Government', 'Roles within a council' and 'How councils are funded'. The two e-modules cover: 'Stepping into Local Leadership: The role of an elected member' and 'Stepping into Local Leadership: The life of an elected member'.

As of mid-June, since the launch of the pre-election learning, the site had received 1,028 views, with 453 people actively accessing the learning. These are very good numbers, especially given registration to run for office did not open until 1 July and interest in elections is only just ramping up. Feedback from councils has been all positive, with those spoken to confirming that they are sharing the links and promoting the learning on their websites.

We have decided to allow non-members to attend Mayors' and Chairs' Schools and elected members induction at a premium rate. We believe this is appropriate from the principle of supporting councils setting themselves up for success at the start of the triennium. Attending helps non-members understand the full breadth of LGNZ's work and makes rejoining more likely. The price differential will be sufficient to avoid disincentivising membership.

Logistics for the Mayor Induction, Chair Induction and EM Induction hui are almost in place with agenda construction nearly finalised.

In other work, development of the Team Builder Toolkit is going well and it's on track for release in August. Development of the 2026 workshop schedule and Ako Hour Academy schedule is also going well, with both due for release in July. Construction of the updated Ākona site and conversion of the Emodules is nearing completion. The Ākona team continues to work with councils to ascertain what local content they want added to the Ākona site.

Te Korowai – CouncilMARK

In April, we launched the new Te Korowai webpage and digital prospectus, making it easier than ever for councils to explore what the new programme offers and how it can support their improvement journey.

We have already completed three assessments under the new programme,:

- Waikato Regional Council
- Otago Regional Council
- Ōtorohanga District Council

In May, we were on the ground with Central Hawke's Bay District Council for their on-site assessment. Next up, we're excited to launch the Integrity Survey with Marlborough District Council

ahead of their July assessment. This will be our first unitary authority to participate under the refreshed Te Korowai banner. Central Otago District Council is also preparing for its assessment in August.

Undertaking an assessment during an election year provides multiple benefits: it supports operational continuity, offers valuable insights for incoming elected members, and gives councils a clear, independent view of how they're tracking—like a 'warrant of fitness' for local government.

For councils not ready to commit to a full assessment, Te Korowai also offers staged entry options. A great starting point is the Integrity Survey. This tool goes beyond traditional engagement surveys by assessing how well strategy and values are aligned across the organisation, including with elected members. It's also an effective early intervention tool for identifying issues before they escalate.

Other staged options allow councils to focus on specific areas—for example, a targeted assessment of financial health.

Te Korowai is presenting at SuperLocal as part of two breakout sessions.

Roading Efficiency Group

The Road Efficiency Group (REG) programme is now in its 10th year of LGNZ involvement, and is coming to the end of this financial year's work plan. We are proud to be a Roading Efficiency Group (REG) partner and will continue to support the 2024-2027 programme.

We have worked hard to further develop the REG relationship and ensure alignment with our Transport Forum and add value where we can.

Our involvement provides increased support for the sector, and over the past five months we have seen significant increased activity in the REG programme. We are planning to develop an online platform for REG, which involves developing an online learning solution for REG and migrating all the historical content over the course of the next two years to Ākona.

REG is presenting at Conference as part of two breakout sessions.

Governance support

We are currently supporting several councils to navigate sensitive issues, albeit on the sidelines given we have not formally been asked by the council to intervene. Alongside this work are the numerous calls we receive for general advice and support.

Work continues on updating LGNZ's suite of governance guides. The first products of the shelf were the Standing Orders' templates and the Standing Orders' Guide. The templates and Guide were updated to reflect legislative changes made over the last three years and to incorporate additional guidance where this has been requested, for example, information on workshops following advice from the Ombudsman and clarity on the new quorum rules.

Other guides to be updated include:

- Guidance for new mayors and chairs;

- The community boards' governance guide (this will also include the council/community board relationship guide when complete);
- The tax guide for elected members; and
- The CE Recruiting Guide.

LGNZ has received a number of queries from councils about whether our Code of Conduct template will be updated. We have plans to streamline the Code of Conduct template, based on feedback from users. However, the Local Government Commission has been charged with developing a model Code of Conduct, and there may be further changes as a result of the LGA amendment bill due to be introduced in the middle of the year. So our template update is on hold until the picture is clearer.

Work is also underway on a Guide to help councils determine governance and decision-making structures. This Guide is intended to assist councils to look at the pros and cons of different governing arrangements, such as the pros and cons of establishing committees, whether committees should have delegated responsibilities, or simply be advisory, and whether they should be committees of the whole, or not.