HERETAUNGA HASTINGS DISTRICT COUNCIL

Te Hui o Te Kaunihera ā-Rohe o Heretaunga

Hastings District Council

Strategy and Recovery Committee Meeting

Kaupapataka

Attachments – Volume 1

Te Rā Hui: Meeting date:	**Tuesday, 19 August 2025**
Te Wā: Time:	**9:00 AM**
Te Wāhi: Venue:	**Council Chamber Ground Floor Civic Administration Building Lyndon Road East Hastings**

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HASTINGS DISTRICT COUNCIL
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TE KAUNIHERA Ā-ROHE O HERETAUNGA

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HAWKE'S BAY
REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI
IRP
Infrastructure
Resilience Programme
NGĀ MAHI TŪROA
Presentation on the North Island Weather Events (NIWE) – HBRC Risk Mitigation Projects
Prepared for Hastings District Council
19th August 2025

Contents

- HBRC NIWE Programme Overview
- HBRC NIWE Projects in Hastings District Council Area
  - → Pākōwhai
  - → Ōhiti / Omāhu
  - → Waiohiki
  - → Whirinaki
  - → Rapid Repairs Levels of Service Upgrade
  - → Other

Item 5

NIWE Programme Overview

11 Projects in Total

(Crown Funding Agreement Programme Sum - $254m)

Key Colour	Status
Green	Progressing Well
Orange	Various Issues
Red	Significant Concerns

Waiohiki ($10m)	Ōhiti / Omāhu ($10m)	Whirinaki ($23m)
Pump Station Upgrade ($30m)	Stopbank Levels of Service ($30m)	Telemetry ($5m)
Havelock North ($10m - being delivered by HDC)	Scheme Reviews ($4m)	
Pōrangahau ($14.6m)	Pākōwhai ($50m)	Wairoa ($70m)

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Pākōwhai - $50M

- Project objective is to put in place works to move 72 properties from 2C to Cat 1
- Original alignment proved challenging, now valued engineered and substantially finalised an alignment
- Structures will be stopbanks where possible but also flood walls
- Overflow into Cat 3 area at Chesterhope Bridge end
- Initial construction commencement planned for Summer 2025/2026 with completion by April 2027, with work to be completed in tranches.
- Material to be sourced from the Rivers
- Now working with all landowners on access agreements.

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Ōhiti/Omāhu - $10M

- Project objective is to put in place works to move 11 properties from 2C to Cat 1
- Predominantly stopbank construction = approx. 32,000m³ of material required with road raises on Taihape and Ōhiti Roads
- Will provide additional protection benefit to Omāhu settlement
- Extensive engagement has occured with Omāhu Community of the most viable option and RD 9 Community
- Land access well advanced
- RFT out for market in week of 18th August 2025
- Construction commencement planned for November 2025 with completion by April 2026
- Early works completed on silt removal and rock revetment under/near Taihape Road Bridge

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Waiohiki - $10M

- Project objective is to put in place works to move 45 properties from 2C to Cat 1 – now recategorised
- Predominantly Stopbank construction - approx. 34,000m^3 of material required – material supplied from Omarunui landfill with transport to site complete
- Land access substantially complete
- Contract has been awarded to Phoenix Contracting Limited
- Construction commenced the week of August 11th 2025 with completion date of March 2026

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Whirinaki - $23M

- → Project objective is to put in place works to move 38 properties from 2C to Cat 1
- → Stopbank construction = approx. 90,000m^3 of material required but with floodwalls in Pan Pac log yard.
- → Road raises on SH2, as well as Northshore Road. State Highway work being dealt with as a separate contract.
- → Land Access being finalised
- → Stopbank tender to market on 28th August. Road raising to market on 8th Septmber.
- → Construction commencement planned for November 2025 with completion by May 2026

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Item 5

Other…

- Stopbank levels of service upgrade project will see upgrade work below and above the Fernhill Bridge on true left bank and intend to 'tie into' the Ōhiti/Omāhu project work. Work to commence January 2026
- Pump station upgrade is for two pump stations
- HBRCs telemetry system upgrade is well underway providing major resilience upgrades with work to be completed by June 2026
- Multiple drainage and smaller scheme reviews are underway including Haumoana,Karamu,Esk/Whirinaki involvi ng various forms of engagement

Ngā mihi

Andrew Caseley
Regional Projects Manager / Programme Director

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HAWKE'S BAY REGIONAL COUNCIL

30 July 2025

Subject: REIMAGINING FLOOD RESILIENCE PROJECT UPDATE

Reason for report

1. Councillors have requested regular project updates on the Reimagining Flood Resilience project for the Upper Tukituki and Heretaunga Plains flood schemes. This item presents an update on project activity since the last report in May 2025.

Background

2. To communicate the complexity of the Regional Council's flood resilience work, a communications and engagement package has been developed – *Reducing Flood Risk in Hawke's Bay* – within which flood risk has been grouped under three headings:
   2.1. Rivers
   2.2. Surface
   2.3. Coastal.
3. This includes communicating what has already happened since the cyclone (Rapid rebuild), what is currently being done (NIWE Land Cat 2 mitigation packages), and what flood resilience might look like in the future (the Reimagining Project).
4. The Reimagining Flood Resilience Project sits under the umbrella of the *Reducing Flood Risk in Hawke's Bay* communication and engagement package.
5. The Reimagining Project was established in direct response to the recommendations of the Hawke's Bay Independent Flood Review (HBIFR). It is intended to take a long-term view to determine what river flood resilience in Hawke's Bay might look like in generations to come, with a focus on the Upper Tukituki and Heretaunga Plains Flood Control Schemes.
6. Through a series of workshops with Council and discussions with partners and key stakeholders held from September to December 2024, a proposed approach for the Reimagining Flood Resilience Project was developed.
7. The project team is now in the process of establishing and working with the various structural elements of the Project, which include:
   7.1. HRBC Councillors Project Champions
   7.2. Steering Groups (one for each scheme) to provide project oversight and develop recommendations to HBRC
   7.3. Stakeholder Reference Groups (one for each scheme), to provide values-based advice and guidance on options.
   7.4. Focus Groups, to work under each Stakeholder Reference Group where targeted or more in-depth discussion is required in regards to a particular community, place, landowner, sector etc
   7.5. Technical Advisory Group, to provide technical input and support for the operation of the project and to HBRC, the Steering Groups and Stakeholder Reference Groups.
8. The Heretaunga Plains and Upper Tukituki Flood Control Schemes are running in parallel workstreams to reflect the differences in communities of interest, scale and complexity.
9. Project timeframes need to be condensed as much as possible in recognition of the significance and urgency of this work, with some outcomes feeding into the next long-term plan in 2027.

Discussion

10. Since the last update, the project team have established a Technical Advisory Group (TAG) which consists of operational staff from the project partner organisations, Tamatea Pōkai Whenua (TPW), Central Hawke's Bay District Council (CHBDC), Hastings District Council (HDC), Mana Ahuriri (MA), Napier City Council (NCC) and Ngāti Kahungunu Iwi Incorporated (NKII).
11. To date the TAG has met five times, including a whole day workshop.
12. The focus of the TAG has been to develop terms of reference, agree on the project principles (as developed by HBRC Councilors), receive presentations on the scheme reviews for both the Upper Tukituki Scheme and the Heretaunga Plains Scheme review, and discuss objectives and deliverables of the TAG.
13. A procurement plan for the next 12 months has been developed for the external resources required to support the Reimaging Project.
14. The project team is currently working through the specific procurement process to engage an external resource to support the stakeholder engagement phase of the project.
15. A Leading Practice review is currently underway, looking at how other flood resilience projects, both within New Zealand and overseas, have been undertaken and particularly how community engagement has been incorporated. A key outcome of this work will be to find ways to practically apply learnings from other jurisdictions into the Reimagining Project.
16. An economic analysis of the schemes is also in development. The scope of the assessment is currently being refined with TAG, but some matters to explore include quantifying the avoided losses provided by the schemes (e.g. asset values and the value of production (goods and services)), an economic assessment of bridge structures that currently impede flood flows, and an economic analysis of further investment in scheme improvements.
17. There has been a slight delay to the commencement of Phase 2b: Stakeholder Reference Groups. This delay has been caused by both the delay in appointments to the two project steering groups by project partners, as well as the need to procure external resourcing to support the stakeholder engagement phase. Noting that funding for this resource commenced on 1 July 2025.
18. An update to the phasing and timeframes is presented in **Table 1**.

Table 1: Updated Project Phasing and Timeline

Project Phase	Timeframe
Phase 1: Project Design (current phase)	September 2024 – June 2025
Phase 2a: Community socialisation	February 2025 – June 2026
Phase 2b: Stakeholder Reference Groups	~~July 2025 – December 2025~~ August 2025 – March 2026
Phase 3: Long-term Plan preparation and consultation	June 2026 – June 2027 (HBRC LTP)
Phase 4: Implementation Programme	July 2027 onwards

19. This delay in phasing will not impact the overall timeframes of the project. Staff highlight that timeframe risks remain, given the scope and complexity of the project and the need to deliver tangible outcomes for the 2027 LTP. This risk is a key focus for the project team and TAG.
20. The two project leads, along with the project sponsor, are meeting monthly with the HBRC Project Champions to keep them updated on progress.

Strategic fit

21. This project directly contributes to the achievement of Regional Council's infrastructure and

services focus area, specifically sustainable and climate-resilient services and infrastructure.

22. This project is also a direct response to recommendations from the HBIFR.

Climate change considerations

23. The Reimagining Project is intended to take a long-term view, to determine what flood resilience in Hawke's Bay might look like in generations to come.

24. Any future options for flood resilience in the region must take into account the impact of climate change and mitigate against its effects on the economic, social and cultural wellbeing of the Hawke's Bay community wherever possible.

Decision-making considerations

25. Staff have assessed the requirements of the Local Government Act 2002 in relation to this item and have concluded that, as this report is for information only, the decision-making provisions do not apply.

Recommendation

That Hawke's Bay Regional Council receives and notes the *Reimagining Flood Resilience project update*.

Authored by:

Simon Bendall
PROJECT LEAD - TRAVERSE ENVIRONMENTAL

Louise McPhail
MANAGER RECOVERY (ASSET MANAGEMENT)

Approved by:

Chris Dolley
GROUP MANAGER ASSET MANAGEMENT

Attachment/s

There are no attachments for this report.

HAWKE'S BAY REGIONAL COUNCIL

30 July 2025

Subject: CLIFTON TO TANGOIO COASTAL HAZARDS STRATEGY PROJECT UPDATE

Reason for report

1. This report provides an update on the 2025 community engagement process for the Clifton to Tangoio Coastal Hazards Strategy (Strategy).

Background

2. Following an extensive development process, the Clifton to Tangoio Coastal Hazards Strategy Joint Committee (Joint Committee) confirmed a proposed Strategy document in August 2024.
3. Following the terms of the agreed Memorandum of Transition signed by HBRC, Napier City Council (NCC) and Hastings District Council (HDC) in 2022, the Joint Committee's proposed Strategy was prepared as a recommendation for HBRC to take forward to implementation.
4. The Joint Committee passed the following resolution at their meeting on 9 August 2024.

   That the Clifton to Tangoio Coastal Hazards Strategy Joint Committee:

   1. *Receives and considers the Clifton to Tangoio Coastal Hazards Strategy and Long Term Plan Amendment recommendations to HBRC staff report.*
   2. *Recommends that Hawke's Bay Regional Council:*

      2.1 *Receives the proposed Clifton to Tangoio Coastal Hazards Strategy dated July 2024 and provided as Attachment 1*

      2.2 *Using the proposed funding principles included in the Strategy, refine and finalise a funding model for Strategy implementation*

      2.3 *Prepare a final Clifton to Tangoio Coastal Hazards Strategy for community consultation in in accordance with the requirements of the Local Government Act 2002.*

      2.4 *Commence community consultation no later than March 2025.*

5. HBRC formally received the Joint Committee's recommendations and proposed Strategy on 28 August 2024.
6. Following two further workshops on the matter, the following resolution was passed at the Council meeting on 29 January 2025:

   That Hawke's Bay Regional Council:

   1. *Receives and considers the Clifton to Tangoio Coastal Hazards Strategy implementation staff report.*
   2. *Agrees that the decisions to be made are not significant under the criteria contained in Council's adopted Significance and Engagement Policy, and that Council can exercise its discretion and make decisions on this issue without conferring directly with the community or persons likely to have an interest in the decision.*
   3. *Reconfirms Council's commitment to the Memorandum of Transition signed with the Napier City Council and Hastings District Council in May 2022, which sets out that subject to the adoption of an amendment to its Long Term Plan in accordance with s.16 of the Local Government Act 2022, Hawke's Bay Regional Council will lead implementation of the Clifton to Tangoio Coastal Hazards Strategy.*

4. *Confirms that the Clifton to Tangoio Coastal Hazards Strategy Joint Committee has developed and presented a draft Strategy, which was received by Council on 28 August 2024.*
5. *Confirms that having considered the Joint Committee's draft Strategy, and taking into account the costs of implementation, the ability of households and communities to meet these costs alongside other financial pressures, and Council's current focus and priority on Cyclone Gabrielle recovery and flood resilience, that the Strategy in its current form is not progressed to implementation at this time.*
6. *Instructs the Technical Advisory Group for the Strategy to undertake community engagement through 2025 to test:*
   6.1. *the outcomes developed by Strategy*
   6.2. *implementation costs*
   6.3. *funding methods*
   6.4. *preferred options.*
7. *Instructs the Technical Advisory Group for the Strategy to report back to Council at the conclusion of 2025's community engagement.*
8. *Instructs the Chief Executive to work with Napier City Council and Hastings District Council to confirm project resourcing and progress no or low-regrets opportunities to respond to the ongoing risks posed by coastal hazards while the Strategy development process continues.*

Community engagement update

7. As directed by Council, the Strategy's Technical Advisory Group (TAG) has commenced community engagement, through the following structure (**Figure 1**). Updates on this engagement activity are provided in the following sections.

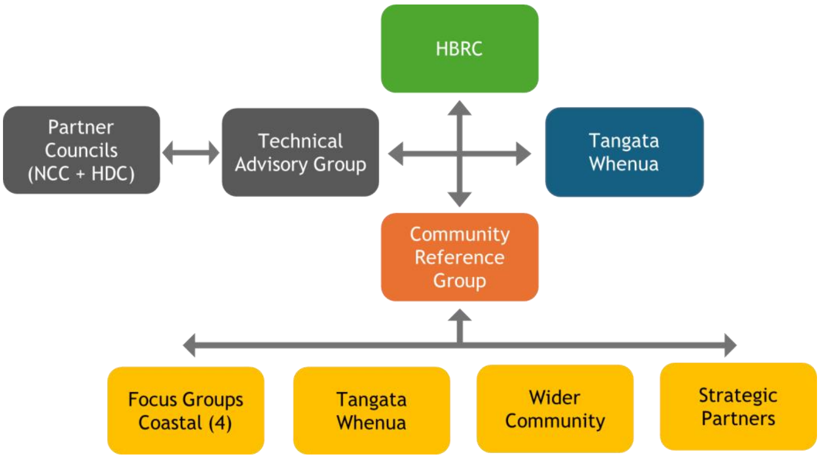


Figure 1: Coastal Strategy Engagement through 2025

Tangata whenua (refer to Figure 1)

8. Supported by an external consultant, the Mātauranga Māori Workstream continues to seek engagement with tangata whenua.
9. The first output of this workstream is to develop cultural framework documents based on PSGE areas, that:

9.1. captures what's important / valued by whānau / the depth of relatedness at the Coast / spiritual connections

9.2. articulates aspirations of whānau / hapū

9.3. provides a mechanism for knowledge / Mātauranga to guide the development and implementation of the Strategy

9.4. supports cross-application e.g. has utility for Kotahi / District Plans / RM Reform, etc.

10. The framework for Mana Ahuriri Trust has been completed and endorsed. Work is progressing on a similar framework for Maungaharuru-Tangitū Trust. Limited progress has been made on the Tamatea Pōkai Whenua framework.

11. A hui was held with Matahiwi Marae in September 2024 to discuss the Strategy, with a follow up hui planned in August.

Community Reference Group (refer to Figure 1)

12. Following an open expressions of interest process, a Community Reference Group (CRG) has been formed. Thirty-four community members are actively participating in the CRG, supported by HBRC, Napier City and Hastings District councillors and staff. The Port of Napier also has representatives in attendance.

13. The purpose of the CRG is to collate information and feedback, including from Focus Groups and the wider community, and to present advice to HBRC that will contribute to decision-making on which options and funding models move forward to formal consultation.

14. The first meeting of the CRG was held on 2 May 2025 (CRG#1) and was chaired by Cr van Beek. This first meeting provided an overview of the work of the Strategy, what the current challenges are, and the proposed engagement approach for 2025.

15. A post-meeting survey was circulated to attendees, with responses indicating that after the first CRG meeting:

15.1. there is good understanding about the purpose of the Strategy and the purpose of the CRG.

15.2. there are concerns about the costs to ratepayers of implementing the Strategy in its current form and the complexity of the challenges ahead.

15.3. some have concerns with how long the process has taken to date.

15.4. there is positivity about the willingness of people to work together to find solutions.

16. The second meeting of the CRG was held on 27 June 2025 (CRG#2) and was chaired by Cr Browne (NCC). This meeting heard back from the Focus Groups (refer below), received a presentation on coastal hazards and climate change, and discussed connecting effectively with the wider community.

17. The meeting was well supported by staff and councillors, but community member attendance for the second CRG meeting was down (26 for CRG#1 vs 15 for CRG#2).

18. TAG has not received any feedback to explain this difference in attendance. Possibly this was due to the meeting being held in Hastings rather than Napier. TAG will continue to review and adjust the process as necessary to ensure it remains as effective as possible for contributing participants.

Focus groups (refer to Figure 1)

19. Following an open expressions of interest process, four Focus Groups have been formed, one for each of the communities where specific and urgent coastal hazards works are proposed by the Joint Committee's recommended Strategy.

20. The purpose of the Focus Groups is to consider the options proposed in the Strategy that directly relate to their location and communities.

21. The Focus Groups are working together in a northern (Bay View + Westshore) and southern (Haumoana + Te Awanga) grouping, which is supporting collaboration and enabling staff and advisors to support their work more efficiently.

    21.1. Northern (supported by HBRC & NCC staff and Councillors):

        21.1.1. Bay View Focus Group (5 members)

        21.1.2. Westshore Focus Group (11 members),

    21.2. Southern (supported by HBRC & HDC staff and Councillors):

        21.2.1. Haumoana Focus Group (9 members)

        21.2.2. Te Awanga Focus Group (5 members)

22. The Focus Groups are meeting on a 3-weekly basis, with three meetings held so far:

    22.1. Meeting 1, 26 May 2025: Introductions, Strategy overview, Focus Group purpose, meeting logistics

    22.2. Meeting 2, 16 June 2025: Explore action(s) proposed by the Strategy + possible alternatives.

    22.3. Meeting 3, 7 July 2025: Local Government Funding 101: Long-term Plans, rating, decision-making & providing actionable advice to HBRC.

23. A forward work plan has been adopted by all Focus Groups, which has set out a meeting schedule through to the end of September 2025.

24. Focus Groups' meetings have been very well attended with constructive and robust discussions ongoing.

Project funding update

25. From inception the Strategy has been jointly funded by HDC, NCC and HBRC.

26. Each year, TAG adopts a project budget, which allocates funding to different workstreams. The level of funding available generally dictates the speed and activity of the project. Project expenditure and budget are reported monthly at each TAG meeting.

27. The 2022 Memorandum of Transition includes an agreement that HDC, NCC and HBRC "*Jointly and equally fund the continued development and implementation of the Strategy until 1 July 2024, when funding has been implemented for physical works under the Strategy in HBRC's long-term plan*."

28. This clause assumed that the Joint Committee would recommend a proposed Strategy to HBRC by 31 March 2023, and that following consultation the Strategy would be adopted as an amendment to HBRC's Long-term Plan.

29. However, Strategy development was delayed by Cyclone Gabrielle, and the Joint Committee did not recommend a proposed Strategy to HBRC until August 2024.

30. In February 2025, HDC decided to re-allocate its Strategy funding contribution for the 2025-26 financial year. While there will be no direct funding contribution, HDC staff and councillors remain involved and are actively supporting the project.

31. In May 2025, NCC determined that it would retain within the Napier Resilience Fund the Strategy funding contribution for the 2025-26 financial year. It is understood that NCC will consider releasing funds to HBRC should additional project funding be needed where it can be demonstrated that it provides value to the Joint Strategy and benefits Napier City. NCC staff remain involved and are actively supporting the project. There is also a level of involvement

from Napier elected members.

32. A project budget has been developed and adopted by TAG for the 2025-26 financial year, estimating workstream costs for engaging with mana whenua, project management, comms and engagement and potentially technical input and peer review.

33. The project budget includes a number of assumptions and some allowance for uncertainty. With HBRC and NCC funding, a small budget shortfall is currently estimated.

34. TAG has agreed to closely monitor project spend over the next 4 months, and compare this against projected spend. At that time, TAG will review remaining project requirements and available funding and develop recommendations on any necessary actions.

Next steps

35. Regular engagement meetings are now occurring through the Focus Groups and CRG. There is good engagement, and positive discussion. A programme of meetings has been confirmed to the end of the year.

36. Connections need to be established with Strategic Partners *(refer Figure 1)* particularly the Port of Napier and Hawke's Bay Airport.

37. Engagement with the wider community *(refer Figure 1),* principally through digital means (surveys, revised website, etc), is due to commence shortly. Key outcomes sought from this engagement will be to inform the wider community about coastal hazards and the proposed Strategy, and to test potential funding approaches.

38. This engagement activity is aimed at assisting the CRG to develop and present actionable advice to HBRC that will contribute to decision-making on which options and funding models move forward to formal consultation. This advice is programmed to be presented to HBRC in February 2026.

Decision-making considerations

39. Staff have assessed the requirements of the Local Government Act 2002 in relation to this item and have concluded that, as this report is for information only, the decision making provisions do not apply.

Recommendation

That the Hawke's Bay Regional Council receives and notes the Clifton to Tangoio Coastal Hazards Strategy Project Update staff report.

Authored by:

Simon Bendall
PROJECT LEAD - TRAVERSE ENVIRONMENTAL

Approved by:

Chris Dolley
GROUP MANAGER ASSET MANAGEMENT

Attachment/s

There are no attachments for this report.

Meeting of the HB Civil Defence Emergency Management Group Joint Committee

Date: Monday 28 July 2025

Time: 1.30pm

Venue: Council Chamber
Hawke's Bay Regional Council
159 Dalton Street
NAPIER

Agenda

Item 4

Item 7

HB CDEM Group Joint Committee

Monday 28 July 2025

Subject: HB CDEM Service Level Agreement

Reason for report

1. This report seeks the Hawke's Bay CDEM Group Joint Committee's adoption of the Hawke's Bay Civil Defence Emergency Management Service Level Agreement (SLA) dated July 2025 (Attached).

Staff recommendations

2. The Coordinating Executive Group has endorsed the Hawke's Bay Civil Defence Emergency Management Service Level Agreement (SLA) as attached and recommends adoption by the CDEM Joint Committee.

3. Further, the Coordinating Executive Group noted the SLA will be reviewed in early 2026 to align with local government annual planning processes, and again as part of the 2027-2037 Long Term Plan process.

Executive summary

4. The Hawke's Bay Civil Defence Emergency Management Service Level Agreement (SLA) formalises the roles, responsibilities, and service expectations of each Territorial Authority (TA), the Hawke's Bay Regional Council (HBRC), and the Hawke's Bay Emergency Management Office in delivering effective CDEM outcomes across the region.

5. The SLA is a critical component of the Hawke's Bay CDEM Transformation Strategy adopted in early 2025, developed in direct response to independent reviews of the Cyclone Gabrielle response and subsequent national inquiries.

6. It supports a rebalanced operating model by strengthening local capability while maintaining strong regional coordination.

Background /Discussion

7. The CDEM Act 2002 establishes the roles and responsibilities of local authorities to plan for, respond to, and recover from emergencies, and to maintain coordinated regional arrangements. It also requires that each CDEM Joint Committee (CDEM Group) has an administering authority, which must be a regional council or unitary authority that is a member of the Committee.

8. The Hawke's Bay Emergency Management Group Plan 2014–2019 set out the region's strategic goals and highlighted the need for improved coordination and interoperability among councils, the Emergency Management Office, and communities.

9. In 2017, the Coordinating Executive Group and the CDEM Joint Committee endorsed a Roles and Responsibilities matrix based on principles that services to communities should not be reduced, that the Joint Committee members are collectively responsible for regional CDEM, and that clarity of roles would enhance resilience and improve response capability.

10. Following the response to Cyclone Gabrielle, both the Mike Bush Review and the Government Inquiry led by Sir Jerry Mateparae, identified significant issues in New Zealand's emergency management system, such as unclear roles and responsibilities, inconsistent local capability, and challenges in regional coordination. The Mateparae Inquiry concluded that the system is not fit for purpose and recommended that roles and responsibilities, particularly for local government, be clarified through updated legislation, reinforcing the need for a more formalised and regionally consistent approach in Hawke's Bay.
11. In response, the Hawke's Bay CDEM Transformation Strategy was developed and adopted in early 2025. The Strategy sets out a programme of work to rebalance the operating model, strengthen community readiness, and improve the overall effectiveness of CDEM activities across the region.
12. A key focus area of the Transformation Strategy is the establishment of a formal Service Level Agreement (SLA) to operationalise the new model. The SLA addresses gaps in role clarity, ensuring each council understands and agrees to its responsibilities and expectations.
13. The attached SLA defines the roles, responsibilities, and service expectations of each of the five councils (the four Territorial Authorities and the Hawke's Bay Regional Council), along with the Hawke's Bay Emergency Management Office. It operationalises statutory obligations under the CDEM Act 2002 and aligns with the Group Plan and national guidance.
14. The SLA supports a rebalanced model by strengthening local delivery while maintaining strong regional leadership and coordination through the Hawke's Bay Emergency Management Office and the Group Controller.
15. Each local authority is a statutory member of the Hawke's Bay CDEM Joint Committee and is responsible for contributing to regional CDEM outcomes. The SLA formalises this commitment in a practical, operationally focused document, reinforcing collective responsibility for reducing risk, ensuring readiness, and supporting communities before, during, and after emergencies.
16. The SLA is proposed to be adopted on 28 July 2025 by the CDEM Joint Committee.
17. Following further review, amendments, and consultation with the parties, the SLA will be reviewed in early 2026.
18. It is intended to be reviewed again for the 2027/28 Long Term Plan process and will align with the new CDEM Group Plan.
19. Earlier this year, the Government announced its intention to reform New Zealand's emergency management legislation, with a Bill expected to be introduced during the current parliamentary term. Subject to timing, the SLA will be updated during the 2026 and 2027/28 reviews to ensure consistency with any legislative changes.

Options assessment

20. The following options have been identified for the Joint Committees consideration regarding the adoption of the HB CDEM SLA. Each option has been assessed against its alignment with the HB CDEM Transformation Strategy, the ability to improve regional and local capability, and implications for timing, funding, and overall community resilience.

Option	Description	Pros	Cons
Option 1: Adopt the SLA (Recommended)	Adopt the SLA as endorsed by CEG. The SLA will be reviewed in early 2026 and again as part of the 2027/28 Long Term Plan process.	Gives effect to the HB CDEM Transformation Strategy and supports the shift to a more coordinated, locally empowered emergency management system. Strengthens clarity, accountability, and alignment of roles and responsibilities across the region.	May commit councils to responsibilities and service expectations before long-term funding and resourcing arrangements under the new operating model are fully confirmed.
Option 2: Adopt subject to conditions	Adopt the SLA in principle, subject to specific conditions being met before final implementation. Conditions may include clarification of future funding arrangements, alignment with forthcoming legislation, or confirmation of resourcing and capability requirements.	Demonstrates support for the HB CDEM Transformation Strategy and the shift to a more balanced regional model. Retains the ability to address and resolve any concerns before fully committing to operational changes.	Would delay implementation of the SLA's intended improvements. May create uncertainty or inconsistencies across the region if some councils proceed without endorsement.
Option 3: Do not Adopt until further detail is provided.	Withhold adoption of the SLA until additional clarity is provided on funding, resourcing arrangements, and/or legislative alignment. No in-principle commitment is given until all outstanding matters are fully resolved.	Ensures Councils do not commit to service expectations or financial responsibilities without a complete understanding of long-term implications. Allows full consideration of upcoming legislative changes and funding mechanisms through future Annual Plan and Long-Term Plan processes.	Delays regional implementation of the SLA and slows progress on Transformation Strategy priorities. Increases the risk of another emergency event occurring before formal roles and responsibilities are agreed. Does not meet the previous direction of the CDEM Joint Committee or expectation of community stakeholders seeking improved clarity and consistency.

Option	Description	Pros	Cons
Option 4: Do not adopt and continue with status quo.	Don't adopt the SLA and continue operating under the existing 2017 Roles and Responsibilities matrix.	The 2017 matrix is already in place and was formally agreed by the CDEM Joint Committee and Coordinating Executive Group.	Does not align with the HB CDEM Transformation Strategy or the strategic direction set by the HB CDEM Group Joint Committee. The existing roles and responsibilities have been identified as unclear and insufficient in recent reviews, including the Cyclone Gabrielle response review.

Financial and resource implications

21. HBRC will collect a targeted CDEM rate of $3.665 million in FY 25/26 and $3.944 million in FY 26/27. These figures are based on the pre-transformation structure, as the budget was set and adopted prior to the Hawke's Bay CDEM Transformation Strategy being finalised.
22. Transformation costs of $836,000 over two years (FY 25/26–26/27) will be loan-funded, with repayment over a 10-year period via the CDEM targeted rate beginning in FY 26/27.
23. At the end of FY 23/24, the CDEM reserve was in deficit by $3.658 million due to costs associated with Covid-19, the Napier floods, and Cyclone Gabrielle. The 2024–2027 Long Term Plan includes a strategy to repay this deficit over 10 years, starting in FY 25/26, through the targeted CDEM rate.
24. The SLA states that during the 2027-28 financial year, consultation should occur as part of the Long-Term Plan process to determine whether the centrally targeted CDEM rate remains the preferred funding approach for the following three years. In addition, the targeted CDEM rate will be reviewed as part of the 2026-27 Annual Plan review and consultation process.

Consultation

25. A preliminary first draft was prepared in March 2025 and reviewed during April by officers from HBRC, Wairoa District Council, Napier City Council, Hastings District Council, Central Hawke's Bay District Council and the Hawke's Bay Emergency Management Office.
26. Chief Executive workshops on the draft SLA were held on 28 April and 23 June 2025. Feedback from these sessions informed further revisions.
27. Each council has had the opportunity to workshop the draft SLA with their elected members, ensuring alignment with local expectations and governance input ahead of formal endorsement.
28. The Coordinating Executive Group endorsed the SLA at its meeting on 21 July 2025, subject to minor wording changes. The current version, incorporating these changes, is presented as attached.
29. Community consultation on the broader Hawke's Bay CDEM arrangements is planned as part of the Hawke's Bay CDEM Group Plan review during the 2025-26 and 2026-27 financial years.

Other considerations

30. At its meeting on 24 March 2025, the CDEM Joint Committee noted the intention to transition to a rebalanced Hawke's Bay CDEM operating model, moving from the current centralised model.

31. The Joint Committee agreed formal transition was subject to key preconditions being met, including:
    31.1. Approval of the Service Level Agreement and Roles and Responsibilities document by the Joint Committee.
    31.2. Completion of recruitment of Emergency Management staff at each territorial authority, as advised by the Director Hawke's Bay Emergency Management.
    31.3. A declaration from the Hawke's Bay CDEM Group Controller confirming that the system is ready to transition.
32. These steps are designed to ensure the region is operationally and organisationally ready to implement the rebalanced model effectively, strengthening local delivery and supporting regional coordination.

Recommendations

That the HB CDEM Joint Committee:

1. Receives and considers the *HB CDEM Service Level Agreement* staff report.
2. Adopts the Hawke's Bay Civil Defence Emergency Management Service Level Agreement, as proposed.

Authored by:

Shane Briggs
Director Hawke's Bay Emergency Management

Approved by:

Katrina Brunton
Group Manager Policy & Regulation

Attachment/s

1⇨	HB CDEM Service Level Agreement July 2025	Under Separate Cover *Available online only*

HB CDEM Group Joint Committee

Monday 28 July 2025

Subject: HB CDEM Group Joint Committee Delegations

Reason for report

1. This item highlights the risk that, during the period between local election results and the swearing-in of members, the Joint Committee is unable to exercise powers under section 85 of the CDEM Act 2002, and recommends that the Joint Committee delegates its section 85 powers to the Group Controller to ensure these powers can be exercised if required during this period.

Discussion

2. If a state of emergency is in force, the Group Controller has emergency powers under sections 86 to 92 and section 94 of the Civil Defence Emergency Management Act 2002. These powers apply within the area covered by the state of emergency.
3. In addition to the Controller's powers, section 85 of the CDEM Act provides emergency powers to Civil Defence Emergency Management Groups while a state of emergency is in force. These include:

85 Emergency powers of Civil Defence Emergency Management Groups
While a state of emergency is in force in its area, a Civil Defence Emergency Management Group may— (a) carry out or require to be carried out all or any of the following: (i) works: (ii) clearing roads and other public places: (iii) removing or disposing of, or securing or otherwise making safe, dangerous structures and materials wherever they may be: (b) provide for the rescue of endangered persons and their removal to areas of safety: (c) set up first aid posts, and provide for first aid to be given to casualties and for their movement to hospital, other place of treatment, or areas of safety: (d) provide for the relief of distress, including emergency food, clothing, and shelter: (e) provide for the conservation and supply of food, fuel, and other essential supplies: (f) prohibit or regulate land, air, and water traffic within the area or district to the extent necessary to conduct civil defence emergency management: (g) undertake emergency measures for the disposal of dead persons or animals if it is satisfied that the measures are urgently necessary in the interests of public health: (h) disseminate information and advice to the public: (i) enter into arrangements, including employment arrangements, with any person for the purpose of carrying out civil defence emergency management as may be agreed: (j) provide equipment, accommodation, and facilities for the exercise of any of the powers conferred by this subsection.

4. The Hawke's Bay CDEM Group Joint Committee Terms of Reference state that:

    4.1. *In accordance with clause 23 of Schedule 7 of the Local Government Act 2002 the quorum of the Group is all local authority members.*

5. The Terms of Reference also state that:

    5.1. *All actions (other than the entering into of contracts within the authorised Group budget) to be taken by the Group must first be approved by way of a majority vote of all members that are present and voting.*

6. The requirement for the Joint Committee to meet, even virtually, to exercise its section 85 powers may cause delays or inefficiencies during emergencies.
7. In many regions, section 85 emergency powers are delegated by the CDEM Group to the Controller and recorded in the Group Plan.
8. The lack of delegation of these powers in the current Hawke's Bay CDEM Group Plan may be the result of an oversight or error.

Gap in Emergency Powers during Local Government Elections

9. During the triennial local government elections, a period of risk arises between the public declaration of official election results and the swearing-in of new mayors and councillors.
10. Under the Local Electoral Act 2001, successful candidates take office the day after the public notification of official results.
11. However, they cannot act in their official capacity until they have made the statutory declaration at the inaugural council meeting. This gap may extend for up to two weeks.
12. During this post-election period, the Joint Committee does not have validly sworn-in members and therefore cannot meet or exercise any powers under the Civil Defence Emergency Management Act 2002.
13. While section 69 of the CDEM Act allows the Minister for Emergency Management to declare a local state of emergency during the post-election period, this does not enable the use of section 85 emergency powers unless those powers have already been delegated to the Group Controller.
14. Although the Chief Executive of each local authority has the ability to call an extraordinary meeting with less than the usual seven days' notice in emergency situations, this process is unlikely to be practical or timely in an emergency response.
15. To ensure continuity and effectiveness during emergencies, it is recommended that, in accordance with section 18(1) of the CDEM Act 2002, the Hawke's Bay CDEM Group delegates its powers under section 85 to the Group Controller and any person acting in that role.
16. The Group Controller shall report on any actions taken under section 85 at intervals directed by the Chairperson of the Hawke's Bay CDEM Group.
17. This delegation does not limit the Group's ability to exercise these powers directly once members are sworn in and available.
18. This delegation could apply either on an ongoing basis, or specifically to cover the period during the local government election transitions.

Decision-making considerations

19. Councils and their committees are required to make every decision in accordance with the requirements of the Local Government Act 2002 (the Act). Staff have assessed the requirements in relation to this item and have concluded that the Joint Committee can exercise its discretion.

20. An ongoing delegation would require an amendment to the Group Plan and meets the requirements of section 57 of the Civil Defence Emergency Management Act 2002 and can be considered as a minor change to the Group Plan that does not need public consultation.

Recommendations

That Hawke's Bay CDEM Group Joint Committee:

1. Receives and considers the Hb CDEM Group Joint Committee Delegations report.
2. Agrees that, in accordance with section 18(1) of the Civil Defence Emergency Management Act 2002, the Hawke's Bay Civil Defence Emergency Management Group delegates its powers under section 85 of that Act to the Group Controller, and to any person lawfully acting in that role, for the duration of their appointment.

OR

3. Agrees that, in accordance with section 18(1) of the Civil Defence Emergency Management Act 2002, the Hawke's Bay Civil Defence Emergency Management Group delegates its powers under section 85 of that Act to the Group Controller, and to any person lawfully acting in that role, *for the period from the day after the public notification of the official 2025 local election results and the Mayors of the region's city and district council have been sworn in*.

Authored and Approved by:

Shane Briggs
Director Hawke's Bay Emergency Management
& Group Controller

Attachment/s

There are no attachments for this report.

HB CDEM Group Joint Committee

Monday 28 July 2025

Subject: Local Controller removal

Reason for report

1. This item seeks the removal Raul Oosterkamp as a Local Controller from the Hawke's Bay CDEM Group Plan as requested by Hastings District Council.

Discussion

2. Hastings District Council currently has four appointed and trained Local Controllers.
3. Raul Oosterkamp, one of the appointed Local Controllers, has recently changed roles within Hastings District Council and has advised that he no longer wishes to continue in the Local Controller role.
4. Hastings District Council supports the removal of Raul Oosterkamp from the Local Controller role.
5. Hastings District Council has three remaining Local Controllers:
   - 5.1. Craig Cameron
   - 5.2. Clint Adamson
   - 5.3. Dean Ferguson.

Background

6. The Joint Committee may appoint 1 or more persons to be a Local Controller, and direct that person or persons to carry out any of the functions and duties of, or delegated to, the Group Controller and to exercise the powers of Controllers in the area for which the Group Controller is appointed, including, but not limited to, the powers in sections 86 to 94.
7. Local Controllers are appointed for the entire Hawke's Bay CDEM Group area, rather than being limited to their specific territorial authority area.
8. In the event of a wider regional emergency, Local Controllers may exercise their delegated powers across any part of the Hawke's Bay CDEM Group area covered by the state of emergency.
9. The Local Controllers for Hawke's Bay, following the removal of Raul Oosterkamp, are:
   - 9.1. Juanita Savage (Wairoa)
   - 9.2. Te Arohanui Cook (Wairoa)
   - 9.3. Craig Cameron (Hastings)
   - 9.4. Clint Adamson (Hastings)
   - 9.5. Dean Ferguson (Hastings)
   - 9.6. Rachael Bailey (Napier)

9.7. Stephanie Murphy (Napier)

9.8. Steve Gregory (Napier)

9.9. Russell Bond (Napier)

9.10. Ben Swinburne (Central Hawke's Bay)

9.11. Dylan Muggeridge (Central Hawke's Bay)

9.12. Reuben George (Central Hawke's Bay).

10. Appointments and associated delegations are contained in the Hawke's Bay CDEM Group Plan and as such represent a minor change to the Plan.

Decision-making considerations

11. Councils and their committees are required to make every decision in accordance with the requirements of the Local Government Act 2002 (the Act). Staff have assessed the requirements in relation to this item and have concluded that the Joint Committee can exercise its discretion.

12. The proposed amendments to the Group Plan meet the requirements of section 57 of the Civil Defence Emergency Management Act 2002 and can be considered as a minor change to the Group Plan that does not need public consultation.

Recommendations

That the Hawke's Bay Civil Defence Emergency Management Group Joint Committee:

1. Receives and considers the *Local Controller Removal* report.
2. Agrees to the removal of Raul Oosterkamp as a Local Controller for the Hawke's Bay CDEM Group.
3. Agrees to amend *Appendix 5: Key Appointments* of the Hawke's Bay CDEM Group Plan pursuant to section 57 of the Civil Defence Emergency Management Act 2002 to remove Raul Oosterkamp as a Local Controller.

Authored and Approved by:

Shane Briggs
Director Hawke's Bay Emergency Management

Attachment/s

There are no attachments for this report.

Item 7

HB CDEM Group Joint Committee

Monday 28 July 2025

Subject: National Emergency Management Agency update

Reason for report

1. This item introduces the National Emergency Management Agency (NEMA) update (attached).

Recommendation

That the Hawke's Bay Civil Defence Emergency Management Group Joint Committee receives and notes the *National Emergency Management Agency update*.

Authored and Approved by:

Shane Briggs
Director Hawke's Bay Emergency Management

Attachment/s

1⇩ NEMA update for HB CDEM Joint Committee 28 July 2025

Item 7

National Emergency Management Agency
Te Rākau Whakamarumaru

NEMA Update

Hawkes Bay CDEM Joint Committee

28 July 2025

EMSIP Road Map

The Government has agreed in principle to the investment and implementation roadmap to strengthen New Zealand's emergency management system.

- The roadmap sets out what we need to do over the next five years. The roadmap will:
  - strengthen community leadership, ownership and preparedness
  - clarify roles, strengthen accountability, set standards, and provide assurance
  - make leaders accountable, and build a trained, exercised workforce
  - update warning systems and modernise antiquated technology and facilities.
- Key initiatives in the roadmap include:
  - Regional support teams based around New Zealand to provide surge support during and following emergencies and boost regional workforce capability.
  - A refreshed and increased Resilience Fund to empower more communities to prepare for and respond to emergencies.
  - Agreements and partnerships with businesses, iwi/Māori and community organisations to enhance local readiness.
  - Professional pathways to expand the emergency management workforce and build capability.
  - Proactive procurement and placement of critical equipment and supplies.
  - A Common Operating Picture to support shared situational awareness and decision-making.
- Cabinet has agreed to the roadmap in principle, subject to further policy work, the passage of enabling legislation, and availability of new funding through future Budgets.
- The National Emergency Management Agency will prioritise activity that can be delivered from its current baselines and go back to the Government for proposed initiatives that will require new funding from future budgets.
- View the roadmap at: https://www.civildefence.govt.nz/emergency-management-system-improvement-programme

EMSIP Phase 3.

EMSIP Phase 3 has commenced

During Phase 3 we (NEMA/Sector) will put forward budget bids for three (3) workstreams, with a view to securing funding from Government in FY26/27.

- The three workstreams are:
  - Regional Support Teams
  - Public Readiness / Community Development and Outreach
  - Resilience Fund

The budget bids will be drafted by the Chief Advisor, Strategic Finance (DPMC), however the content for the budget bids will be provided by key stakeholders, including EMLG

National Emergency Management Agency
Te Rākau Whakamarumaru

The budget bids (for FY26/27) are likely due at Treasury in **December 2025**. The process/dates are:

- **July and August**: Scope/shape budget initiatives (workstreams) *(Note: detailed plans not required; this will come if budget bids are successful)*
- **September**: Finalise content for bids and commence stakeholder consultation
- **October**: Invitations to submit budget bids advised (by Treasury) + stakeholder consultation
- **Nov/Dec**: Budget bids submitted to Minister, followed by formal submissions to Treasury

To support this process, and the tight timeframes, NEMA proposes:

- **2 EMLG Workshops**: one the week of 21 July (TBC soonest), and one at the August EMLG (13 August)
- **EM System Focus Group Engagement**
- 3 Focus Groups (one for each workstream)
- The intent is that there will be 2 – 3 workshops for each Focus Group (depending on stakeholders and demand)
- The workshops for these will be held the week of 21 July and 11 August
- There will be an online update held the week of 1 September

Emergency Management Bill

The Minister for Emergency Management and Recovery intends to introduce a new Bill in the second half of 2025, to be enacted in 2026. From 15 April to 20 May 2025 NEMA invited submissions on the issues and options outlined in the discussion document, summary and information which is available on NEMA's website www.civildefence.govt.nz/emergency-management-bill. NEMA received nearly 400 submissions, the vast majority of which are substantive. final policy decisions are expected to be made later this year before the introduction of a new Emergency Management Bill.

CDEM Resilience Fund

The CDEM resilience fund is a contestable fund to enhance Aotearoa New Zealand's hazard risk resilience. The resilience fund aligns with CDEM Group Plans and the National Disaster Resilience Strategy priorities to enhance Aotearoa New Zealand's hazard risk resilience through the development of local and regional capability and practices. For the 2025/26 financial year, there were ten successful applicants, however none from the Hawkes Bay Region.

Tsunami Evacuation Guideline

This updated Director's Guideline sets the new nationally consistent approach for public-facing tsunami evacuation zones: the Blue Zone. The purpose of the Blue Zone is to simplify tsunami evacuation; to make it easier for our communities to know what to do when a tsunami arrives at our coast and there is little time to evacuate. This reinforces our Long or Strong, Get Gone message. The Blue Zone will save lives and enable our communities to be safe and feel safe.

This guideline builds upon the foundation laid by the previous version, reflecting the increased understanding of out threat, advances in technology and great social science research. It has been developed through a collaborative effort with experts across the motu. NEMA thanks everyone who contributed to updating this guideline which is available at: https://www.civildefence.govt.nz/cdem-sector/guidelines/tsunami-evacuation-directors-guideline

National Emergency Management Agency
Te Rākau Whakamarumaru

Memoranda of Understanding (MoU) with Broadcast Media

On May 14 an updated MoU was signed between NEMA and, RNZ, TVNZ, the Radio Broadcasters Association, Community Access Media Alliance, Whakaata Māori and Te Whakaruruhau o Ngā Reo Irirangi Māori (Iwi Radio Network). This MoU guides how we work together both in peacetime and in response.

The MoU has greater flexibility in activating the agreement depending on the severity and pace of an event, and increased provisions for the partners to work collaboratively before and during an emergency response. When activated in an emergency response, it mobilises support from broadcasters to broadcast or amplify critical messages above and beyond normal news programming.

The new MOU incorporates "informal activation," a practice refined during COVID-19 to quickly share vital public information—an approach that has proven to be both effective and appreciated. You can view the new agreement here.

MfE Emergency Waste Funding.

Minister Simmonds made an announcement on the 27th April about the establishment of an emergency waste funding process that will be available for future events. Details will be available on the MfE website;

Overview - https://environment.govt.nz/news/emergency-waste-funding/

Application information - https://environment.govt.nz/what-you-can-do/funding/emergency-waste-funding/

Water entities effective 1 July 2026

The Government is committed to ensuring all New Zealanders have access to safe, reliable and affordable drinking water, wastewater and stormwater services. Therefore, the Government is setting up 10 entities across the country to administer/provide this service. The Government believes it is critically important that the entities have clear stronger links with their communities, to ensure New Zealanders have confidence that the entities will listen and respond to their needs. Each entity will have the same functions, powers and accountabilities as already provided for in the Water Services Entities Act.
Water Care Auckland is the first entity to be legally recognised in this capacity, with the ability to deal directly with NEMA in an event.

Ian Wilson
Senior Regional Emergency Management Advisor
National Emergency Management Agency Te Rākau Whakamarumaru

Item 8

Item 7

HB CDEM Group Joint Committee

Monday 28 July 2025

Subject: HB CDEM Group Controller update

Reason for report

1. This item informs and updates the CDEM Group Joint Committee on the Group Controller's activities.

Discussion

2. The statutory Controllers have agreed to meet bi-monthly:
   2.1. Meetings may include workshops, training, and mini exercises
   2.2. Twice a year, the statutory Controllers will hold a joint meeting with non-statutory controllers and the Emergency Services Coordinating Committee
   2.3. A terms of reference for the Controllers Forum will be developed.
3. At its meeting on 21 July 2025, the Coordinating Executive Group (CEG) approved the proposal to formally invite one statutory Controller from each Council to attend CEG meetings as an observer, recognising the statutory role Controllers hold under the Civil Defence Emergency Management Act 2002.
4. CEG also agreed that agendas and minutes will be shared with all statutory Controllers to support their awareness of regional arrangements and priorities.

Group Controllers

5. A Civil Defence Emergency Management Group must appoint, either by name or by reference to the holder of an office, a suitably qualified and experienced person to be the Group Controller for its area. [s26(1)], along with at least one alternate.
6. Hawke's Bay CDEM Group faces a shortage of alternate Group Controllers, with no other emergency management staff members having the necessary qualifications or experience to serve as an alternate Group Controller.
7. A public expression of interest process held in late 2024 received few responses.
8. Increased scrutiny of key roles during and after recent events has made it more challenging to find people willing to take on the Controller role alongside their regular job. This challenge is also being experienced by other CDEM Groups.
9. At the 27 January 2025 meeting, we presented the Joint Committee with a proposed selection and appointment process for Controllers, following their request for a more rigorous approach. This was endorsed, subject to minor changes.
10. Due to capacity limitations, we have not yet completed the full process. However, while this work continues, we have identified and engaged with several potential Group Controllers and are supporting three candidates to attend the RRANZ Response and Recovery Leadership Development Programme, as they have met the prerequisite training requirement

11. One of the candidates is employed by HBRC, while the other two will be engaged on a contractor basis to ensure appropriate liability coverage when acting during a non-declared emergency.
12. The RRANZ Response and Recovery Leadership Development Programme includes seven online modules, supported by weekly facilitator-guided discussions. This is followed by a five-day face-to-face course featuring interactive learning sessions, hazard-specific response and recovery leadership activities, and written assignments. Two of the candidates are expected to complete the course by the end of August.
13. We intend to complete the formal selection and appointment process before presenting a paper to the 20 October CEG meeting and the 24 November 2025 Joint Committee meeting seeking approval to appoint the two candidates as Group Controllers.
14. The third candidate is expected to complete the course by the end of November, and we intend to bring a paper to the first CEG and Joint Committee meetings of 2026 for consideration of that candidate's appointment.
15. In the interim, if needed for a likely or actual event, Group Controller support will be requested through NEMA.
16. There are sufficient Local Controllers for most emergencies, and delegating a suitable Local Controller to act as Group Controller remains a viable option in the short-term.

Local Controllers

17. The Joint Committee may appoint 1 or more persons to be a Local Controller, and direct that person or persons to carry out any of the functions and duties of, or delegated to, the Group Controller and to exercise the powers of Controllers in the area for which the Group Controller is appointed, including, but not limited to, the powers in sections 86 to 94.
18. Local Controllers are appointed for the entire Hawke's Bay CDEM Group area, rather than being limited to their specific territorial authority area.
19. In the event of a wider regional emergency, Local Controllers may exercise their delegated powers across any part of the Hawke's Bay CDEM Group area covered by the state of emergency.
20. The Local Controllers for Hawke's Bay are:
    - 20.1. Juanita Savage (Wairoa)
    - 20.2. Te Arohanui Cook (Wairoa)
    - 20.3. Craig Cameron (Hastings)
    - 20.4. Clint Adamson (Hastings)
    - 20.5. Dean Ferguson (Hastings)
    - 20.6. Rachael Bailey (Napier)
    - 20.7. Stephanie Murphy (Napier)
    - 20.8. Steve Gregory (Napier)
    - 20.9. Russell Bond (Napier)
    - 20.10. Ben Swinburne (Central Hawke's Bay)
    - 20.11. Dylan Muggeridge (Central Hawke's Bay)
    - 20.12. Reuben George (Central Hawke's Bay).

Recommendation

That the HB CDEM Joint Committee receives and notes the *HB CDEM Group Controller update*.

Authored and Approved by:

Shane Briggs
Director Hawke's Bay Emergency Management

Attachment/s

There are no attachments for this report.

HB CDEM Group Joint Committee

Monday 28 July 2025

Subject: HB CDEM Group Office update

Reason for report

1. This item informs and updates the CDEM Joint Committee on the Hawke's Bay Emergency Management Office (CDEM Group office) activities.

Discussion

2024-2025 Work Programme

2. The work programme was approved in November 2022, covering the period from July 2022 to June 2024. This can be accessed at https://www.hbemergency.govt.nz/assets/Documents/Plans-Procedures-and-Strategies/Group-Work-Programme-2022-24.pdf
3. While the 2022-2024 work programme activities remained valid in 2024-25, some of the activities impacted by the transformation were put on hold.
4. Over the 2024-25 year, the Emergency Management Office:
   - 4.1. Made strong progress in community resilience work, increasing the number of Community Hubs and Community Resilience Plans across the region.
   - 4.2. Engaged with eight iwi and marae across Wairoa, Hastings, and Central Hawke's Bay, and supported a wide range of community groups, including multicultural, disability, early childhood, and older persons networks.
   - 4.3. Continued public information and education activities, including updates to tsunami information boards and expanded outreach through school and community sessions.
   - 4.4. Improved operational capability, with 926 training attendances. New courses were delivered focusing on coordination centre function-specific roles, function management, and assessing welfare needs in an emergency
   - 4.5. Strengthened satellite communication and digital radio networks, and more staff were trained and authorised to issue Emergency Mobile Alerts.
   - 4.6. Started rolling out the Registration and Needs Assessment (RANA) platform.
   - 4.7. Continued to develop guidelines for Civil Defence Centres, although the regional welfare plan was delayed.
   - 4.8. Started kōrero with Māori communities, but further dedicated resources are needed and are included in the proposed restructure of the Emergency Management Office.
5. Several areas of work were paused or slowed due to limited staff capacity. This included hazard research, risk reduction, and the Group Plan review.
6. Overall, despite resourcing pressures, the office maintained momentum in core activities while laying important groundwork for future improvements through the transformation programme and the upcoming Group Plan review.

Financial update for 2024-2025

7. The financial figures for 2024–2025 are indicative and not yet finalised. They are provided to give an overview of the expected financial position.

Management Reporting	YTD Actual	Forecast additional spend	Forecast total Spend	FY Budget	Performance vs. Budget
EXPCAP - Capital charges	1,225.52		1,225.52	-	- 1,225.52
EXPEXT - External Costs	673,043.99		673,043.99	571,290.48	- 101,753.51
EXPINT - Internal Time	1,930,244.95		1,930,244.95	2,544,503.40	614,258.45
EXPOHA - Overhead allocation	520,355.40	193,800.00	714,155.40	520,355.40	-
FNDOTH - Other funding	- 151,851.09		- 151,851.09	- 140,346.12	11,504.97
FNDRES - Reserves funding	-		-	-	-
FNDTAR - Targeted Rates	- 3,530,558.16		- 3,530,558.16	- 3,495,802.68	34,755.48
	- 557,539.39	**193,800.00**	**- 363,739.39**	**0.48**	**557,539.87**
Reserve Balance YE 23/24 (Deficit)			3,658,118.00		
Contribution to Reserve			- 363,739.39		
Forecast Reserve balance YE 24/25 (Deficit)		**3,294,378.61**			

8. External costs were over budget due to transformation-related expenses, including increased training.

9. Internal time was under budget due to vacancies being held while proposed structural realignment of the Emergency Management Office was underway.

10. As a result, the estimated $360,000 underspend will be allocated towards repaying the reserve.

Transformation

11. See the attached Transformation Dashboard for details.

12. Overall, the transformation programme remains on track, though there is some uncertainty over the next 12 months as outlined below.

Staffing

13. In line with the Hawke's Bay CDEM Transformation Strategy, a formal consultation process is underway regarding a proposed structural realignment of the Emergency Management Office.

14. Consultation with staff began on 10 July 2025 and will conclude on 30 July 2025. Final decisions are expected to be communicated in late August, subject to any further consultation that may be required.

15. The proposed changes aim to strengthen local delivery, enhance regional coordination, and ensure the Emergency Management Office is well positioned to meet future demands in areas such as planning, risk reduction, Māori partnerships, intelligence, capability development, readiness, and community resilience.

16. While some short-term risks are inherent in any organisational change, steps are being taken to minimise disruption and maintain operational readiness. This includes prioritising essential

functions, progressing changes as promptly as possible, and ensuring the Emergency Coordination Centre remains well supported.

17. Over the past 18 months, additional staff have been trained to support both Emergency Operations Centres (EOCs) and the Emergency Coordination Centre (ECC), further strengthening the region's ability to respond during the transition.

2025-2026 Work Programme

18. The Hawke's Bay CDEM Transformation Strategy continues to guide the 2025-26 work programme. The attached Transformation Dashboard outlines the status of key deliverables.

19. Work is underway across several focus areas, including:

    19.1. The transition to a more locally led delivery model

    19.2. Implementation of the Service Level Agreement

    19.3. Support for territorial authorities to increase community hubs and resilience plans

    19.4. Expansion of the response workforce, and delivery of the regional training and exercising programme

    19.5. Review of the regional warning system and development of flood trigger levels in three pilot communities

    19.6. Ongoing rollout of the Registration and Needs Assessment (RANA) platform

    19.7. Planning for a temporary Emergency Coordination Centre and Emergency Management Office location until an IL4 facility can be developed

    19.8. Review of ECC operating procedures

    19.9. Development of a business case for a regional Common Operating Picture

    19.10. Review of emergency management digital tools, supported by the proposed ICT and information management role

    19.11. In addition, a governance review paper is being prepared for the next Joint Committee meeting.

20. Several other areas are scheduled to begin later this year but may be impacted by the current proposed structural realignment of the Emergency Management Office, including:

    20.1. **Māori Partnerships:** Engagement is underway, and a discussion paper will be presented the next Joint Committee. A dedicated Māori Partnerships role is proposed and subject to consultation.

    20.2. **Performance and Assurance:** While the SLA provides a foundation, work on an assurance framework, including standards, monitoring, and evaluation, has not yet commenced. A new assurance role is proposed and subject to consultation.

    20.3. **Planning:** Development of the CDEM Group Plan and the review of regional and local emergency management plans is expected to begin this financial year. A planning role has been proposed to support this work and is currently under consultation.

21. Several staff are also contributing to the Coroner's inquest, which is placing additional demands on capacity during this period.

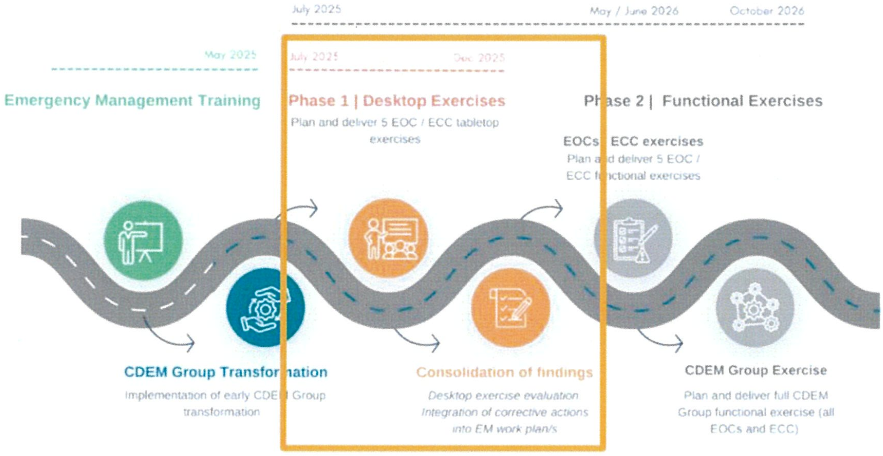
Exercise Activate

22. The Transformation Strategy identified the need for regular exercising at both the local and regional level to strengthen the region's emergency management capability.

23. In 2025, each council will participate in a structured tabletop exercise as part of Exercise Activate, a coordinated series scheduled for August and September. These exercises are designed to test readiness, reinforce recent training, and build confidence in response

procedures at both Emergency Operations Centres (EOCs) and the Group Emergency Coordination Centre (ECC). A brief outlining Exercise Activate is attached.

24. Following feedback from Controllers and emergency management staff, the original programme has been refined to allow time for lessons to be embedded between exercises and to ensure alignment with recent capability development work.



25. These changes support more meaningful learning outcomes, increased preparedness, and stronger regional coordination, while maintaining the commitment to exercising each council during 2025.

26. To maintain momentum through the current period of structural change, external expertise has been engaged to lead the delivery of the exercise series.

27. A regional functional exercise is planned for 2026, which will involve a broader range of agencies and require collective planning across the emergency management system.

Financial update for 2024-2025

28. The following budget is for the 2024-2025 financial year.

29. The budgeted $2,369,421 for internal time includes allocations to each council to support resourcing their obligations under the SLA.

Management Reporting	25/26 Budget
EXPCAP - Capital charges	15,140.52
EXPEXT - External Costs	1,115,819.80
EXPINT - Internal Time	2,369,421.52
EXPOHA - Overhead allocation	490,869.50
FNDOTH - Other funding	- 631,250.00
FNDRES - Reserves funding	- 3,665,541.35
FNDTAR - Targeted Rates	305,540.00
	- 0.01
Reserve Balance YE 23/24 (Deficit)	3,294,378.61
Budgeted Reserve repayment	305,540.00
Forecast Reserve balance YE 25/26 (Deficit)	2,988,838.61

Recommendation

That the HB CDEM Coordinating Executive Group receives and notes the *HB CDEM Group Office update.*

Authored by:

Shane Briggs
Director Hawke's Bay Emergency Management

Approved by:

Katrina Brunton
Group Manager Policy & Regulation

Attachment/s

1⇨	HBCDEM Transformation Dashboard July 25	Under Separate Cover	*Available online only*
2⇨	Brief - Exercise Activate July 2025	Under Separate Cover	*Available online only*

HB CDEM Group Joint Committee

Monday 28 July 2025

Subject: Confirmation of Public Excluded Minutes

That the HB CDEM Group Joint Committee excludes the public from this section of the meeting being Confirmation of Public Excluded Minutes Agenda Item 9 with the general subject of the item to be considered while the public is excluded. The reasons for passing the resolution and the specific grounds under Section 48 (1) of the Local Government Official Information and Meetings Act 1987 for the passing of this resolution are:

General subject of the item to be considered	Grounds under section 48(1) for the passing of the resolution	Reason for passing this resolution
Cyclone Gabrielle Coroner's Inquest legal representation	s7(2)(g) Excluding the public is necessary to prevent disclosure of information that is legally privileged.	The matters being discussed will include legally privileged material.

Authored by:

Leeanne Hooper
Team Leader Governance

Approved by:

Desiree Cull
Strategy & Governance Manager

Hawkes Bay
Civil Defence and Emergency Management
Service Level Agreement

Together, as a community, we aim to create a safe, informed and resilient Hawke's Bay that is prepared for, responds to, and recovers from emergencies and disasters well. Our community is at the heart of our civil defence system. We will build stronger connections, trust and empower local voices, and enhance collaboration across the region.

Version 1.3 (for approval)

Document Version History

Version	Name	Date	Description
0.1 (DRAFT)	Boggs	Mar 2025	1st DRAFT
0.2 (DRAFT)	Boggs	Apr 2025	Peer review comments added
1.0 (DRAFT)	Boggs	Apr 2025	Editorial and submitted for CE workshop consideration
1.1 (DRAFT)	Boggs	May 2025	Edited based on 28 April 2025 CE guidance
1.2 (DRAFT)	Briggs	July 2025	Edited based on 23 June 2025 CE guidance – removed Local Authority Readiness Levels, add dispute resolution, clean-up of content
1.3 (for approval)	Briggs	July 2025	Edited based on 21 July 2025 CEG guidance

Referenced Documents

Reference Document	Date
Civil Defence Emergency Management Act	2002
Civil Defence Emergency Management Regulations	2003
National Civil Defence Emergency Management Plan	2015
Guide to the National Civil Defence Emergency Management Plan	2015
The National Disaster Resilience Strategy	2015
Hawke's Bay Civil Defence Emergency Management Plan	2016
HB CDEM Transformation Strategy	2025
The review into HBCDEM response to Cyclone Gabrielle	2024
The Coordinated Incident Management System (CIMS 3rd Edition)	2019
HB CDEM Concept of Operations	2019
HB CDEM Emergency Management Capability Development Pathway	2023

Contents

Hawkes Bay Civil Defence and Emergency Management SLA v1.3 (DRAFT)

Foreword

The past few years have underscored the critical importance of a strong, connected, and community-focused civil defence emergency management system in Hawke's Bay. The challenges posed by recent events, most notably Cyclone Gabrielle, have reminded us of the power of working together and the importance of being prepared.

This Service Level Agreement formalises our shared commitment to work in partnership, both regionally and locally, to deliver an integrated, effective, and responsive emergency management system. It puts our communities at the centre of everything we do and is a practical expression of the strong partnership between our councils and the Hawke's Bay Emergency Management Office. By

Guided by the Hawke's Bay CDEM Transformation Strategy and shaped by the lessons from our recent reviews, this agreement represents more than a formal document, it is a statement of our intent to continually improve, to learn, and to strengthen the trust our communities place in us. We are dedicated to building relationships, empowering local voices, and upholding the principles of Māori partnership that are so essential to our region.

Through this agreement, we affirm our commitment to a future where Hawke's Bay communities are safer, more informed, and better prepared. We do this knowing that our success depends on strong collaboration, clear communication, and an unwavering focus on the people we serve.

Executive Summary

The Service Level Agreement (SLA) formalises the roles, responsibilities, and service levels for each Territorial Authority (TA), the Hawke's Bay Regional Council (HBRC), and the Hawke's Bay Emergency Management Office. It reinforces a partnership approach aligned with the Group Plan and the Hawke's Bay CDEM Transformation Strategy.

Core principles include working as a team, strong Māori partnership, community focus, and open communication. Governance is provided through the Joint Committee and the Coordinating Executive Group (CEG), in line with the CDEM Act 2002.

The SLA serves as the regional agreement that operationalises roles and responsibilities, both locally and regionally within Hawke's Bay. The SLA will be reviewed regularly, with changes only made by agreement of all parties.

Definitions

Terms used in this document which are also defined in the CDEM Act, have the same meaning.

Administering authority means Hawke's Bay Regional Council (HBRC).

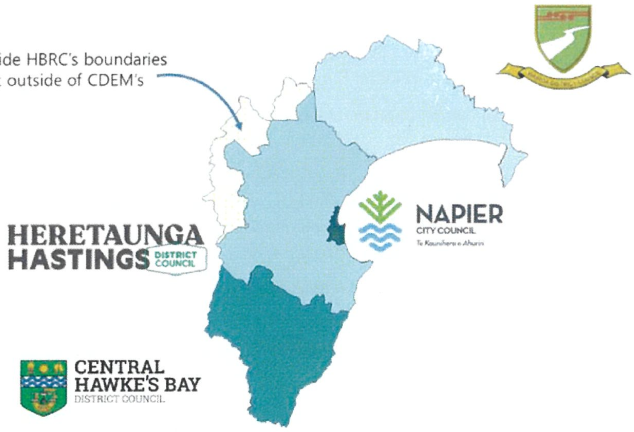
Agency means a government or non-government organisation or entity with responsibilities under the National Civil Defence Emergency Management Plan Order.

Agreement means this HB CDEM SLA signed by all parties.

CDEM Group refer to Joint Committee

Coordinating Executive Group (CEG) means the Coordinating Executive Group established in accordance with the CDEM Act. The CEG is responsible to the Civil Defence Emergency Management Group (Joint Committee) for providing advice to the Group and its subcommittees, implementing the decisions of the Group as appropriate, and overseeing the implementation, development, maintenance, monitoring, and evaluation of the CDEM Group Plan.

Hawke's Bay civil defence emergency management area (HB CDEM area) means the area defined by the boundaries of the territorial authority members of Hawke's Bay, specifically Hastings District, Wairoa District, Napier City, and Central Hawke's Bay District. It does not align exactly with the boundary of the Hawke's Bay Regional Council.



Hawke's Bay Emergency Management Office (HB EMO) means the office that delivers emergency management services on behalf of the Joint Committee and CEG.

Joint Committee (Joint Committee or CDEM Group) means the joint standing committee of mayors and the chairperson of the Hawke's Bay Regional Council within the HB CDEM area, established in accordance with the CDEM Act. The Joint Committee (also referred to as the CDEM Group) is responsible for directing and assuring the delivery of CDEM reduction, readiness, response, and recovery in the HB CDEM area. Mana whenua representatives, the Group Controller, and the Chair of the Coordinating Executive Group (CEG) have speaking rights at the Joint Committee.

Local authority means a city council or a district council, specifically Hastings District, Wairoa District, Napier City, Central Hawke's Bay District, and Hawke's Bay Regional Councils.

Targeted CDEM Rate means the annual rate set by Hawke's Bay Regional Council (HBRC), on behalf of the Joint Committee, under the Local Government (Rating) Act 2002 to fund the budget approved by the CDEM Group for emergency management services.

Territorial Authority (TA) means a city council or a district council, specifically Hastings District, Wairoa District, Napier City, and Central Hawke's Bay District Councils.

Legislation

The primary reference for CDEM in Hawke's Bay is the Civil Defence Emergency Management Act 2002 (the Act), which came into force on 17 October 2002. The following summarises key provisions from the Act.

The Act provides for planning and preparation for emergencies and for response and recovery in the event of an emergency. It does the following:

- **Requires local authorities to coordinate,** through regional groups, planning, programmes, and activities related to civil defence emergency management across the areas of reduction, readiness, response, and recovery, and to encourage cooperation and joint action within those regional groups.
- **Provides a basis for integrating national and local CDEM planning and activities,** through the alignment of local planning with the national strategy and national plan.
- **Encourages coordination of emergency management planning and activities** across the wide range of agencies and organisations involved in preventing or managing emergencies under the Act.

The Act states that every regional council and every territorial authority within that region are members of a CDEM Group and, for the purposes of the Act, establish a joint standing committee under clause 30(1)(b) of Schedule 7 of the Local Government Act 2002.

The Act further states that the Joint Commitee <u>and</u> each regional council and territorial authority within that region, must:

- In relation to relevant hazards and risks:
    - Identify, assess, and manage those hazards and risks.
    - Consult and communicate about risks.
    - Identify and implement cost-effective risk reduction.
- Take all steps necessary on an ongoing basis to maintain and provide, or to arrange the provision of, suitably trained and competent personnel (including volunteers) and an appropriate organisational structure for those personnel, for effective CDEM in its area.
- Take all steps necessary on an ongoing basis to maintain and provide, or arrange the provision of, materials, services, information, and other resources for effective CDEM in its area.
- Respond to and manage the adverse effects of emergencies in its area.
- Plan and carry out recovery activities.
- When requested, assist other CDEM Groups in the implementation of CDEM in their areas (having regard to competing CDEM demands within the Group's own area and any other requests for assistance).
- Promote and raise public awareness of, and compliance with, the Act and legislative provisions relevant to its purpose.
- Monitor and report on compliance within its area with the Act and related provisions.
- Develop, approve, implement, and monitor a CDEM Group Plan and regularly review it.
- Participate in the development of the National CDEM Strategy and the National Civil Defence Emergency Management Plan.
- Promote CDEM in its area consistent with the purpose of the Act.

The Act also states that the Joint Committee may:

- Recruit and train volunteers for CDEM tasks.
- Conduct CDEM training exercises, practices, and rehearsals.
- Issue and control the use of signs, badges, insignia, and identification passes authorised under the Act, regulations, or any CDEM plan.
- Provide, maintain, control, and operate warning systems.
- Provide communications, equipment, accommodation, and facilities for the exercise of its functions and powers during an emergency.
- Exercise any other powers necessary to give effect to any CDEM plan.

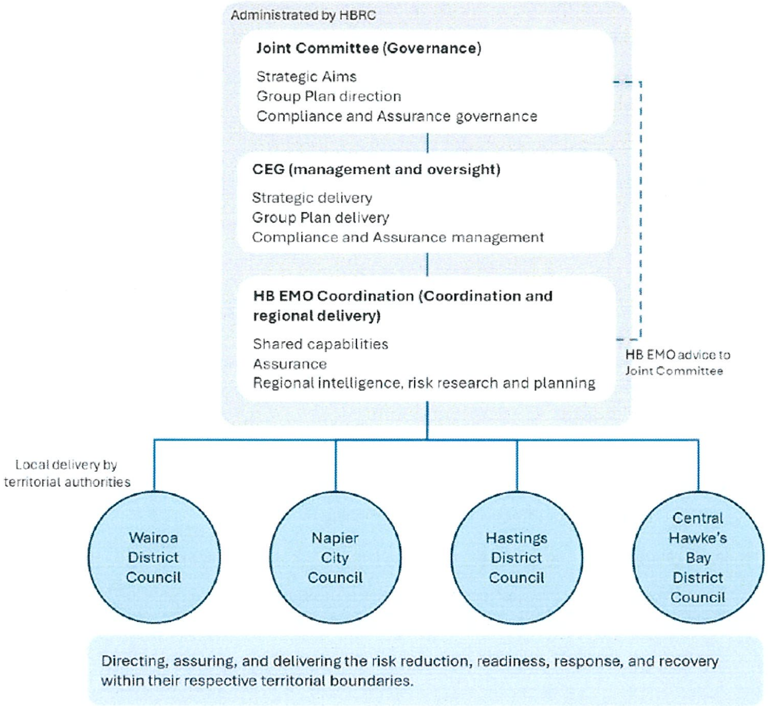
Finally, the Act directs that a territorial authority must plan and provide for CDEM within its district and must ensure that it is able to function to the fullest possible extent, even if at a reduced level, during and after an emergency.

Key Points

- Requires regional councils and territorial authorities to establish a CDEM joint committee to provide governance and oversight.
- Obligates CDEM Joint Committee to develop, implement, and regularly review a Group Plan for reduction, readiness, response, and recovery (the 4Rs).
- Requires councils and CDEM Joint Committee to maintain trained personnel, resources, and organisational structures for effective emergency management.
- Emphasises cooperation and joint action among councils and partner agencies across the region.
- Supports coordinated regional and local arrangements, including shared responsibilities for community awareness, planning, and operational readiness.

HB CDEM Operating Model

In response to the Act, and as described in the HB CDEM Transformation Plan, HB CDEM operates in a rebalanced way that builds capability and response from the bottom up, starting with the community, then local, and then regional levels. The HB CDEM operating model set out below focuses on CDEM at the community, local, and regional levels, with national arrangements considered out of scope.



Hawke's Bay Regional Council

In addition to its administering authority role, HBRC manages natural hazards, primarily through its land use and resource management functions. HBRC is responsible for monitoring the state of the environment, managing flood protection schemes, and providing flood alerting and forecasting services. It works in collaboration with local territorial authorities and emergency services.

Emergency Services

Fire, Police, Health, and St John play a critical role in protecting lives and property during emergencies. They provide first response capabilities, lead incident management for specific events in accordance with their respective legislation, and support evacuation, rescue, and public safety operations. These agencies work closely with CDEM and local authorities to coordinate actions, share information, and ensure a unified response to protect the community.

The roles and responsibilities of emergency services are further specified in the National Civil Defence Emergency Management Plan Order 2015.

Response Levels

This diagram illustrates the graduated levels of response as outlined in the Coordinated Incident Management System (CIMS) framework, showing how response in Hawke's Bay is built from the ground up - community-focused, locally led, and regionally coordinated.

Communities

At the foundation are communities, where individuals, whānau, community groups, businesses, and organisations self-respond to incidents, either through official pre-existing arrangements or spontaneously. Councils, in their statutory roles under the CDEM Act, along with the Hawke's Bay Emergency Management Office, have a key role in enabling and coordinating community participation in response and recovery. This is supported by other partners within the wider CDEM system. Agency responsibilities are further outlined in the National Civil Defence Emergency Management Plan Order.

Incident Level

The incident level represents the first official tier of response, carried out by first responders. This includes physical actions such as clearing roads, treating casualties, fighting fires, and conducting rescues.

Incident responses can range from a few personnel to several hundred and are coordinated from an Incident Control Point (ICP), led by an Incident Controller. On a large-scale response, the Local TA may establish an Incident Management Team (IMT) to provide support if needed.

Local Level

In the CDEM context, the local level response usually refers to a territorial authority led response. It is activated for multi-agency or multi-incident coordination or in support of incident-level response. TA's may also activate to exercise overall control depending on lead agency arrangements, for example, during flooding.

This response is coordinated from an Emergency Operations Centre (EOC), led by a Local Controller. The EOC links with Incident Control Points (ICPs) and, if required, with the Emergency Coordination Centre (ECC).

Support agency representatives are included in the EOC structure and decide whether to activate their own Coordination Centres.

The HB Emergency Management Office holds a regional multi-agency coordination meeting whenever an event impacts or may impact multiple districts.

The HB Emergency Management Office may activate the ECC to support local incidents and will activate when a local emergency is declared.

Regional Level

The regional level response is typically activated for large-scale or complex incidents, including those affecting multiple areas or requiring overarching coordination. While an incident may be contained within a single territorial authority boundary, the Group Controller may assume control if necessary.

The HB Emergency Management Office, in response to local incidents, may activate in a support capacity, initially with at least a Duty Officer, and will establish a regional Incident Management Team (IMT) when greater support or coordination is required.

The ECC, led by the Group Controller, coordinates across TA EOCs and links to the National Coordination Centre if needed.

Support agencies at the regional level determine whether to activate their own coordination centres and likely to be coordinated at the regional level, especially when incidents impact multiple TA areas or require broader support and oversight.

Together, these layers ensure a scalable, integrated approach to emergency management that is community-focused, locally led, and regionally coordinated, enabling effective response and recovery across the region.

Key Points

- Communities are the foundation, self-responding and supporting each other first.
- Local territorial authorities lead coordination through EOCs when broader support is needed.
- The regional level provides overarching coordination and support, led by the Group Controller and ECC when incidents escalate or cross boundaries.
- Emergency services and support agencies work across all levels to protect life and property and ensure a unified response.

The HB CDEM Service Level Agreement

The SLA is an agreement that clarifies and formalises the roles, responsibilities, and service levels of each territorial authority (TA), the Hawke's Bay Regional Council (HBRC), and the HB Emergency Management Office (together referred to as "we" or "the Parties"), both locally and regionally, as they relate to HB CDEM. It affirms the intent that all Parties will act in partnership, working together through all HB CDEM activities across the 4 Rs (reduction, readiness, response, and recovery), and give effect to the HB CDEM Group Plan and the HB CDEM Transformation Strategy.

Once all Parties have agreed to the SLA, the document will be submitted to the HB CDEM Joint Committee for approval. Approval of the SLA serves as direction for the Parties to carry out the specified actions and tasks detailed in the agreement.

Key Transformation Themes

The HB CDEM Transformation Strategy provides direction on the key themes the SLA must follow:

- Our community is at the heart of HB CDEM.
- We are prepared and ready.
- HB CDEM is highly effective, capable[1], and assured.
- HB CDEM is balanced and responsive to local needs.

Guiding Principles

The following principles have been used in the development of the SLA:

Partnership and Collaboration

We agree to work together to establish and maintain a mutually beneficial relationship, acknowledging and respecting each other's responsibilities, interests, views, capabilities, and constraints. We commit to supporting each other to achieve shared outcomes for our communities. At no stage should the actions of one Party negatively impact on the performance of the others.

Māori Partnership

We acknowledge Te Tiriti o Waitangi as a foundational partnership guiding CDEM. We are committed to working with mana whenua, iwi, hapū, whānau, Māori communities, Taiwhenua, and PSGEs to strengthen resilience and support collective preparedness and response. We will enable Māori leadership and input into plans and activities where appropriate, integrate mātauranga Māori, and maintain open, respectful relationships built on trust and shared decision-making.

Community Centred

We ensure that our communities are always at the centre of our CDEM activities. We acknowledge that communities are diverse in place, interest, culture, language, and needs, and we commit to supporting them to build resilience and respond effectively.

Professionalism and Accountability

We will maintain high standards of professionalism and accountability. We commit to continuous improvement through education, training, exercising, and alignment with national guidelines. We will regularly monitor, evaluate, and report on performance to ensure transparency and build public confidence.

[1] Capability will be assessed both individually (at the staff level) and collectively (at the TA level, regional level, and across key partners). The HB EMO, led by the Group Controller, is responsible for conducting assessments and serves as the final arbiter of CDEM capability, which will be provided to the Joint Committee.

Risk-Informed Approach

We recognise that sound risk management is fundamental to all CDEM activities. We commit to identifying, assessing, and managing risks proactively and to using risk-based prioritisation to inform our decision-making and resource allocation.

Communication

We agree that our relationships will be based on open, timely, and transparent communication. We will strive for effective communication with each other, our communities, and partner agencies, ensuring clarity and trust throughout all activities.

Obligations

- Each Party must act in accordance with the purpose and principles of this SLA.
- Each Party shall do all things necessary to give effect to this SLA.
- Each Party must make all necessary delegations to enable full implementation of this SLA.

Governance

The SLA will be governed through the existing Hawke's Bay CDEM Joint Committee and Coordinating Executive Group (CEG) processes. In accordance with the CDEM Act 2002, the Joint Committee provides overall governance, strategic direction, assurance, and leadership for civil defence emergency management in the region. The CEG is responsible for implementing and overseeing the delivery of the Joint Committee's plans and decisions, and for coordinating operational CDEM delivery across all agencies.

Dispute Resolution

We agree that any dispute arising under this Service Level Agreement will be resolved as quickly and informally as possible, with a focus on maintaining positive and collaborative relationships.

- In the first instance, we will attempt to resolve any dispute through direct negotiation and good faith discussions between the relevant Chief Executives or senior representatives.
- If the dispute cannot be resolved within 15 working days of notice being given, it will be referred to the Chair of the Coordinating Executive Group (CEG) for facilitation.
- If resolution is still not achieved within a further 15 working days, the matter will be referred to the Chair of the Joint Committee for further facilitation.
- If the dispute remains unresolved after these steps, we agree to enter mediation, using a mediator mutually agreed by all Parties. If a mediator cannot be agreed upon within 10 working days, one will be appointed by the President of the New Zealand Law Society (or their nominee).
- The costs of any mediation will be shared equally by the Parties involved in the dispute.
- Nothing in this clause prevents any Party from seeking urgent interim relief from a court if necessary. However, the Parties agree to use the dispute resolution process in full before initiating any formal legal proceedings.

SLA Review

A review of the SLA will begin in early 2026 to align with local government annual planning processes, and again in time for the 2027/28 Long-Term Plan (LTP) process. The SLA should also be reviewed annually as a standing item on the Joint Committee's agenda. Any changes to the SLA outside of these scheduled reviews may be made at any time, but only with the agreement of all Parties.

The SLA will also help inform the new CDEM Group Plan, which is scheduled to begin development in the 2025/26 financial year. In accordance with the CDEM Act 2002, the CDEM Group Plan must be publicly notified, allow for submissions, and provide submitters with an opportunity to be heard.

Administering Authority

The Act states that:

- The administering authority for each Joint must be a regional council or unitary authority that is a member of the Group.
- An administering authority established under section 23, and as appropriate the Chief Executive of that authority, is responsible for providing administrative and related services that may be required from time to time by the Joint Committee.
- Administrative and related services include those required for the purposes of the Local Government Act 2002, the CDEM Act, or any other legislation that applies to the conduct of a joint standing committee.
- The cost of these administrative and related services must be agreed from time to time by the Joint Committee.
- Unless the members of the Joint Committee agree otherwise, the agreed costs must be divided equally among the members, with each member paying one share.

Finance

HB CDEM Annual Plan

HBRC will centrally rate for HB CDEM via a targeted CDEM rate in FY 2025/26 and FY 2026/27 to fund both local and regional CDEM activities across Hawke's Bay.

The funding from the targeted CDEM rate covers five cost areas:

- **Capital costs:** Depreciation of assets and loan costs.
- **External costs:** Payments to external vendors.
- **Internal time:** Salary and staff costs (including rent for the current HB CDEM Hastings office).
- **Reserve repayments:** The HB CDEM reserve fund is currently in deficit due to Cyclone Gabrielle.
- **Overhead allocation:** Costs paid to HBRC for corporate support services (e.g., payroll, finance, HR), split across the organisation.

HBRC's forecasted rating base is 66,951 rating units, and the forecasted targeted CDEM rate per rating unit is:

Financial Year	Amount
FY 2025/26	$3,665,000
FY 2026/27	$3,944,000

(Note: These figures include inflation. The actual rate per unit will be confirmed once the budget is formally adopted each year, as rating units and budgets are subject to change.)

HB CDEM Transformation Costs

Additional forecasted transformation costs over the next two financial years total **$836,000**, specifically:

Financial Year	Amount
FY 2025/26	$631,000
FY 2026/27	$205,000

These costs are to be drawn from CDEM reserve account and are intended to cover:

- General, function-specific, function manager, and Controller training
- 2025–2027 HB CDEM exercise programme
- HB CDEM Group Plan development
- HB CDEM hazard and contingency planning
- ECC operating procedure development
- Welfare platform development
- HB EMO restructure
- Operating model transition
- Assurance framework and standard setting

Anticipated non-Budgeted Costs

Emergency Management Staffing

With each local TA allocated $160,000 to support its emergency management workforce during the 2025/26 and 2026/27 financial years, there will be an ongoing requirement for each TA to fund and sustain this capability. Like HBRC's administering authority arrangements, local TA emergency management functions will require appropriate resourcing and support, including (but not limited to):

- Office space
- Equipment
- IT systems
- Fleet
- Legal services
- Financial support
- Governance and administration
- Clothing and personal protective equipment (PPE)

Community Hubs

The focus on community resilience and readiness area will likely lead to an increase in Community Hubs across the HB CDEM area. The costs of establishing and maintaining additional hubs within local TA boundaries will be the responsibility of each respective local TA.

Common Operating Platform (COP)

The COP business case will commence in FY 2025/26, with enduring costs expected from FY 2026/27 onwards. Costs will likely be shared between HBRC (as the administering authority) and local TAs.

New Emergency Coordination Centre and Office Space

Hastings District Council has given notice that the current Emergency Coordination Centre (ECC) is to be vacated by 1 July 2026. Work is underway to identify a new location; however, there are currently no IL4[2] (Importance Level 4) ready buildings available in the region.

As an interim solution, a temporary ECC (non-IL4) will need to be established to ensure continuity of operations, along with suitable office space for the HB Emergency Management Office staff.

[2] Buildings of essential importance that must remain operational immediately after a major event, such as emergency coordination centres, hospitals, fire and police stations, and other critical infrastructure. The failure of IL4 buildings could lead to severe societal impacts and disruption.

Planning for a permanent, purpose-built IL4 facility will be progressed, subject to funding, resource consents, and construction timelines.

The costs associated with establishing and maintaining both the temporary and future permanent ECC and Emergency Management Office will be funded from the regionally targeted CDEM rate, reflecting its region-wide function. Territorial Authorities remain responsible for maintaining appropriate Emergency Operations Centres (EOCs) at the local level.

Beyond 2027

During FY 2027/28, consultation should take place - as part of the local government Long-Term Plan (LTP) process - to determine whether the current centrally targeted CDEM rate remains the preferred funding approach for the following three years, or if an alternative model is preferred.

Indicative funding options to consider include:

- A centrally targeted CDEM rate collected via HBRC.
- A reduced centrally targeted CDEM rate collected via HBRC, alongside a new local targeted CDEM rate collected by each respective local TA.
- No centrally targeted CDEM rate collected via HBRC, with a new local targeted CDEM rate collected by each respective local TA, combined with a "fee for shared services" paid to the HB Emergency Management Office via HBRC.

Key Points

- The SLA formalises roles, responsibilities, and service levels for each TA, HBRC, and the HB Emergency Management Office, reinforcing a partnership approach aligned with the Group Plan and Transformation Strategy.
- Core principles include working as a team, strong Māori partnership, community focus, and open communication.
- Governance is provided through the Joint Committee and CEG, in line with the CDEM Act 2002.
- The SLA will be reviewed regularly, with changes only by agreement of all Parties.
- HBRC will centrally rate for shared CDEM activities in FY 2025/26 and 2026/27.
- Each local TA is allocated funding to support emergency management staffing and must sustain local capability needs (e.g., office, equipment, PPE).
- Non-budgeted costs include community hubs, a common operating platform, and a new Emergency Coordination Centre to replace the current facility.
- Future funding arrangements beyond 2027 will be reviewed through LTP consultation.

Schedule 1: Hawkes Bay Civil Defence and Emergency Management Service Level Agreement

Between

Hawkes Bay Regional Council

Wairoa District Council

Napier City Council

Hastings District Council

Central Hawkes Bay District Council

Hawke's Bay Emergency Management Office

To ensure shared understanding and operational clarity, the roles and responsibilities of each Party are defined across key CDEM functions. We agree to review and update these detailed functional roles as needed, and to incorporate them into future versions of this SLA to reflect evolving practice, lessons learned, and national guidance.

Costs are to be borne by each Party in accordance with their respective responsibilities, unless otherwise specified.

Governance and Strategy

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Governance		
Supports governance through the provision of required reports and plans, as directed by the Act and Joint Committee and CEG.	Provide governance leadership through the HBRC Chair for the Joint Committee and the HBRC Chief Executive for the CEG. Provide governance and administrative services to support the HB EMO, Joint Committee, and CEG, including convening meetings, providing venues, preparing agendas and minutes, and offering general administrative support. Provide legal services (document review, legal advice, representation). Publish HB EMO work programmes, plans, and performance updates as required.	Provide Mayors for the Joint Committee and Chief Executives for the CEG.
Funding and Budget		
Submit the Annual Plan for HB EMO to the CEG for approval. Manage allocated funds to deliver HB EMO work programme. Plan and manage shared CDEM services.	Centrally rate for regional and shared CDEM services. Prepare and manage budgets, administer investment, and oversee procurement for shared capabilities. Provide financial management of the targeted CDEM rate and CDEM reserve fund. Execute contracts on behalf of HB EMO.	Fund local CDEM activities, including staffing and operational expenses.

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Plans and Processes		
Lead Group Plan, consequence plans, hazard specific plans, contingency plans, and recovery plan development and maintenance. Lead the development, implementation, and maintenance of the HB CDEM Group Work Programme to ensure delivery of the Group Plan. Provide advice and guidance on the development of Local TA work programmes to ensure alignment with the Group Plan. Develop and maintain processes and SOPs for ECC/EOC operations, allowing for local adjustments where appropriate.	Support the development, implementation, maintenance, monitoring, and evaluation of the HB CDEM Group Plan using approved processes. Support Group Work Programme implementation. Support CDEM consequence and hazard planning. Maintain business continuity plans to ensure the organisation is able to function to the fullest possible extent, even if at a reduced level, during and after an emergency.	Support the development, implementation, maintenance, monitoring, and evaluation of the HB CDEM Group Plan using approved processes. Align local plans and work programmes with the Group Plan and Work Programme. Develop local response and recovery plans. Use and support HB CDEM SOPs. Support CDEM consequence and hazard planning. Provide local input into processes and SOPs for EOC operations. Maintain business continuity plans to ensure the organisation is able to function to the fullest possible extent, even if at a reduced level, during and after an emergency.

People and Capability

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Staffing and Personnel HB EMO maintains technical control over the Local TA EM advisors regardless of who employs them. Technical control involves the following: • Professional development • Contribution to the annual performance process • Involvement in the recruitment process		
Provide key regional leadership roles (Group Controller, Group Welfare Manager, Group PIM Manager, Group Lifeline Coordinator). Recommend appointments to key local CDEM roles. Provide a 24/7 duty system. Lead ECC/EOC staff competency and capability development. Maintain a suitably trained and resourced structure to support ECC operations, including volunteers.	Provide alternate Group Controller(s) and staff for ECC operations. Support recruitment, HR, and administration for HB EMO staff. Manage performance, remuneration, leave, and wellbeing support for HB EMO staff. Provide support to the 24/7 duty Group Controller and HB EMO PIM capability. Make staff allocated to the ECC available for training and exercising.	Provide Local Controllers and staff local EOCs. Appoint and support Local Welfare Managers, PIM Managers, Lifeline Coordinators. Provide Local TA EM advisors with suitable resources, office space, fleet, and professional development budgets. Maintain a trained and resourced local structure for CDEM. Provide 24/7 duty Local Controller and duty officer arrangements. Make CDEM and EOC staff available for training and exercising.

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Training and Exercises		
Set training standards, develop and deliver regional training and exercise programmes[3], and maintain records. Fund two Group and/or Local Controllers per year to attend approved Controller courses. Provide elected representative training. Develop an assessment process, in consultation with TAs, to measure HB CDEM performance and readiness.	Make staff allocated to the ECC available for training and exercising. Support HB EMO in providing training to elected representative.	Make CDEM and EOC staff available for training and exercising. Maintain training records for local staff and provide to HB EMO as required. Develop and deliver local exercise programmes aligned with regional. Costs will be met by respective TAs. Support HB EMO in providing training to elected representative.

[3] Training refers to the formal training a staff member or volunteer has received and been certified in. The HB EMO, through the Group Controller, are the prime reference and arbitrators of the training pathway and certification. The approved programme is contained in the HB CDEM Emergency Management Capability Development Pathway.

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Volunteers Responsibilities involving volunteers, welfare, plans, and exercises should continue to prioritise community-centred approaches, support local capacity, and reflect the shared principle that CDEM is a collective responsibility.		
Coordinate regional volunteer programmes. Ensure PCBU, safety and wellbeing obligations for CDEM volunteer are met. Provide and maintain approved equipment for CDEM volunteers. Lead regional recruitment and training for CDEM volunteers. Provide HB CDEM organised volunteer coordination. Manage the database of all regional CDEM volunteers.	Provide insurance and public liability cover for CDEM volunteers (e.g., Response Team and Support Team). Provide IT services to volunteers as required (e.g., email accounts, Teams site, printer access).	Coordinate local volunteer programmes. Maintain local volunteer databases. Ensure PCBU obligations for volunteers are met at the local level.

Infrastructure and Technology

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Facilities and Equipment Any facility nominated to become a coordination centre should meet IL4 (Importance Level 4) standard. Community Hub fit-out requirements will be detailed in the HB CDEM Community Emergency Hub Plan, due for release in late 2025		
Provide guidance and monitor the capability of all CDEM facilities within the HB CDEM area.	Provide a suitable ECC (main and alternative facilities), including MoUs.	Provide and maintain local EOCs (main and alternative facilities), including MoUs.
Maintain the ECC to ensure operational readiness. Provide guidance on Civil Defence Centres (CDCs) and Community Hubs, including standards and policy.	Provide fit-for-purpose office space for HB EMO. Allocate an appropriate fleet for HB EMO activities. Provide procurement advice and support as required.	Provide and maintain CDCs and Community Hubs. Manage local emergency response equipment inventory, testing, and maintenance.
Conduct audits of CDCs.	Refer to IT requirements for additional responsibilities.	Implement regional equipment standards locally. Provide suitable fleet capability for local EM team
Manage regional response equipment inventory, testing, and maintenance.		
Provide fleet capability requirements to HBRC as part of LTP planning.		

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
ICT Once established, all local TAs are to implement, train and use the HB EMO-directed Common Operating Platform (COP). All Local TA are to use, employ and train solely on the HB CDEM suite of IT tools and applications for use in the EOC		
In consultation with TAs, select, monitor, and improve the HB CDEM Common Operating Platform (COP). Select and oversee IT tools and applications (e.g., GIS, Microsoft 365, emergency management software, learning management platforms). Train local TA and ECC staff in the use and operation of these platforms.	Purchase, develop, host, and maintain the COP and associated digital tools as required. Provide and maintain IT infrastructure, hardware, and services, e.g., networks, phones, audio/visual, printing) to support ECC readiness and response. Support 24/7 IT service continuity, meeting HB CDEM readiness standards and Group Controller direction. Support the HB EMO in training local TA and ECC staff in the use of the Common Operating Platform and IT tools. Note: The provision of IT support for HB CDEM may require a separate MOU or SLA, given the unique requirement to provide both business-as-usual (BAU) support and 24/7 readiness support. Currently, this support is split between HBRC and a local IT service provider. The HBRC portion is charged as an overhead allocation, while the local service provider is funded through external costs. This work is expected to be undertaken during the 2025/26 financial year.	Purchase licences and hardware to connect to and use the HB COP. Adopt and use the agreed suite of tools and applications in EOCs and, where appropriate, CDCs and Community Hubs. Fit out local EOCs with appropriate IT infrastructure.

Community and Engagement

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Community Resilience		
Develop and maintain regional processes for Community Hubs. Support local development and maintain an overview of hub status. Provide hazard information and guidance for the development of local Community Resilience Plans.	Promote civil defence emergency management.	Develop, equip (as appropriate), maintain, and support local Community Hubs. Report on hub capability and status. Develop Community Resilience Plans with communities.
Welfare		
Develop regional CDC guidelines, allowing for local requirements, and conduct audits. Lead regional welfare planning and the Welfare Coordination Group. Provide resources and templates to support local welfare planning.	—	Equip, maintain, support, and staff CDCs as required to deliver community welfare during emergencies. Provide Local Welfare Managers to coordinate local community welfare support. Lead planning for the delivery of local welfare services during emergencies. Recruit and train CDC supervisors and staff.

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Public Education and Communications NCC maintains the regional HB CDEM website (www.hbemergency.govt.nz) as part of a separate shared service agreement.		
Develop and maintain a Group Communications Strategy. Provide consistent messaging for public education across the HB CDEM area and deliver regional public education initiatives. Develop SOPs for HB CDEM PIM activities and provide coordination and advice to TA PIM teams. Develop, maintain, and provide content for the HB CDEM regional emergency management Facebook page. Provide content for the regional website (www.hbemergency.govt.nz). Provide guidance and standards for CDEM signage (e.g., tsunami information boards).	Promote civil defence emergency management.	Lead and manage all local-level PIM activities using consistent messaging. Promote civil defence emergency management. Develop and provide CDEM content for Local TA communication channels. Link to the HB CDEM regional Facebook page. Link and direct all Local TA emergency management internet traffic to www.hbemergency.govt.nz. Implement and maintain CDEM signage (e.g., tsunami information boards) in accordance with regional guidance and standards.

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Hazard and Risk Reduction		
Provide public communications and information when new research is released. Educate, advocate for, and support hazard risk management, providing expert advice as required.	Support hazard risk management research. Maintain the Hazards Web Portal for Hawke's Bay. Promote civil defence emergency management.	Support hazard risk management research. Consult and communicate risks with communities. Identify and implement cost-effective risk reduction measures. Provide supplementary funding for local, project-specific hazard research where agreed and appropriate.

Operations

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Warning Systems		
Maintain HB EMO points of contact on the National Warning System with NEMA. Develop and maintain public alerting system processes. Maintain the HB CDEM Regional Warning System. Coordinate testing of all public alerting systems. Procure, maintain, test, and activate HB CDEM public alerting systems, including (but not limited to): • Emergency Mobile Alert • SMS • Social media • HB CDEM website Provide guidance on procurement and maintenance of local public alerting systems. Lead promotion of HB CDEM public alerting systems.	Ensure an effective flood monitoring system across Hawke's Bay for HB CDEM purposes. Promote the flood warning system to partners, emergency services, and communities.	Maintain Local TA points of contact on the National Warning System with NEMA. Support HB EMO in promoting public alerting systems. Provide local input into processes for the use of public alerting systems. Procure, maintain, test, and activate local public alerting systems as appropriate, ensuring consistency with HB EMO direction.

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Lifelines		
Provide administrative support and CDEM advice to the Lifelines Group. Train and activate Lifelines Utility Coordinators (LUCs) at the ECC. Support LUCs to attend Lifelines Group meetings and contribute to Lifelines projects.	Support the Lifelines Group through active participation.	Support the Lifelines Group through active participation of local lifelines managers or coordinators.
Response		
If an incident affects one or more TAs, or meets the requirements of the HB Notification Protocols, HB EMO Duty staff will monitor and support the Local TA(s). Where a state of emergency has been declared for a single ward or district, HB EMO will establish the ECC to support the Local TA EOC, and the Group Controller will monitor and support. Where a state of emergency has been declared across multiple districts, or when an incident should be regionally led due to its scale, complexity, coordination requirements, or limited local resources, the ECC will be established, with the Group Controller assuming overall control. During a significant oil spill response, provide selected HB EMO to support the Regional On-site Commander as requested.	Where the HB EMO or a TA is monitoring or responding to a potential or actual incident HBRC IT will support regional CDEM digital platforms. When the ECC has established, HBRC prepared to support the HB EMO staff in the ECC.	In an incident affecting a TA, or where coordination of another agency's response may be required, the Local TA will monitor and support, ensuring the Local Controller is informed. If the incident meets the requirements of the HB CDEM Notification Protocols, the HB CDEM Duty Officer will also be notified. In a local state of emergency, the EOC will be established, and the Local Controller will assume control. When a regional state of emergency has been declared, or when the Group Controller assumes control, the Local Controller will operate in a supporting role, ensuring local delivery of the Group Controller's direction.

HB Emergency Management Office	HBRC (administering Authority)	Each Territorial Authority
Recovery		
Provide Group Recovery Managers and support local recovery where needed.	Support Group and local recovery efforts.	Lead and manage local recovery efforts.

Key Points

- **HB Emergency Management Office (HB EMO):** Provides regional leadership, assurance and technical direction, maintains oversight of plans, capability, and readiness, leads regional training and exercises, and supports local authorities to ensure alignment with the Group Plan and national guidance.
- **Hawke's Bay Regional Council (Administering Authority):** Provides governance support, central funding and financial management, administrative services, Emergency Management Office staffing, ECC staffing, and provides regional facilities and IT systems to enable regional CDEM operations.
- **Territorial Authorities (TAs):** Lead local emergency management delivery, maintain local readiness and response capability, staff local EOCs, support community resilience, and implement plans and processes aligned with regional direction.
- All Parties commit to periodically reviewing and updating roles to reflect evolving practice, lessons learned, and changes in national policy.

Schedule 2: EOC/ECC Staffing Requirement

The following serves as the Group Controller's guide to the minimum number of staff required to be trained per shift in each coordination centre to enable an effective response to a minor[4] to moderate scale event. Not all events will require this number of staff per shift; however, ensuring each coordination centre maintains sufficient trained personnel is essential for operational readiness.

These numbers do not include liaison staff from other agencies.

This guidance is provided to support workforce planning and capability development needs analysis and is intended as an interim reference until the HB EMO establishes its assurance role, develops a formal framework, and sets minimum standards.

The following figures include:

- staff trained in their specific functions,
- function managers who have completed a function management course, and
- Controllers who have completed the RRANZ Response and Recovery Leadership Programme.

Function	Staffing number
Controller	1
Response Manager	1
Controller's Assistant	1
Iwi Māori Partnerships	2
Safety	3
Intelligence	6
Planning	4
Operations	5
Lifelines	1
Logistics	6
PIM	6
Welfare	9
Strategic Communications	1
Recovery (during response)	1
	47

[4] Refer to Schedule 3: Incident Severity

Schedule 3: Incident Severity

Hawke's Bay Emergency Management uses the following levels, as per CIMS, to describe incident severity.

There are no fixed weightings for these factors; however, some descriptors may carry more importance than others depending on the situation. The overall severity is determined at the discretion of the Controller, based on their best judgement at the time.

	Minor (1)	Moderate (2)	Major (3)	Severe (4)
Impacts Deaths, injury, health, uninhabitable buildings, critical infrastructure, social, culture, economic, natural environment, reputation.	A small portion of the population in the area may be affected	Moderate number of the population may be affected.	Many of the population in the area may be affected	Most of the population in the area may be affected.
Response characteristics Containment, stability, location, number of agencies involved, urgency, novelty, decisions required, duration.	Known solutions to familiar, routine, or predictable problems.	Mostly familiar, routine, or predictable, with some degree of irregularity. Known solutions to somewhat irregular problems.	Mostly irregular, with some degree of familiarity and predictability. Predominantly known solutions to irregular and potentially unknown problems.	Unfamiliar, unprecedented, and unpredictable, with unknown solutions to unknown problems.
Resources Capacity and capability to manage, technical expertise, financial ability.	Manageable within available resource and capacity.	Requires some allocation of resource.	Resource limits and capacity are full.	Resource limits and capacity are exceeded.
Public, political and media interest Degree of expected public, political and media interest.	Minimal to no interest. Routinely managed.	Some degree of interest. Senior leadership engaged.	Significant degree of interest. Elected officials and ministers are engaged.	Global interest. Elected officials and ministers are engaged.

HERETAUNGA HASTINGS DISTRICT COUNCIL

Growth and Development
Visual Activity Snapshot

August 2025



FOCUS AREAS

- Active Residential Areas
- Active Industrial Areas
- Growth Infrastructure Enablement Civil Works
- Residential Intensification / Medium Density Projects

HERETAUNGA HASTINGS

HERETAUNGA
HASTINGS

Active Residential Areas


HOWARD STREET
Active Development Site
Active Development Site
Active Development Site
SW Management Area

HERETAUNGA HASTINGS DISTRICT COUNCIL

HOWARD STREET

HERETAUNGA HASTINGS DISTRICT COUNCIL

BROOKVALE

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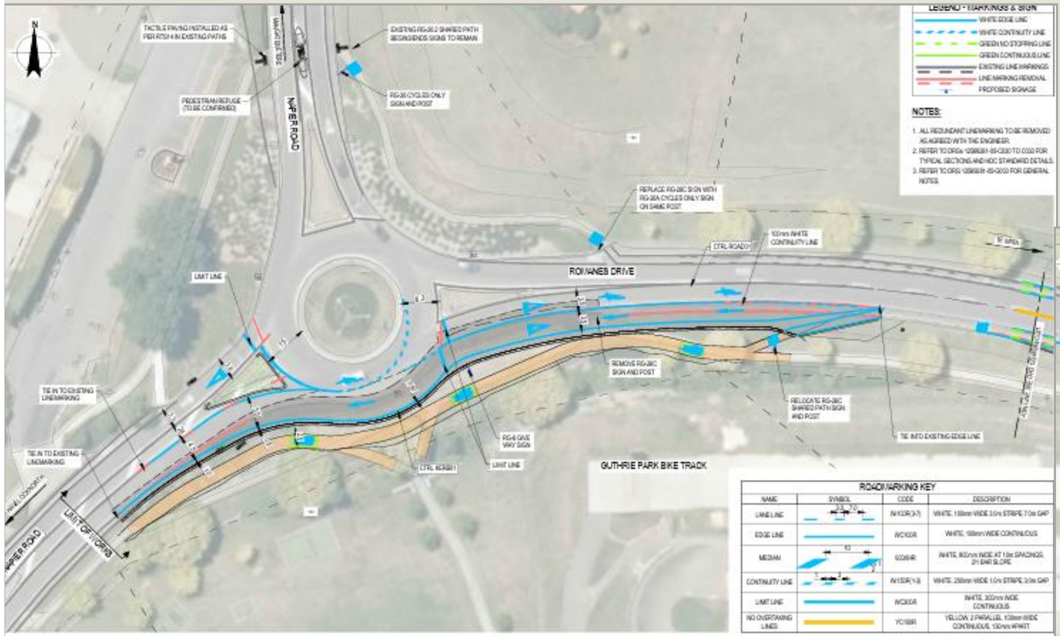
HERETAUNGA HASTINGS DISTRICT COUNCIL

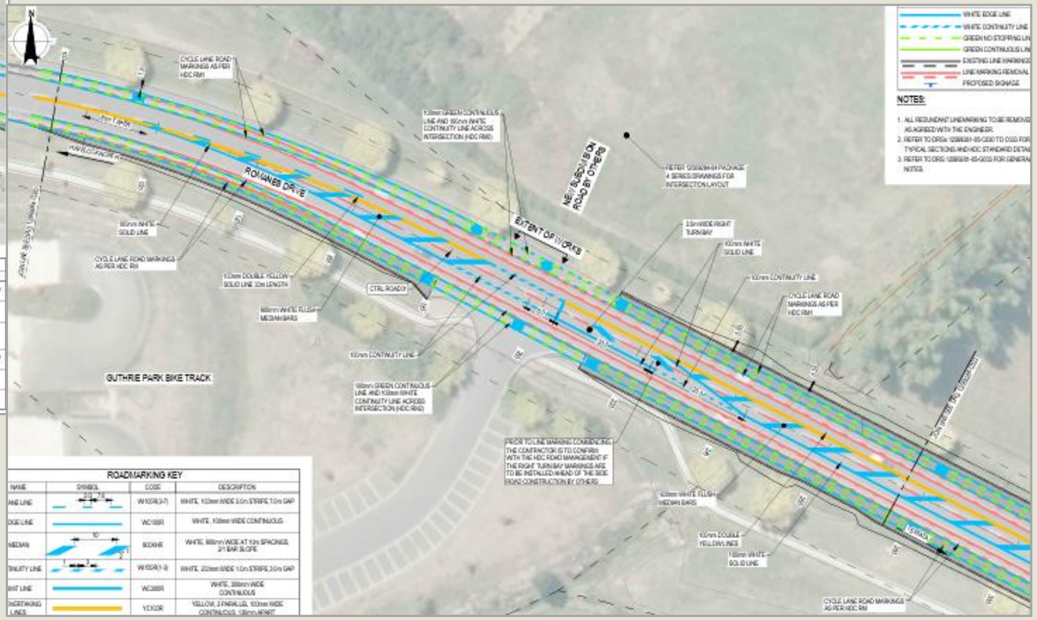
BROOKVALE

HERETAUNGA HASTINGS DISTRICT COUNCIL

BROOKVALE

BROOKVALE – PACKAGE 5





HERETAUNGA HASTINGS

HERETAUNGA HASTINGS DISTRICT COUNCIL

IONA /HAVELOCK HILLS AREA

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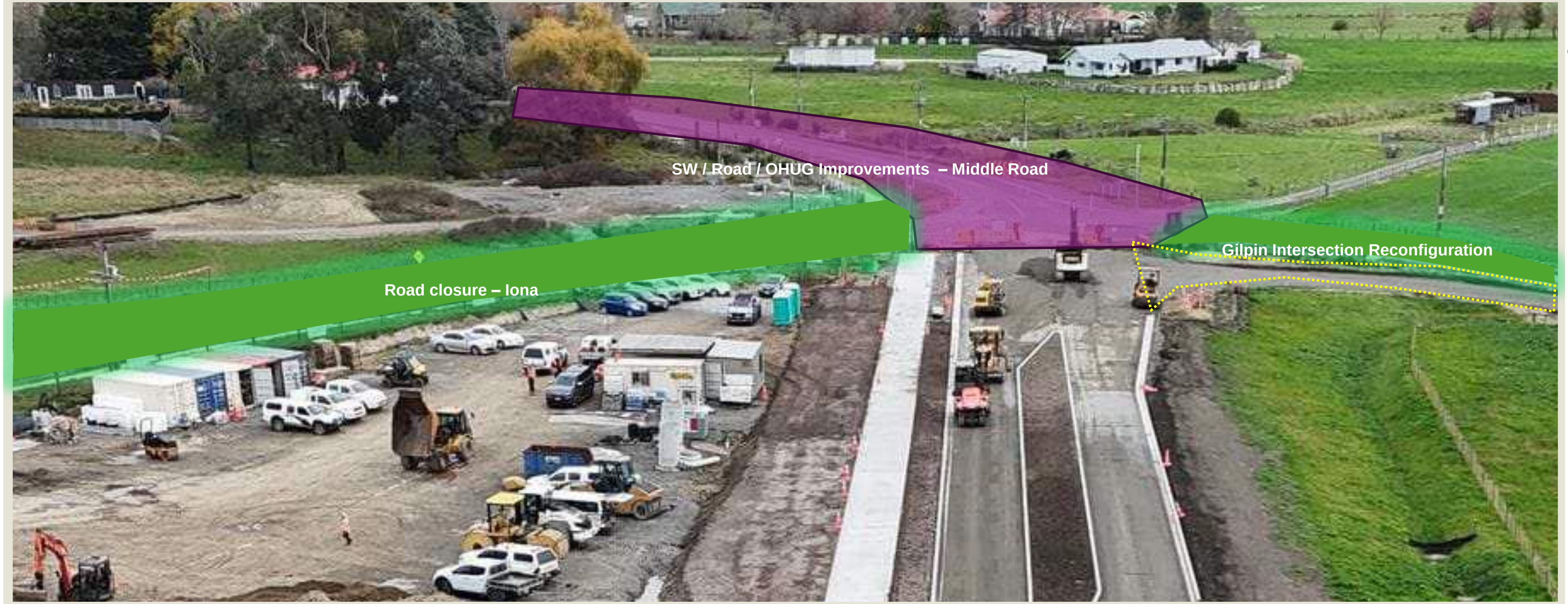
HERETAUNGA
HASTINGS

HERETAUNGA HASTINGS DISTRICT COUNCIL

IONA /HAVELOCK HILLS AREA



HERETAUNGA HASTINGS

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WAINGĀKAU

HERETAUNGA HASTINGS

Item 8

HERETAUNGA HASTINGS DISTRICT COUNCIL

LYNDHURST (STAGE 2)

HERETAUNGA
HASTINGS

Industrial Activity

MAINFREIGHT & NEW COOLSTORE

HERETAUNGA HASTINGS DISTRICT COUNCIL

NZ POST

HERETAUNGA HASTINGS

Other Growth Infrastructure Enablement Civil Works

FLAXMERE STORMWATER

HERETAUNGA HASTINGS DISTRICT COUNCIL

IAF WW – OMAHU RD TO FLAXMERE

HERETAUNGA HASTINGS

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IAF WW - LYNDHURST TO OMAHU RD

HERETAUNGA HASTINGS

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IAF WW - WAIPATU

HERETAUNGA HASTINGS

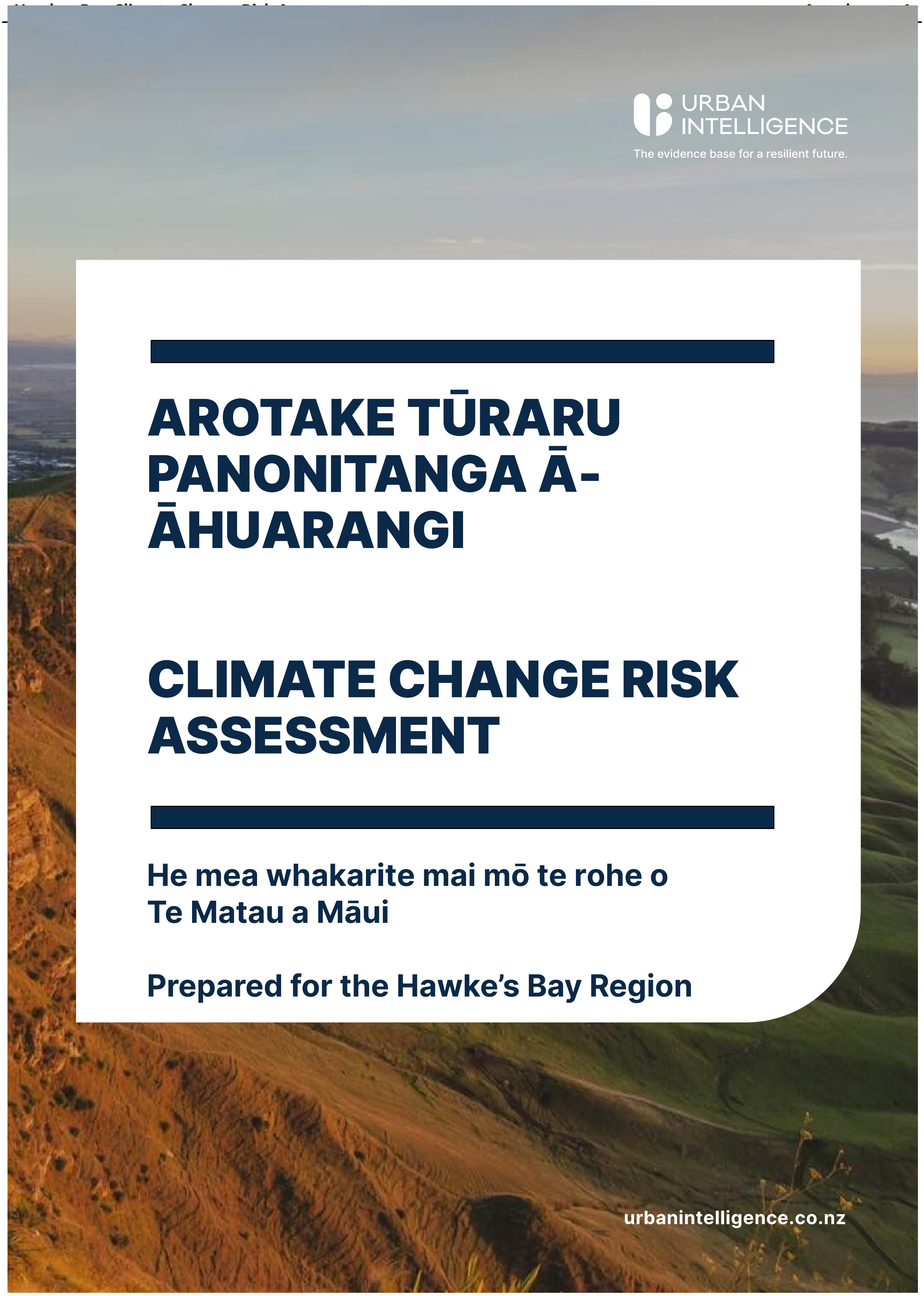
HERETAUNGA
HASTINGS

Residential Intensification / Medium Density Projects

HERETAUNGA HASTINGS DISTRICT COUNCIL

206 QUEEN ST WEST – INNER CITY LIVING

HERETAUNGA HASTINGS



URBAN INTELLIGENCE
The evidence base for a resilient future.

AROTAKE TŪRARU PANONITANGA Ā-ĀHUARANGI

CLIMATE CHANGE RISK ASSESSMENT

He mea whakarite mai mō te rohe o Te Matau a Māui

Prepared for the Hawke's Bay Region

urbanintelligence.co.nz

Item 11

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

Item 11

Ngā kai o roto | Contents

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.

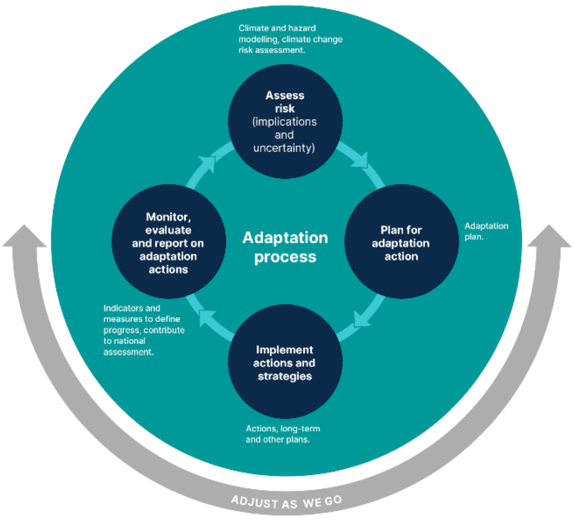


Figure 1.1. The Adaptation Process.

URBAN INTELLIGENCE

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.

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.

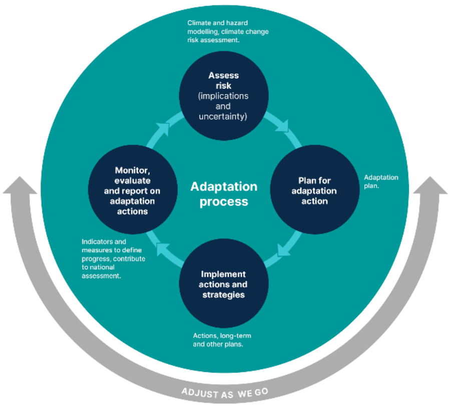


Figure 1.1. The Adaptation Process

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).

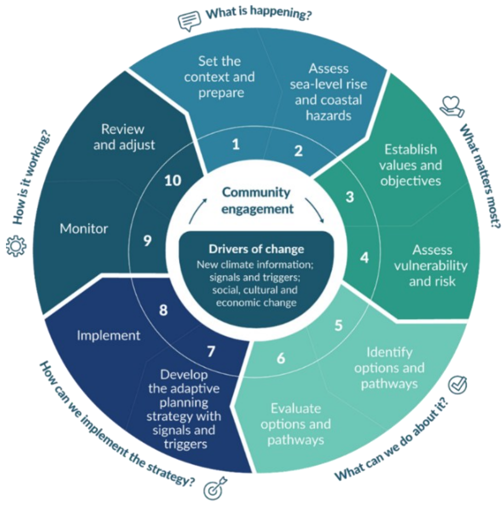


Figure 1.2. MfE's 10-step decision cycle for climate and coastal adaptation planning [2].

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.

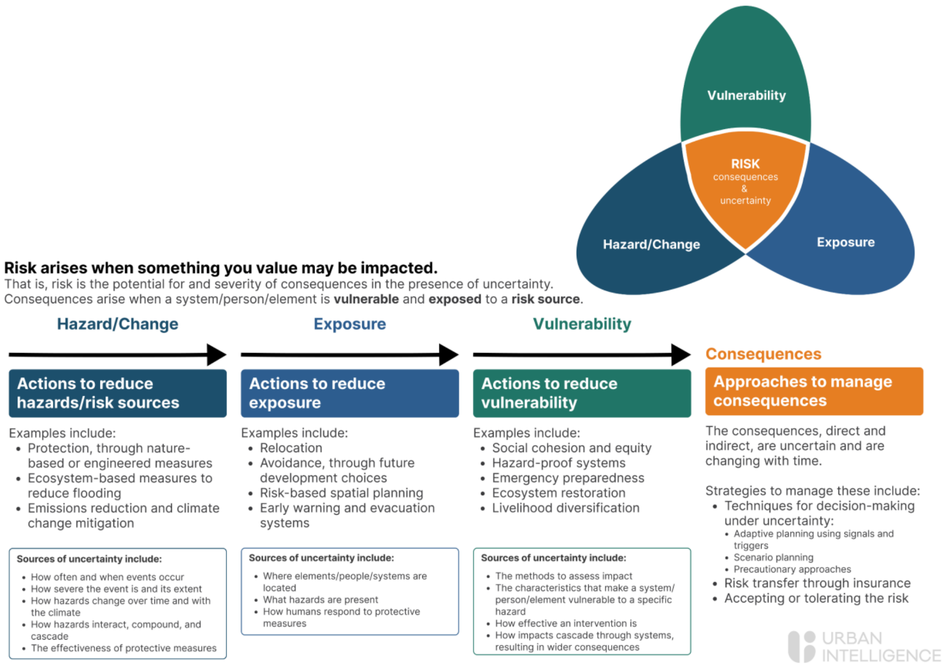


Figure 2.1. Risk arises when something valued could be impacted. That risk is the combination of consequences and uncertainty. In a natural hazards and climate change context, consequences arise when something that is vulnerable is exposed to a hazard or change. Risk can be reduced by intervening at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

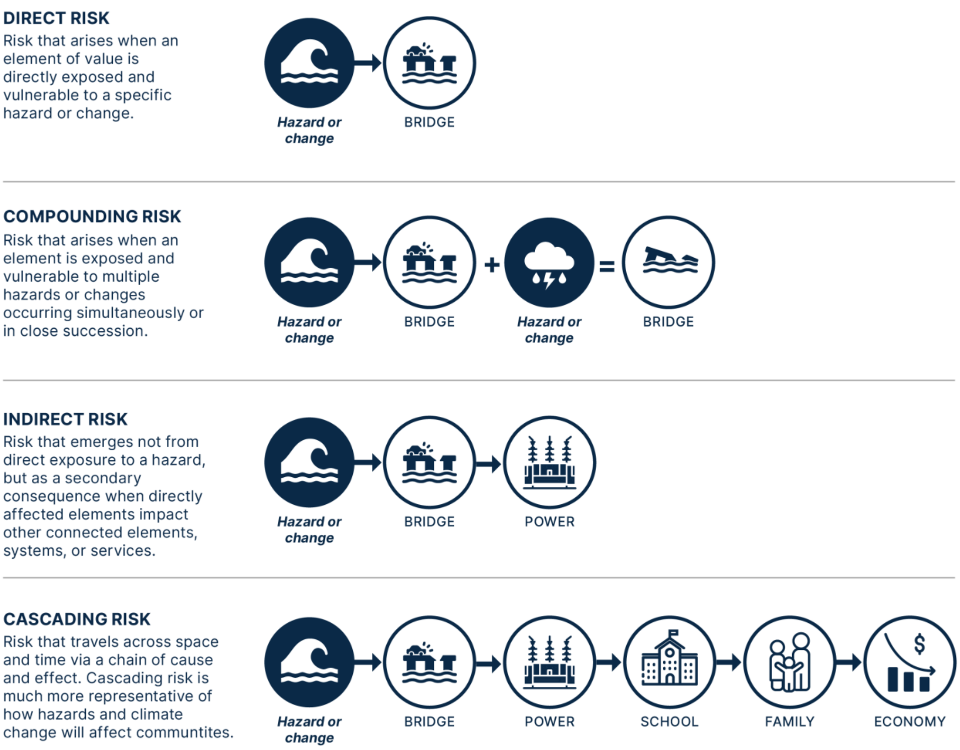


Figure 2.2. Illustration of different types of climate risks. Direct risks are immediate impacts from a hazard (e.g. flood damage to a road), while indirect risks are secondary effects (e.g. communities being isolated due to the damaged road). Cascading risks show how impacts can trigger chain reactions 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.

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 (Table A.1). 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.

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.

03

Te Arotakenga ā-Rohe Regional Assessment

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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 others) **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.

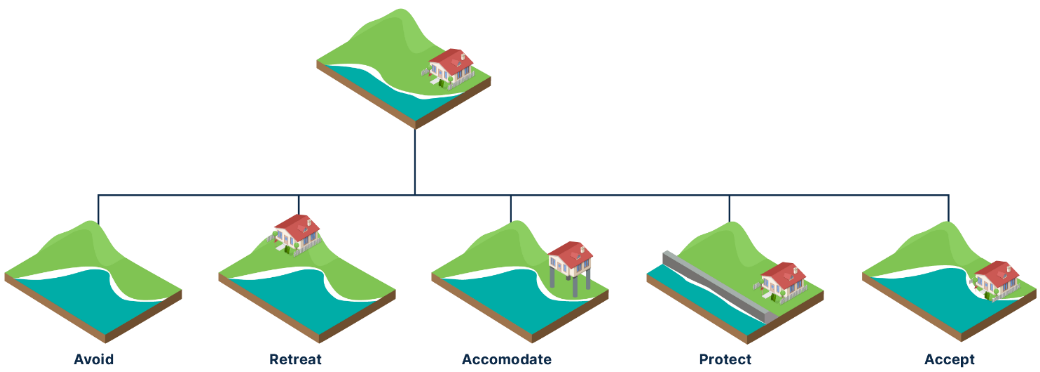

Figure 5.2. Adaptation options - avoid, retreat, accommodate, protect, and accept.

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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.

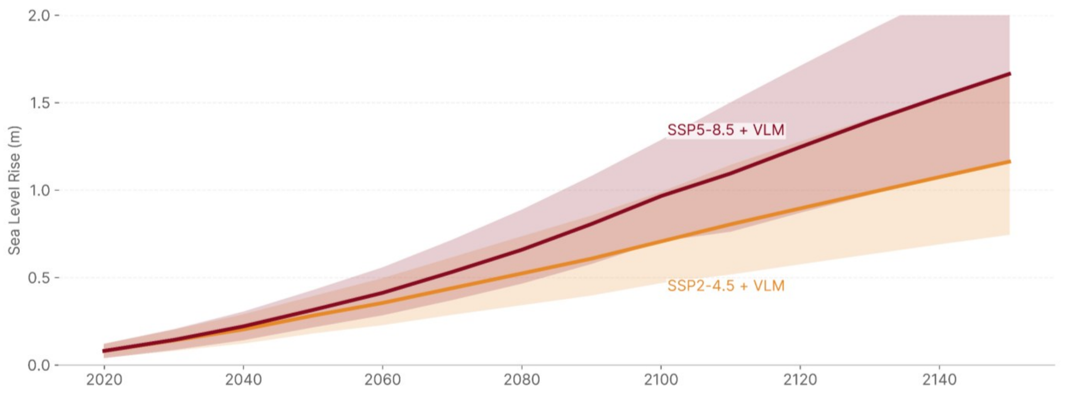

Figure 5.3. How sea level rise is projected to change across the region compared to 2005. Source: NZSeaRise [39].

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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.

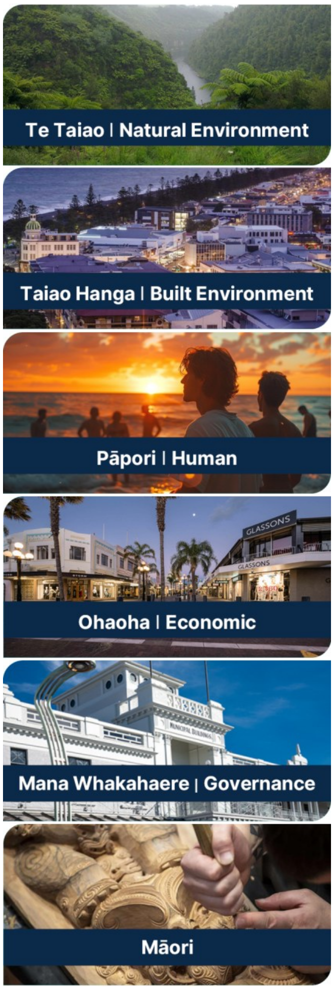
Landslides Landslides involve the downward movement of rock, soil, and debris on slopes. While already common in New Zealand, landslide risk is expected to increase with more frequent, intense rainfall events predicted under climate change scenarios and fire occurrence that will exacerbate soil erosion.

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].

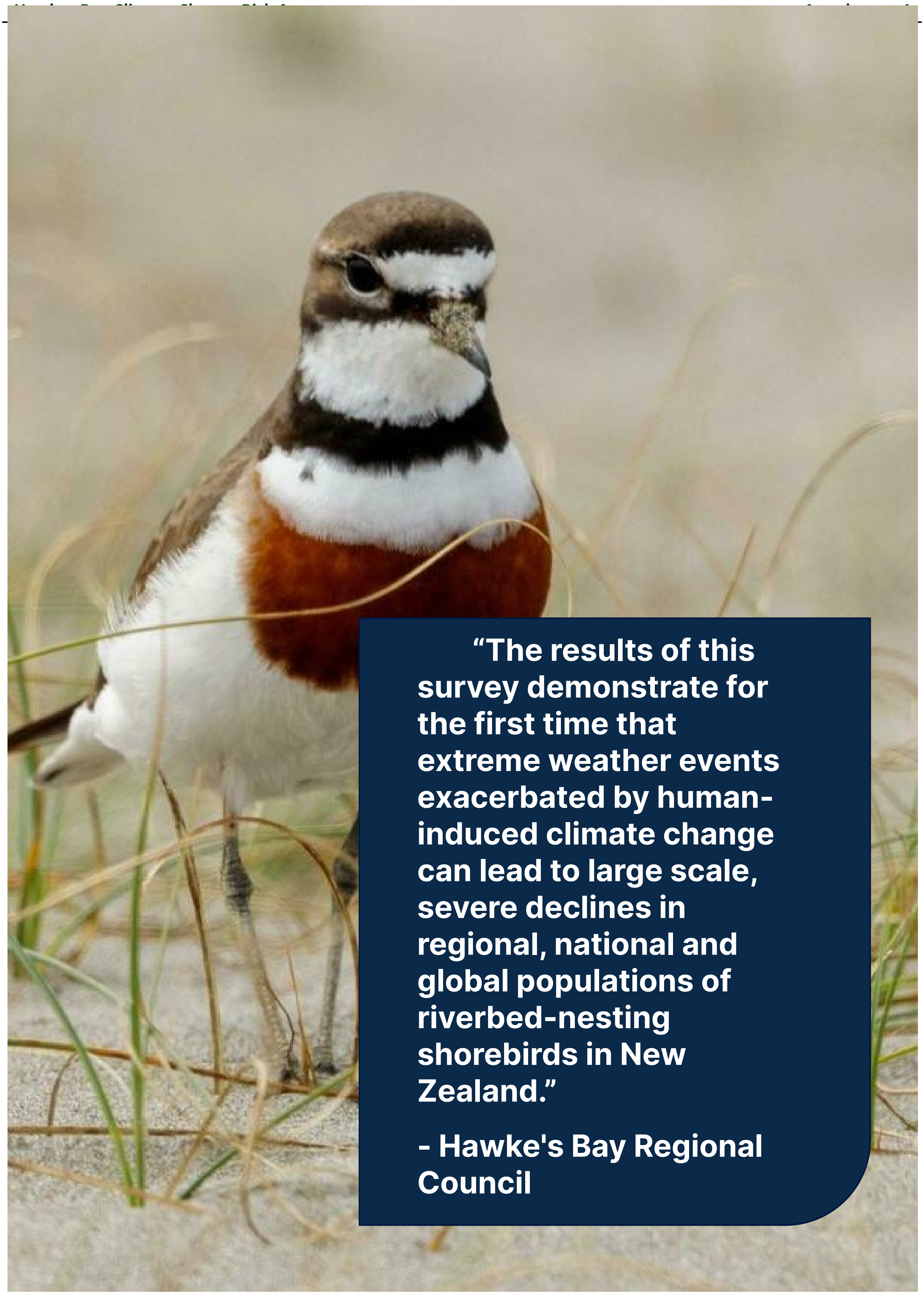
Risks to terrestrial and forest ecosystems

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.

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.**

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.

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.

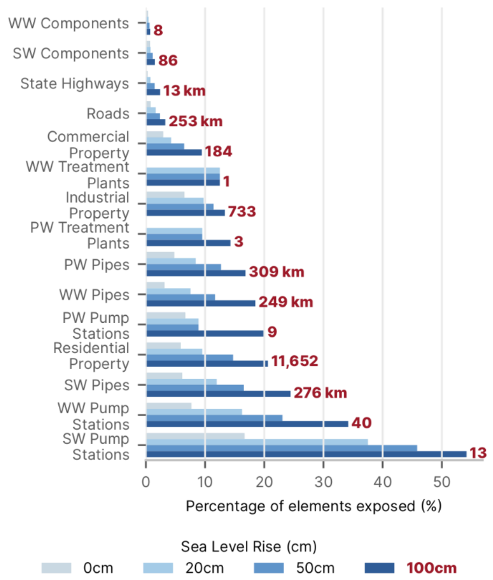


Figure 7.1. The number/length of each infrastructure type that would be flooded in a 1% coastal flood, given different amounts of sea level rise.

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.

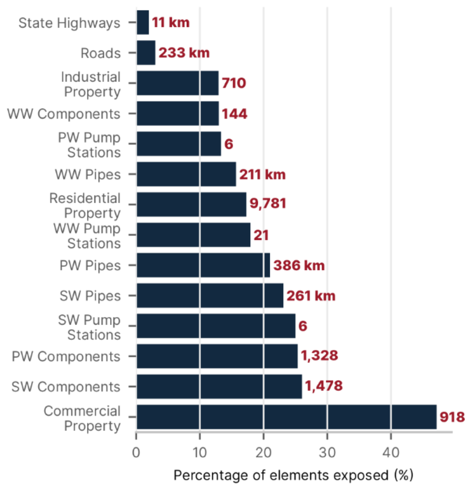


Figure 7.2. Regional infrastructure potentially exposed to more than 10cm of river and rainfall flooding across Hawke's Bay. Data uses the best estimate of today's flood risk, which requires combining different flood scenarios across districts (1% AEP for Wairoa, and Central Hawke's Bay; 2% AEP for Hastings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

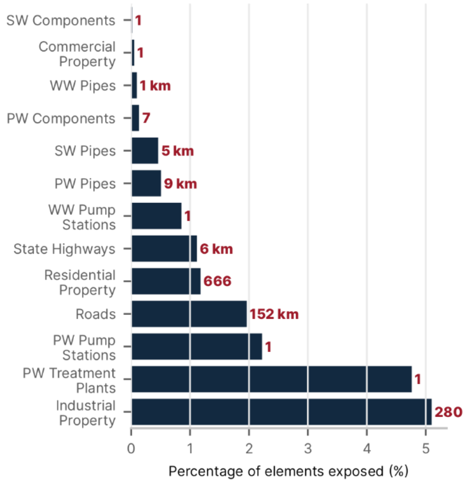


Figure 7.3. Regional infrastructure exposed to landslides across Hawke's Bay.

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.

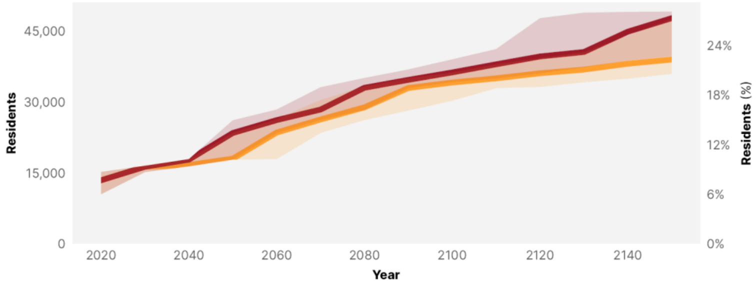
URBAN INTELLIGENCE

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?

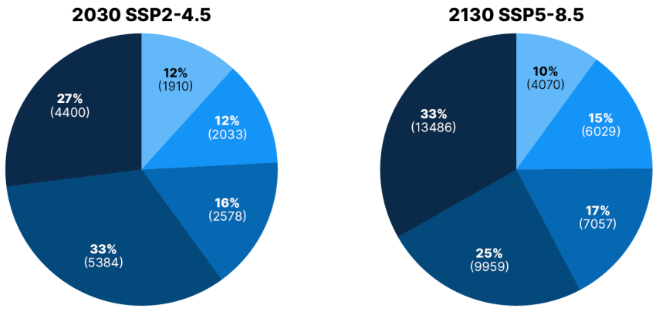
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



16,304 of 174,936 total residents

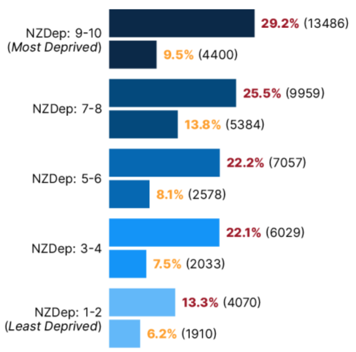
40,600 of 174,936 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

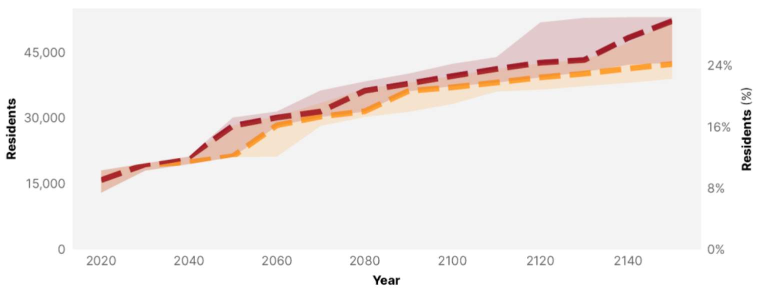
Figure 8.1. Risk to residents in the Hawke's Bay Region living in property directly exposed to coastal flooding and projections over time.

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)?

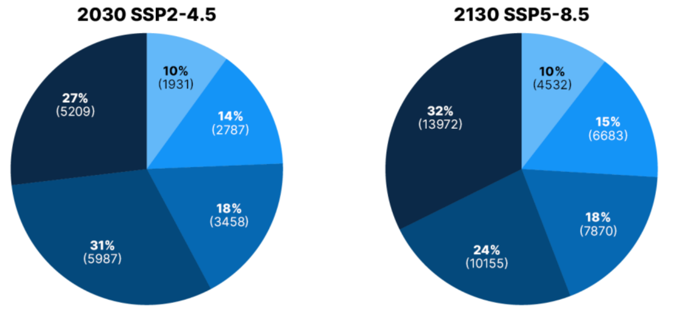
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



19,373 of 174,936 total residents

43,212 of 174,936 total residents

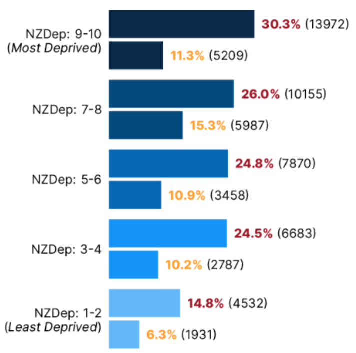
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

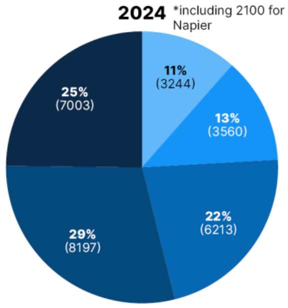
Figure 8.2. Isolation risk to residents in the Hawke's Bay Region from coastal flooding and projections over time.

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



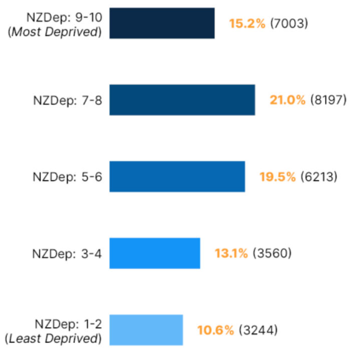
28,216 of 174,936 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

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

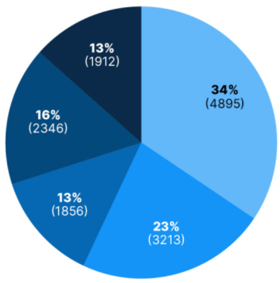
Population Isolated by Landslides in the Hawke's Bay Region

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



14,222 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

2023

NZDep 1-2

NZDep 3-4

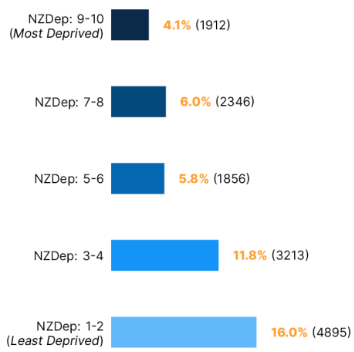
NZDep 5-6

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

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.

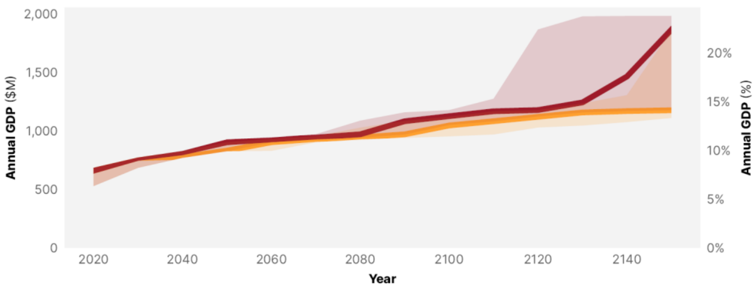
These changes will require significant adaptation investment but may also present opportunities for regional diversification of horticultural production. Success will depend heavily on water availability, infrastructure development, and adoption of climate-resilient growing practices.

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?

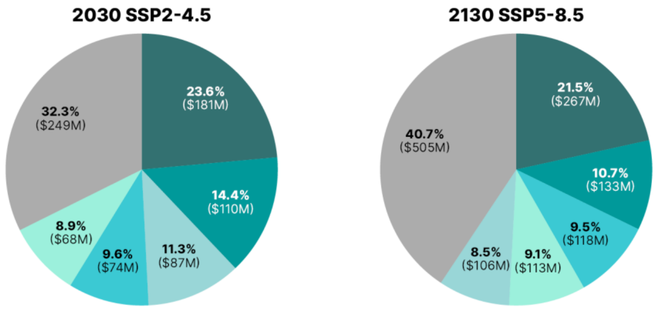
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



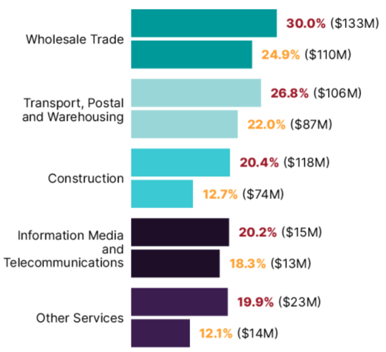
$768M of $8,329M total GDP

$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.

(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)



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
- 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

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

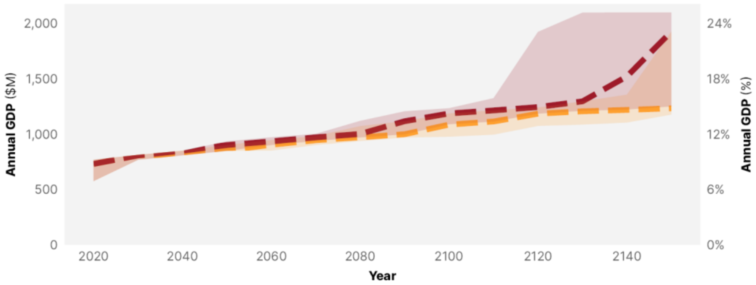
Item 11

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)?

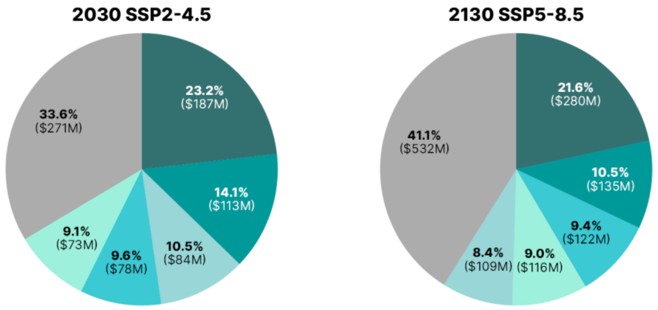
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



$806M of $8,322M total GDP **$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.

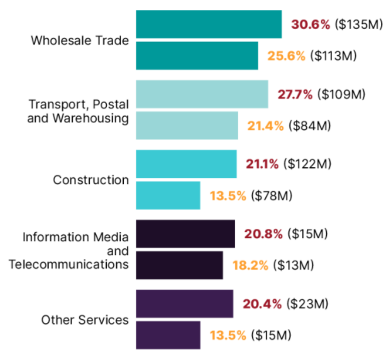
KEY

- 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)



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.

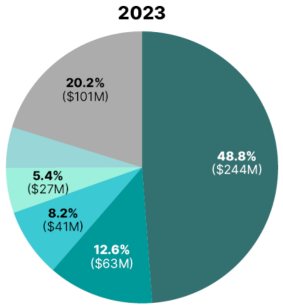
Figure 9.3. Risk to economic sectors in the Hawke's Bay Region from isolation caused by 1% AEP coastal flooding.

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



$500M of $8,329M total GDP

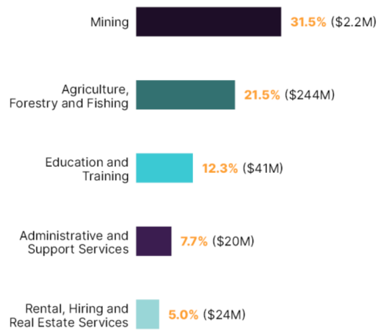
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

KEY
2023

Agriculture, Forestry and Fishing
Manufacturing
Education and Training
Construction
Rental, Hiring and Real Estate Services
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)



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.

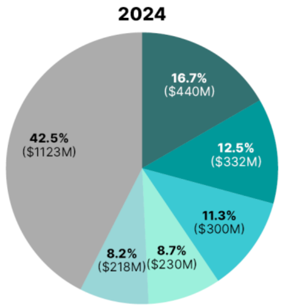
Figure 9.4. Isolation risk to economic sectors in the Hawke's Bay Region from landslides.

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

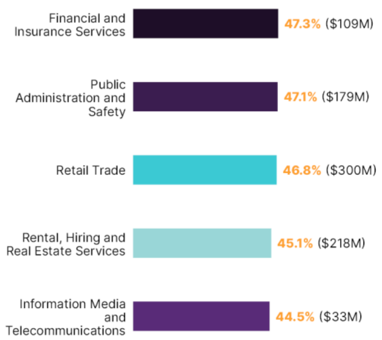


$2,642M of $8,329M total GDP

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.

(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)



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
- 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

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.

Māori are at risk from coastal flooding as well as isolation risk arising from landslides

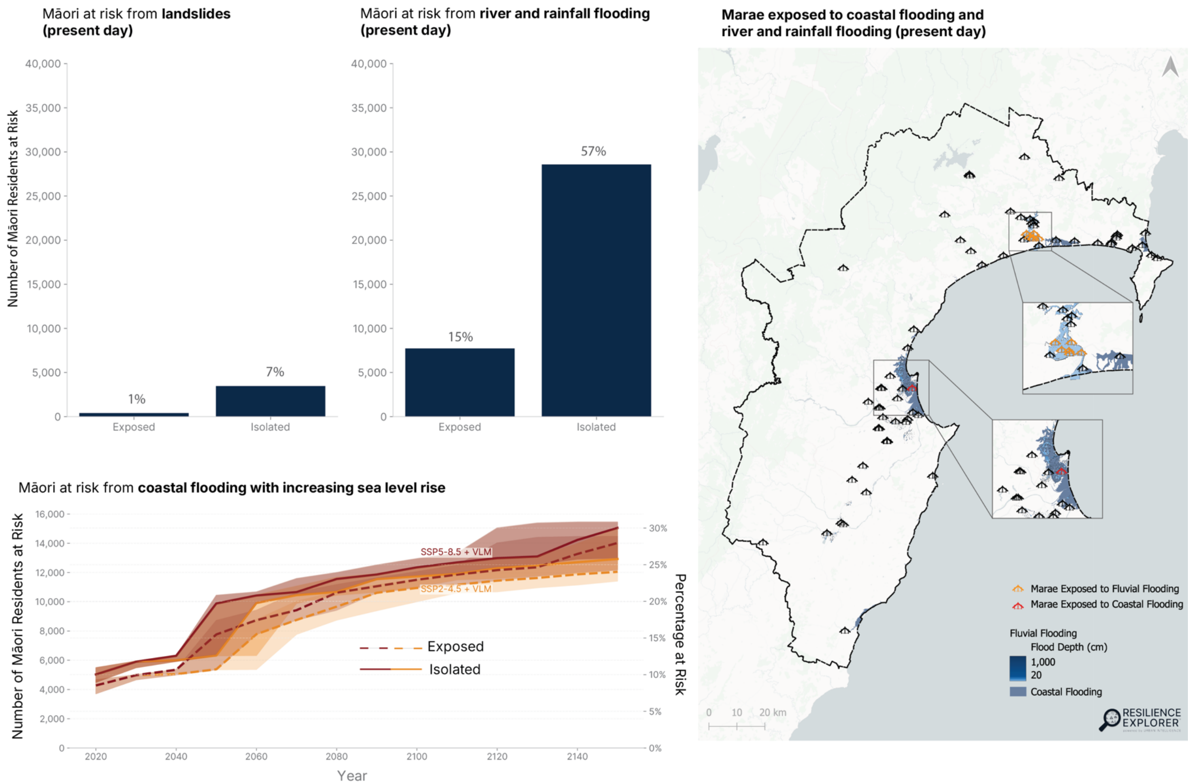


Figure 11.1. Risk to Māori from landslide, coastal, river and surface flooding.

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

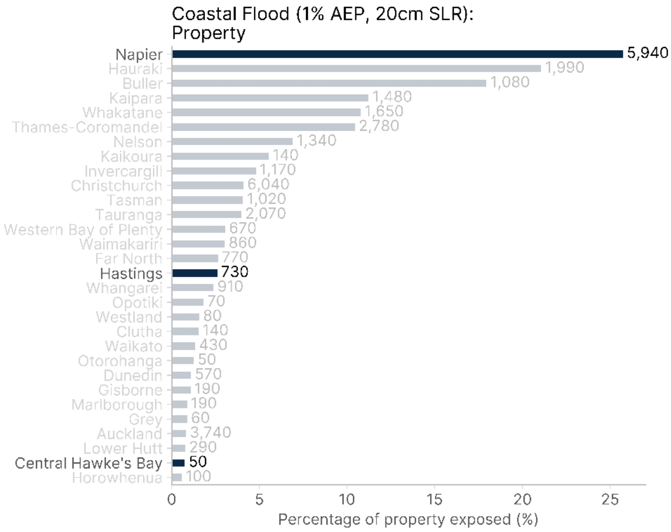
This underscores why regional adaptation planning must account for gaps in national progress while also identifying opportunities for local action. The Hawke's Bay region faces particular urgency in this regard. Napier City ranks first nationally for property exposure to coastal flooding, with over 25% 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:

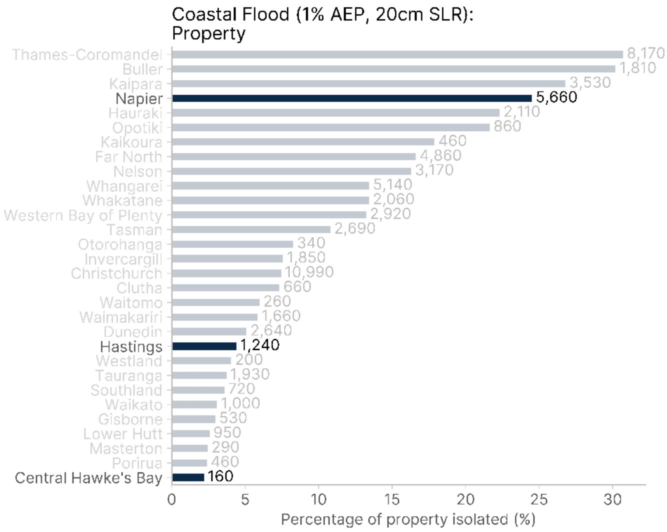
1. national policies and frameworks for climate adaptation
2. actions (or inaction) of central government and agencies operating within the region
3. neighbouring councils' risk management strategies and respective priorities
4. private sector resilience planning, particularly for critical infrastructure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

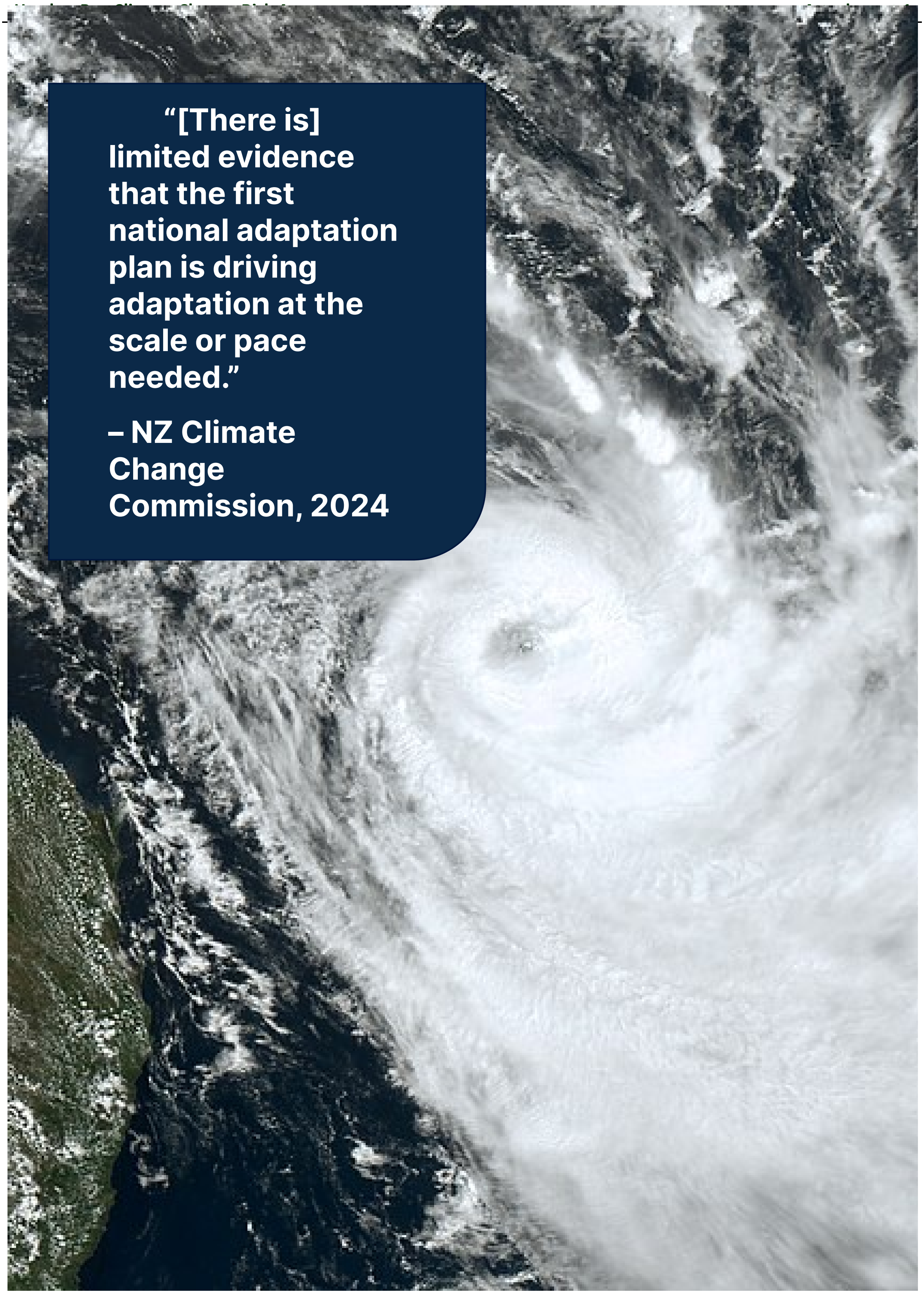


(a) Properties exposed to coastal flooding.



(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

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.

URBAN INTELLIGENCE

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.

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

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, 8% employment), and Professional Services (5% GDP, 5% employment)

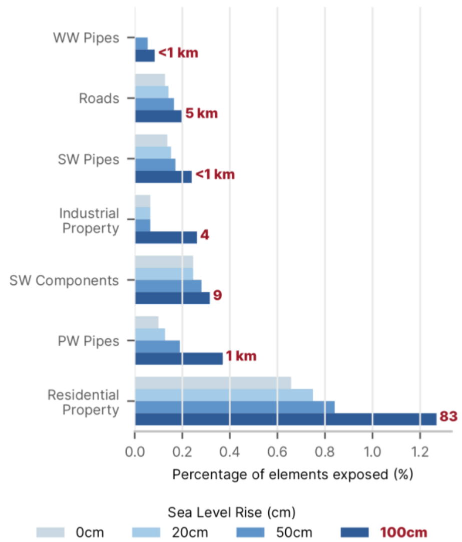


Figure 14.2. Infrastructure exposed to more than 10cm of coastal flooding with different amounts of sea level rise.

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.

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 one 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.

Property Exposed to and Isolated by Hazards in Central Hawke's Bay

This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.

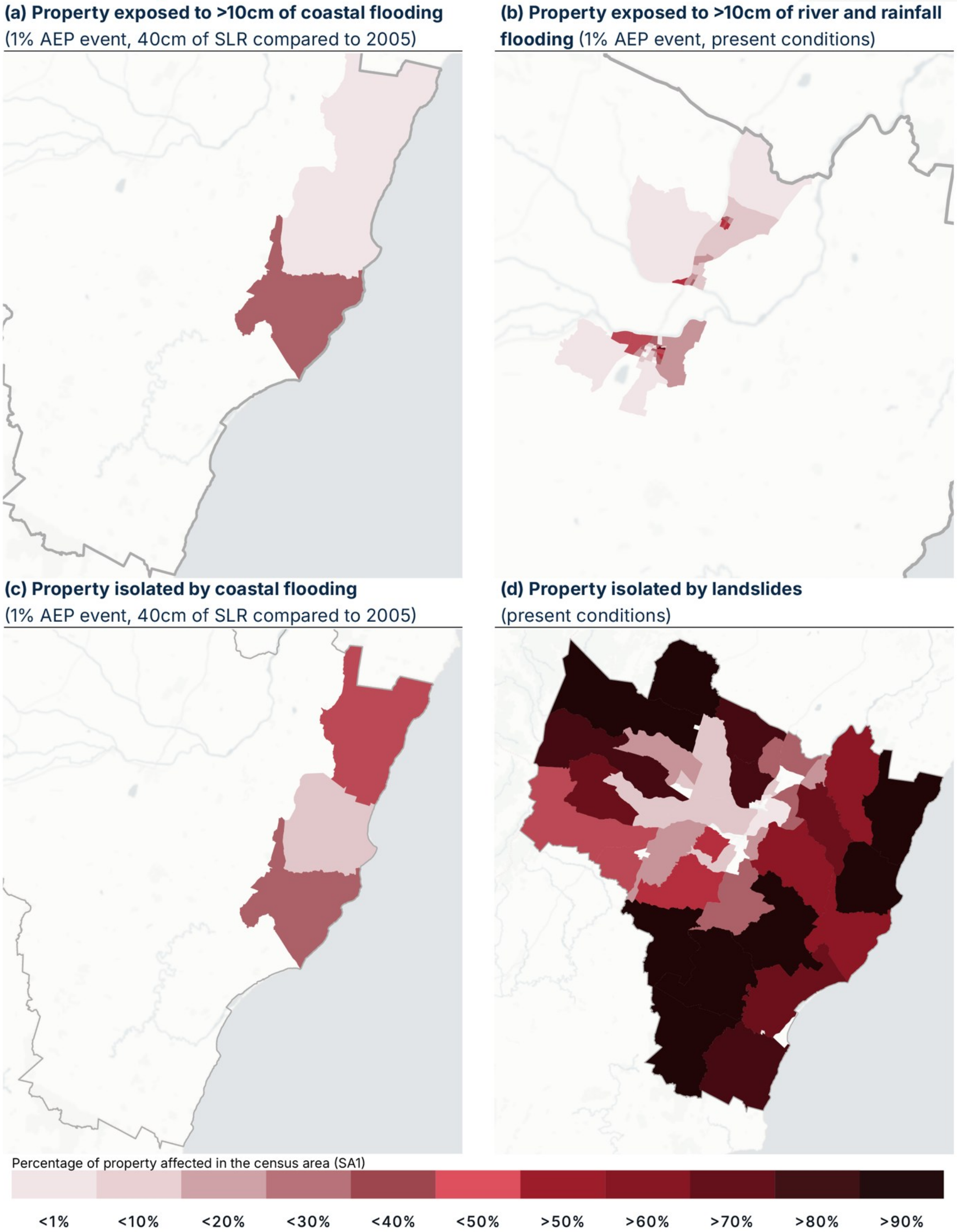


Figure 14.3. Areas with high percentage property risk in Central Hawke's Bay

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.

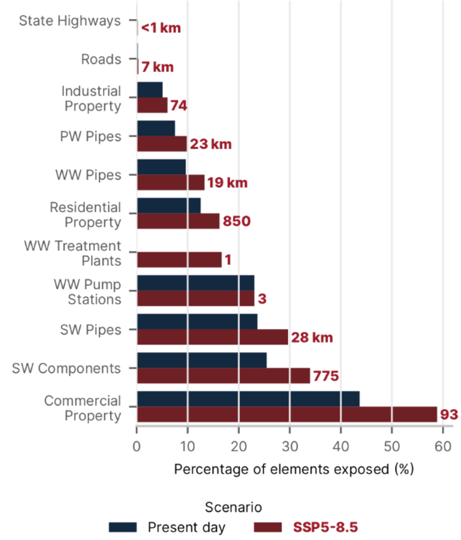


Figure 14.4. Infrastructure exposed to more than 10cm of river and rainfall flooding now and in 2100.

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

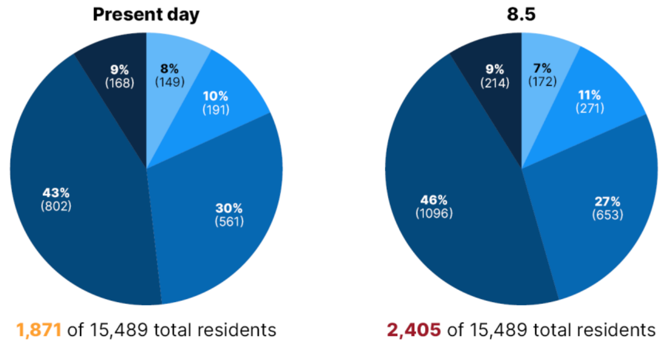
The economic impacts of river and rainfall flooding (Figure 14.6; Figure A - 24) could be substantial for the Central Hawke's Bay District. Industrial and commercial properties contributing to 18% ($110M) of the district's annual GDP are currently exposed to the direct impacts of river and rainfall flooding. 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.

Population 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 population exposure to a 1% AEP event and >10cm of flooding?

EXPOSED POPULATION BY NZ DEPRIVATION INDEX



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).

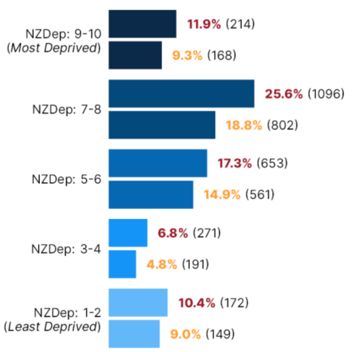
KEY

- 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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

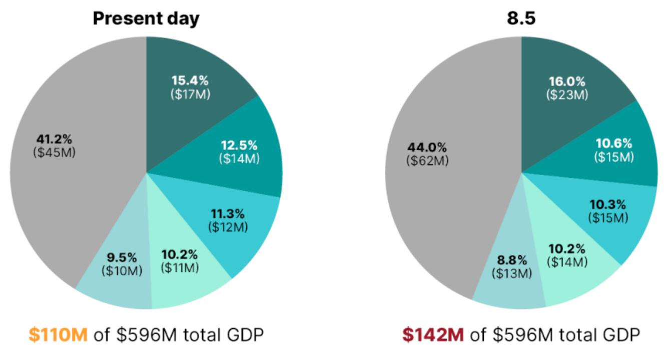
Figure 14.5. Risk to residents in Central Hawke's Bay from exposure to 1% AEP river and rainfall flooding.

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?

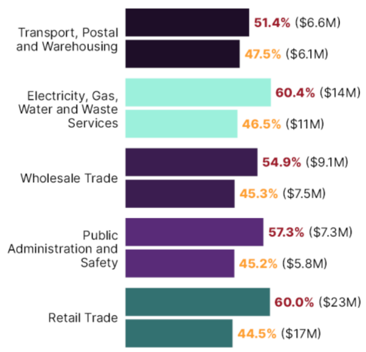
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS



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.

(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)



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
- 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

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.

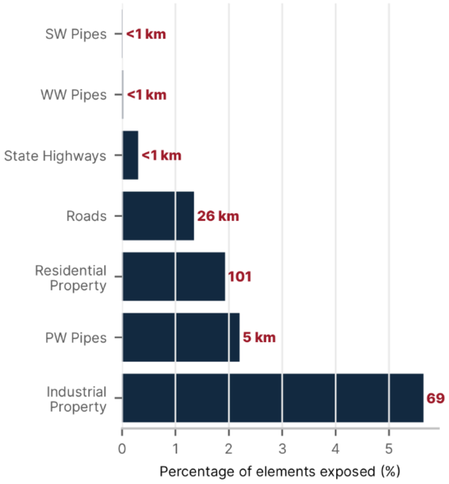


Figure 14.7. Infrastructure exposed to landslides.

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

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%)

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.

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%).

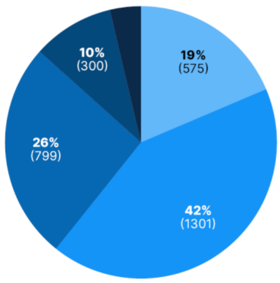
Population Isolated by Landslides in Central Hawke's Bay

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



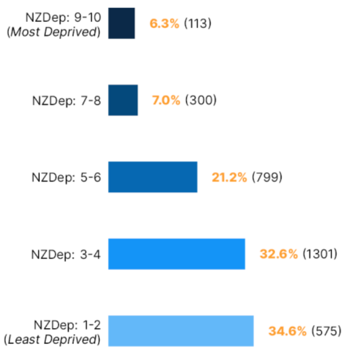
3,087 of 15,489 total residents

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

PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

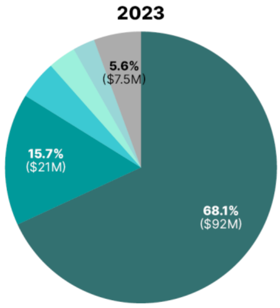
Figure 14.8. Risk of isolation to residents in Central Hawke's Bay from landslides.

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?

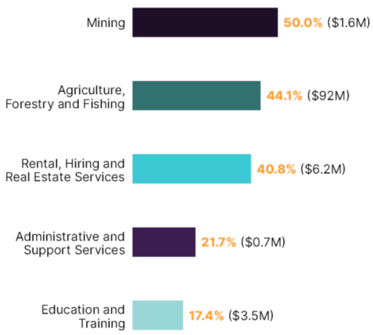
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS



This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

(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)



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
- Administrative and Support Services
- Other Sectors

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.

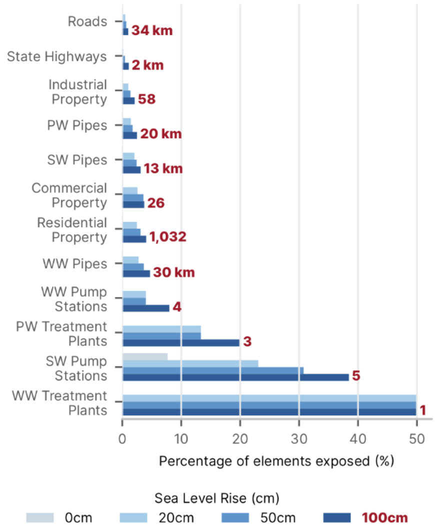


Figure 15.2. Infrastructure exposed to 1% AEP coastal flood event with different amounts of sea level rise.

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

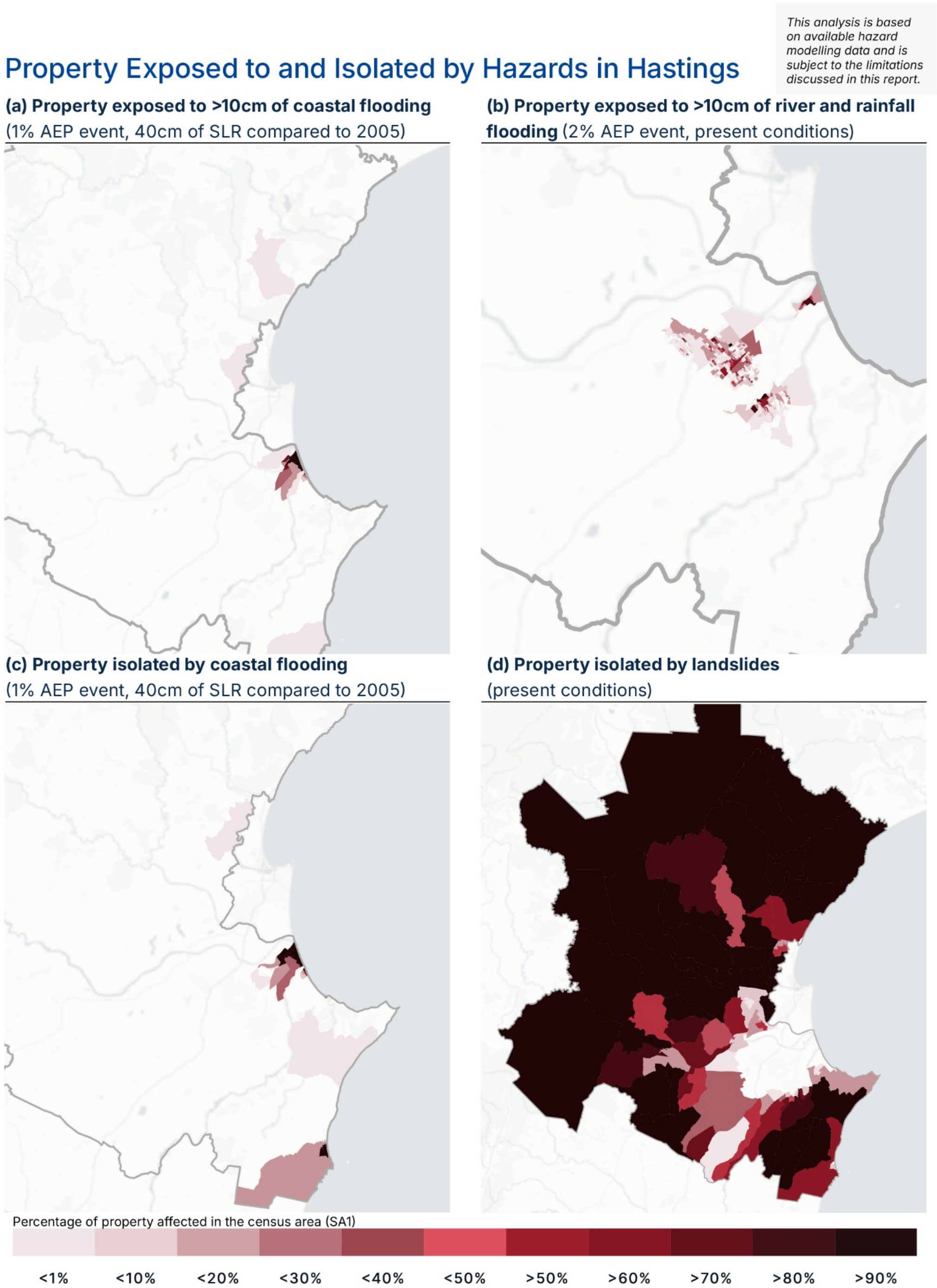


Figure 15.3. Areas with high percentage property risk in Hastings.

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

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%)

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 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

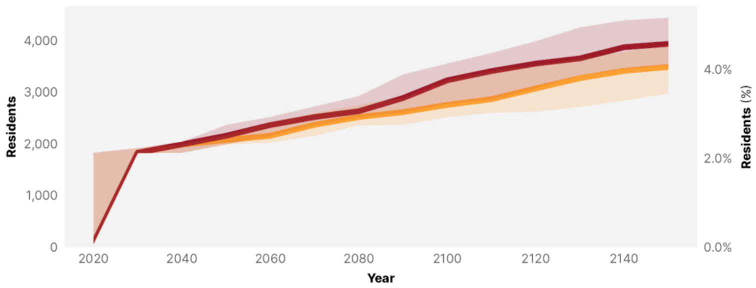
Direct exposure of commercial and industrial property to coastal flooding is low, with exposed properties contributing to less than 2% of the district's annual GDP exposed or isolated in 2130 (Figure A - 31; Figure A - 32).

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?

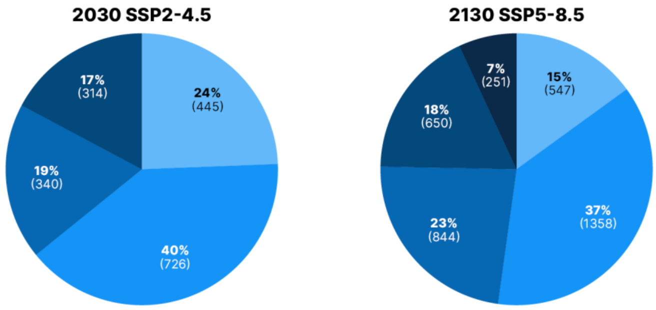
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



1,825 of 85,968 total residents

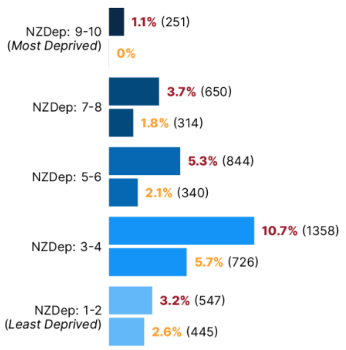
3,650 of 85,968 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

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.

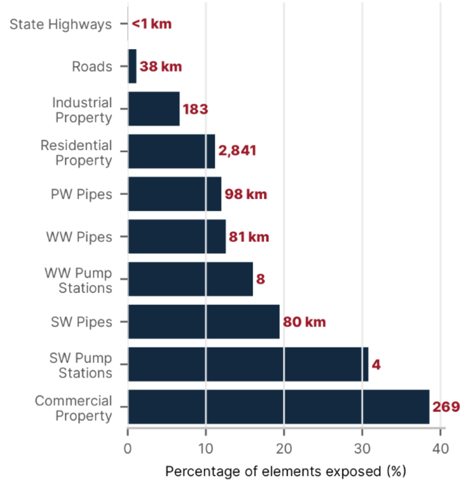


Figure 15.5. Infrastructure exposed to 2% AEP river and rainfall flooding.

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.

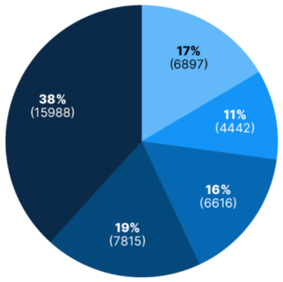
Population Isolated by River and Rainfall Flooding in Hastings

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



41,759 of 85,968 total residents

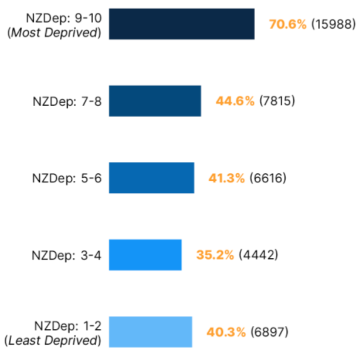
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

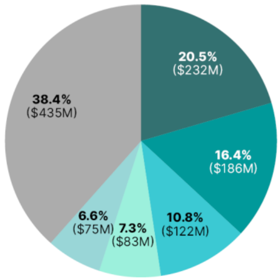
Figure 15.6. Risk of isolation to residents in Hastings due to a 2% AEP river and rainfall flood event.

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

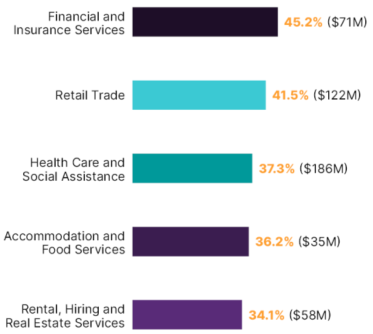


$1,133M of $4,509M total GDP

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.

(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)



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
- 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

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).

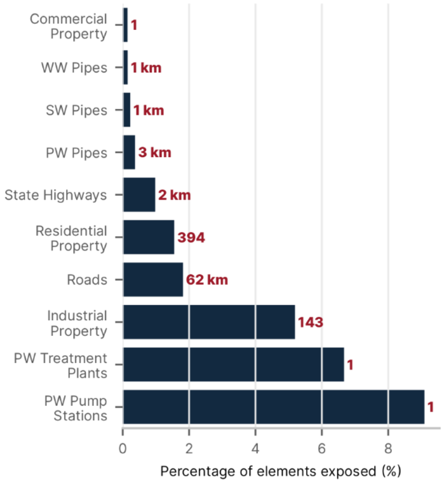


Figure 15.8. Infrastructure exposed to landslides.

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.

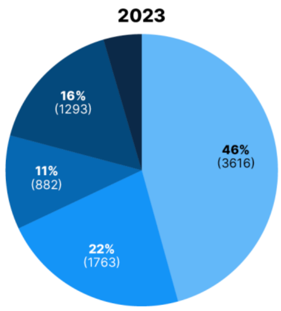
The analysis suggests that while physical damage from landslides may be limited, access disruption could create significant operational challenges across multiple sectors, particularly affecting the district's agricultural and transport activities. More detailed analysis of indirect economic impacts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

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



This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

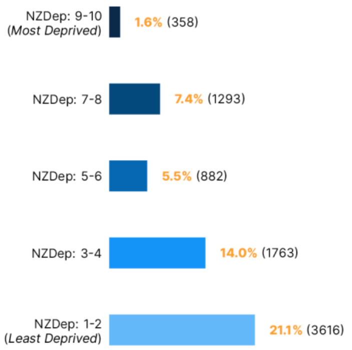
7,912 of 85,968 total residents

KEY
2023

NZDep 1-2
NZDep 3-4
NZDep 5-6
NZDep 7-8
NZDep 9-10

(b) Which groups face disproportionate isolation risk relative to their size?

PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

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

URBAN INTELLIGENCE

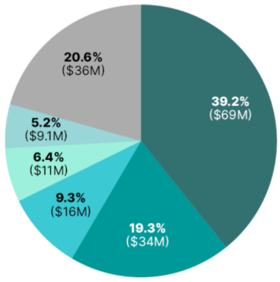
Economic Activity Isolated by Landslides in Hastings

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

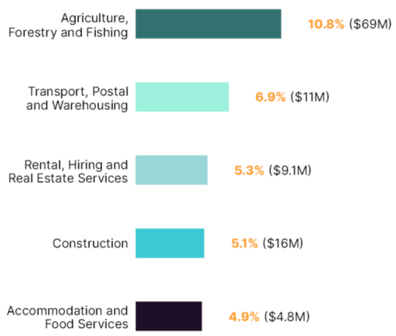


This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

$175M of $4,509M total GDP

(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)



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
- Construction
- Transport, Postal and Warehousing
- Rental, Hiring and Real Estate Services
- Accommodation and Food Services
- Other Sectors

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.

Property Exposed to and Isolated by Hazards in Napier

This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.

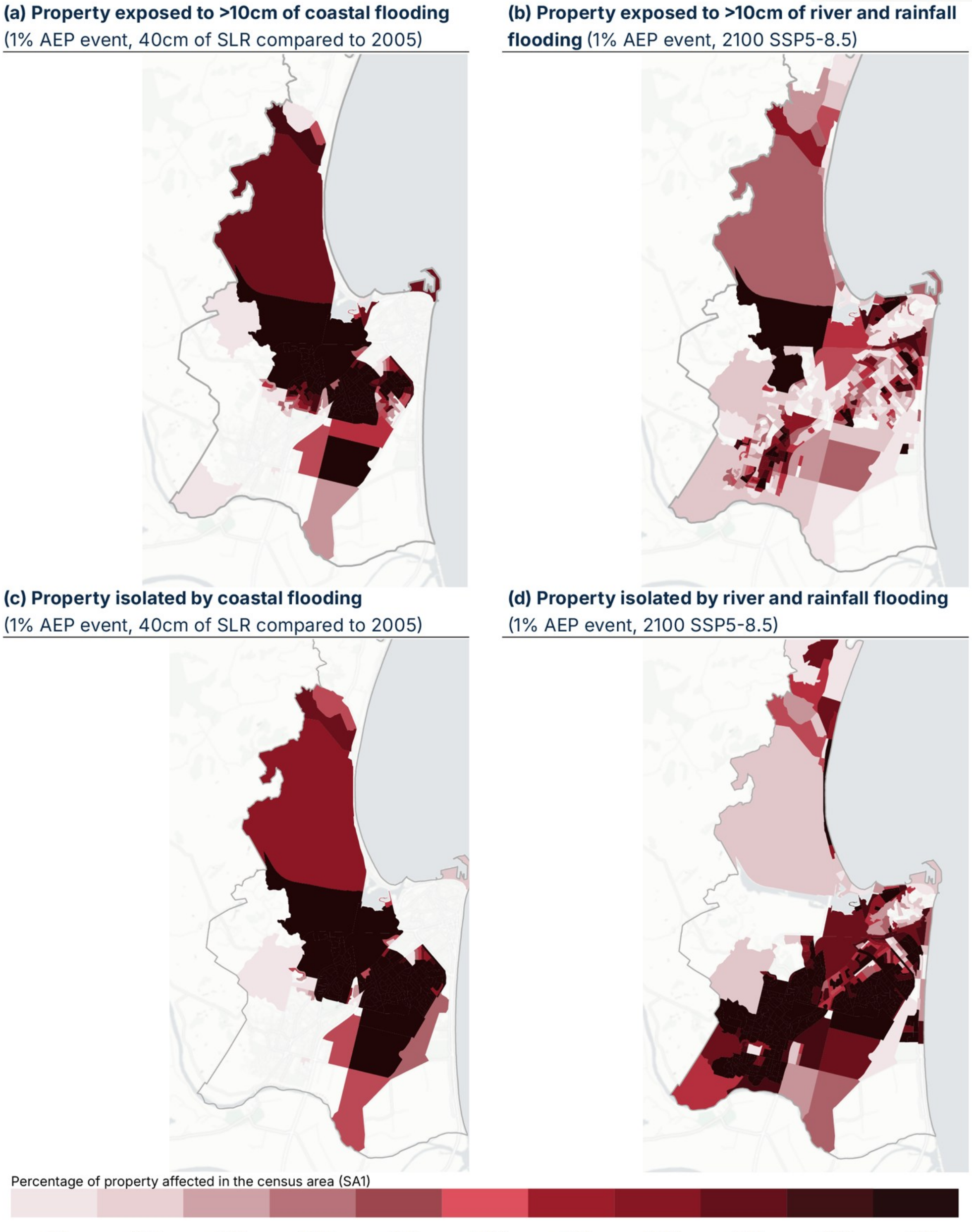


Figure 16.2. Areas with high percentage property risk in Napier.

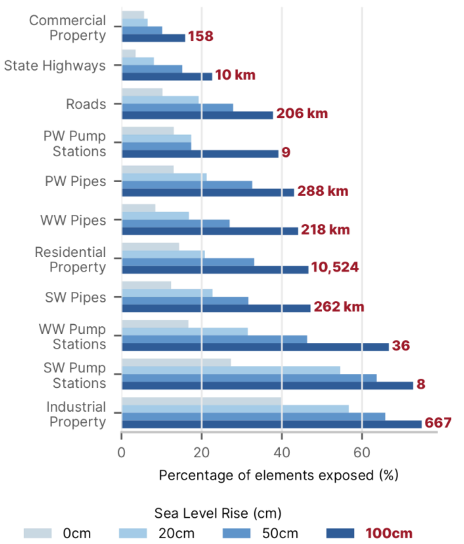


Figure 16.3. Infrastructure exposed to a 1% AEP coastal flood with different amounts of sea level rise.

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.

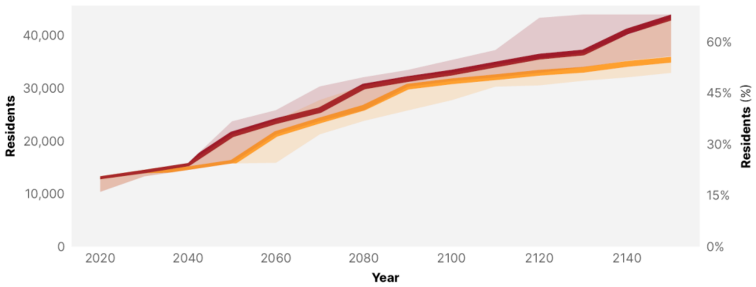
The spatial concentration of economic activity, particularly around coastal and low-lying industrial areas, means that flood impacts could simultaneously affect multiple sectors and their supporting infrastructure, creating compound effects that amplify beyond direct losses. This interconnected vulnerability 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.

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?

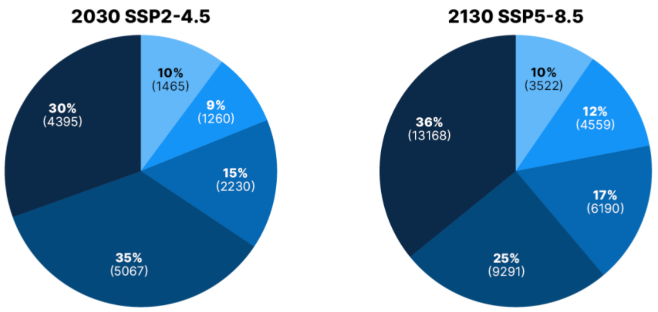
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



14,417 of 64,668 total residents

36,729 of 64,668 total residents

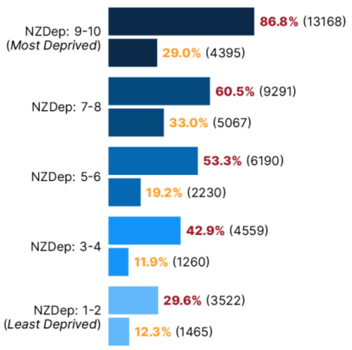
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure 16.4. Risk to residents in Napier from 1% AEP coastal flooding.

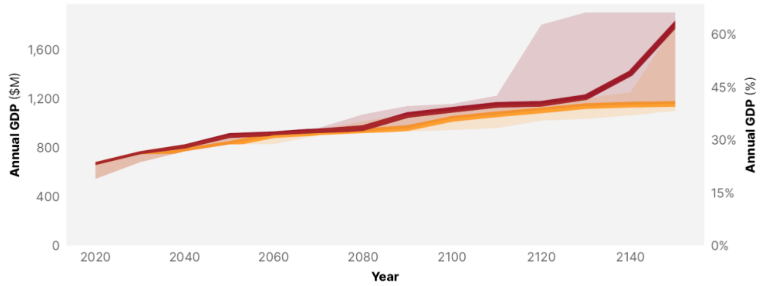
URBAN INTELLIGENCE

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?

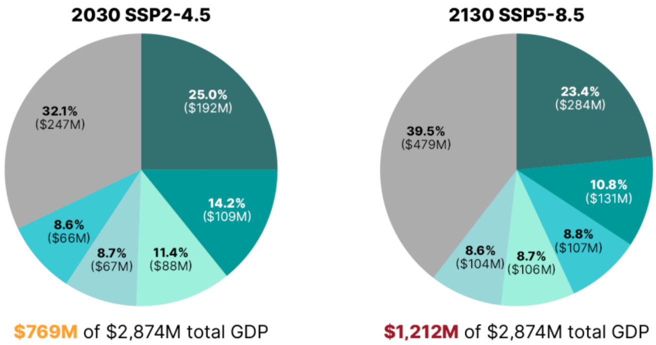
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



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.

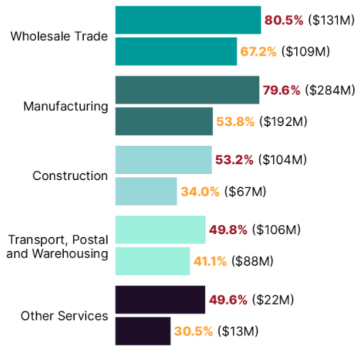
KEY

- 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)



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 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%.

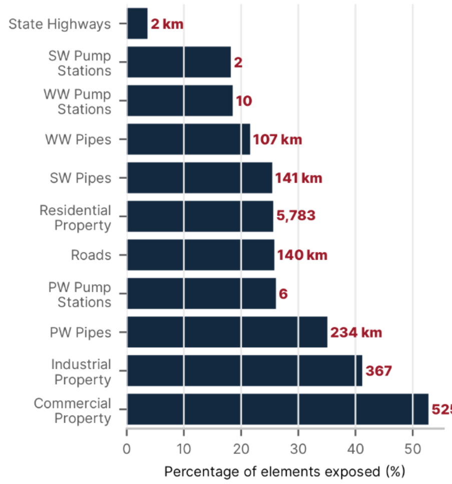


Figure 16.6. Infrastructure exposed to more than 10cm of river and rainfall flooding for 2100 under SSP5-8.5.

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.

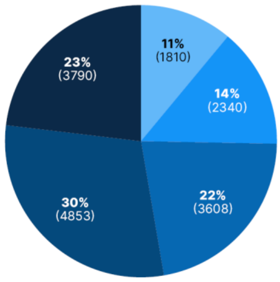
Population Exposed to River and Rainfall Flooding in Napier

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



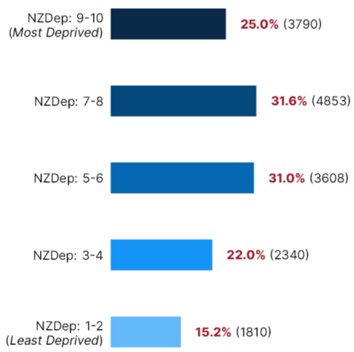
16,401 of 64,668 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure 16.7. Direct risk to residents in Napier from 1% AEP river and rainfall flooding.

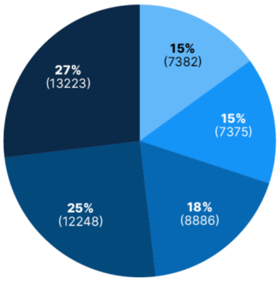
Population Isolated by River and Rainfall Flooding in Napier

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



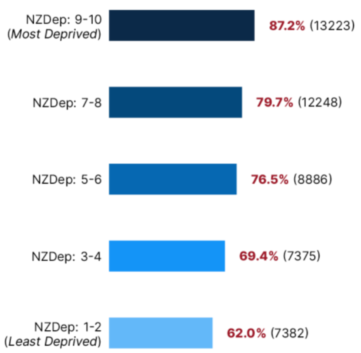
49,113 of 64,668 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

Figure 16.8. Isolation risk to residents from a 1% AEP river and rainfall event modelled for 2100.

URBAN INTELLIGENCE

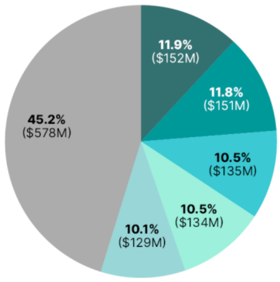
Economic Activity Exposed to River and Rainfall Flooding in Napier

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

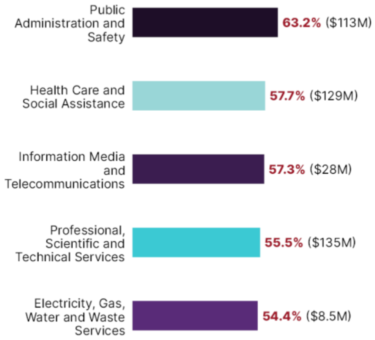


$1,278M of $2,874M total GDP

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.

(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)



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

- 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

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).

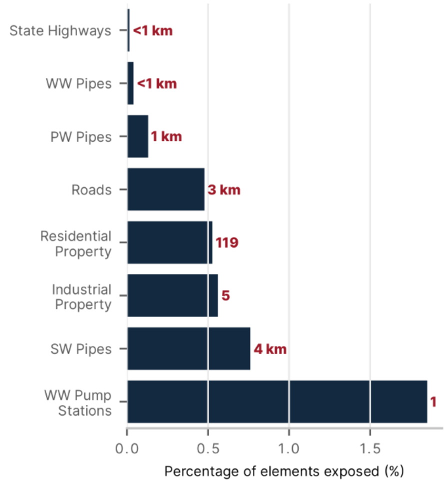


Figure 16.10. Infrastructure exposed to landslides.

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.

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.

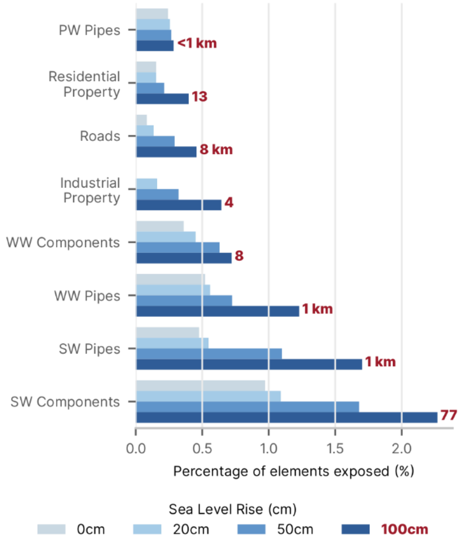


Figure 17.2. Infrastructure exposed to a 1% AEP coastal flood with different amounts of sea level rise (SLR).

Property Exposed to and Isolated by Hazards in Wairoa

This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.

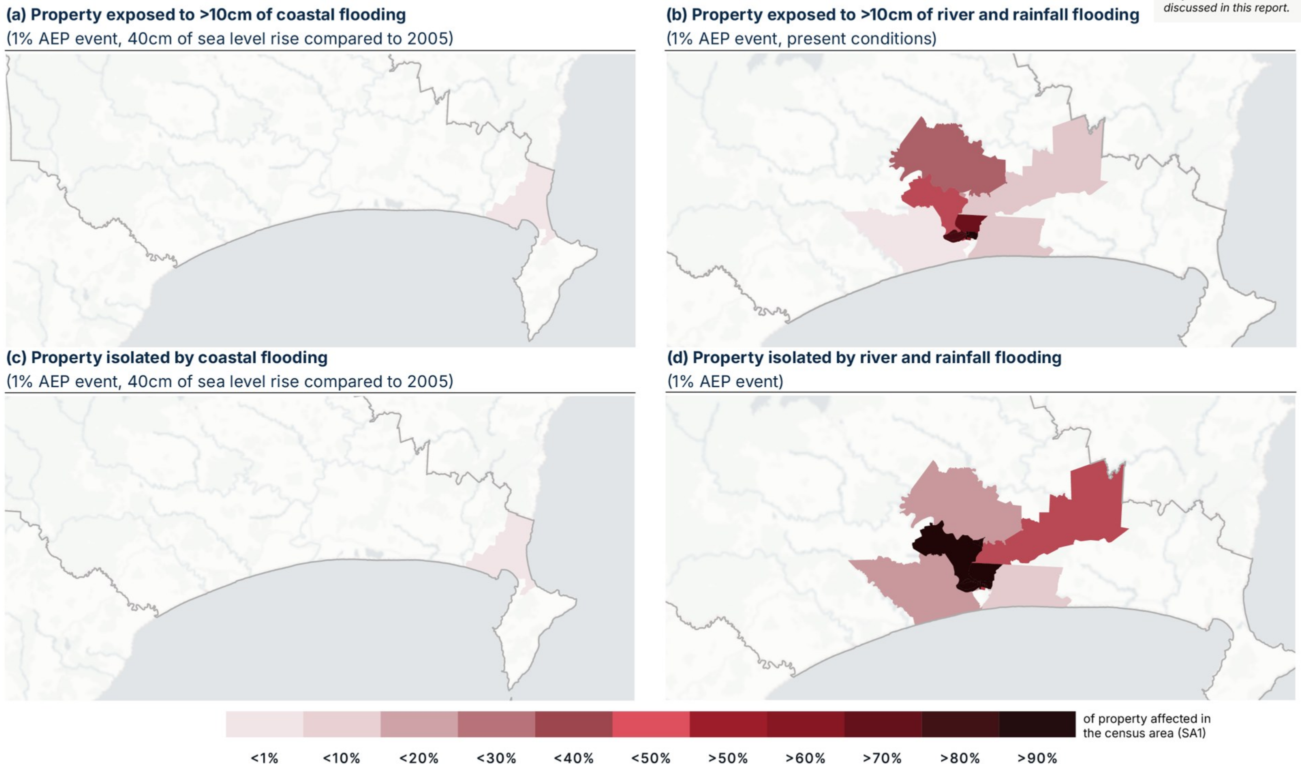


Figure 17.3. Areas with high percentage property risk in Wairoa.

URBAN INTELLIGENCE

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:

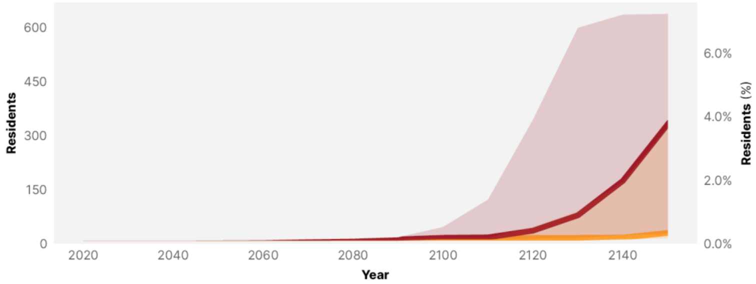
- Rental, hiring and real estate services (23.1% of sector)
- Professional, scientific and technical services (13.2% of sector).

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?

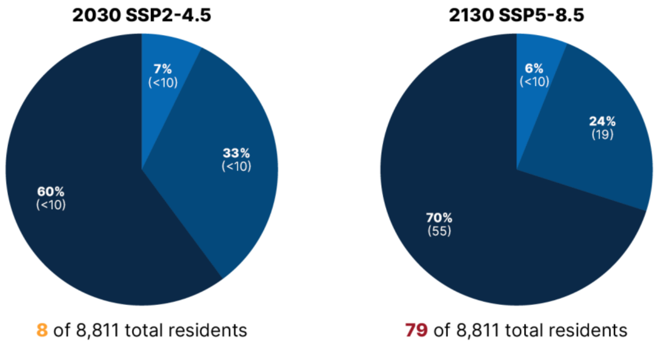
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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

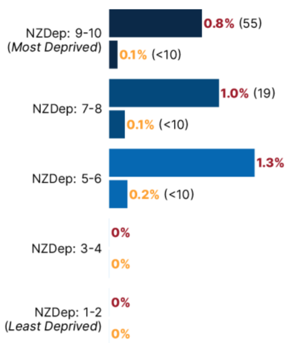


This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

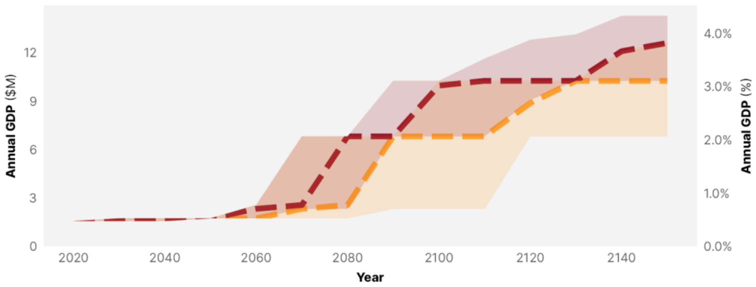
Figure 17.4. Risk to residents being exposed in Wairoa from 1% AEP coastal flooding.

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)?

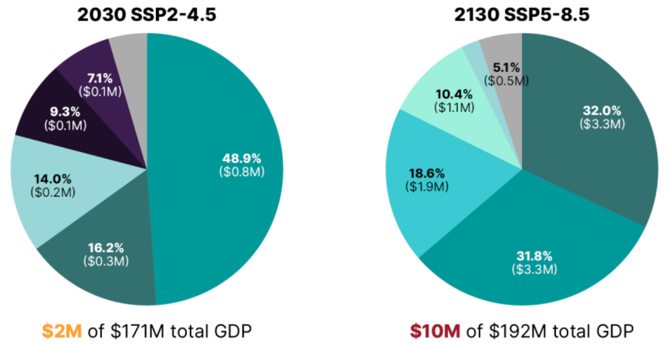
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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?

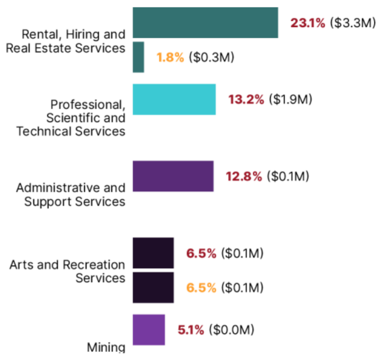
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS



This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

(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)



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
- 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

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.

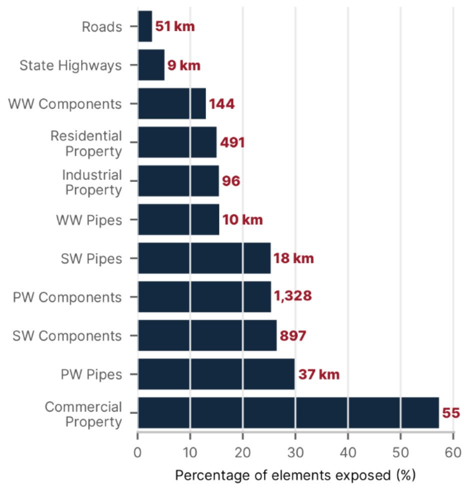


Figure 17.6. Infrastructure exposed to more than 10cm of river and rainfall flooding.

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.

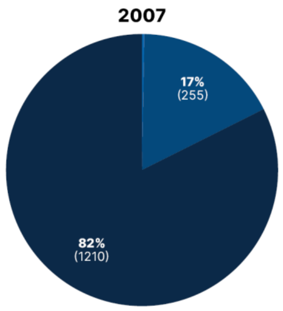
The proportion of specific sectors at risk of isolation is highly significant, with 97% of manufacturing, 78% of wholesale trade and 60% of the construction sector at risk of short-term isolation from a flooding event.
These findings indicate that river and rainfall flooding presents a more extensive 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.

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



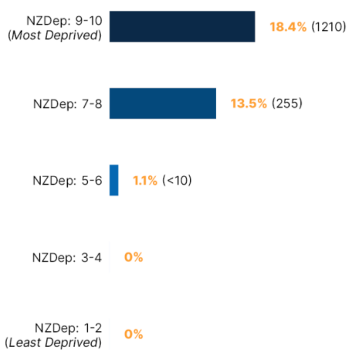
1,469 of 8,811 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

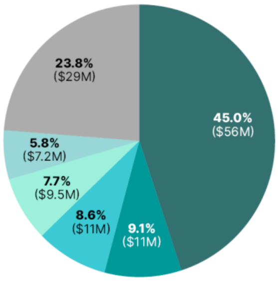
Figure 17.7. Risk to residents in Wairoa from 1% AEP river and rainfall flooding.

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

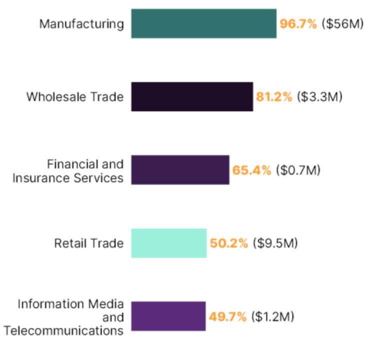


$123M of $330M total GDP

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.

(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)



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
- 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

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).

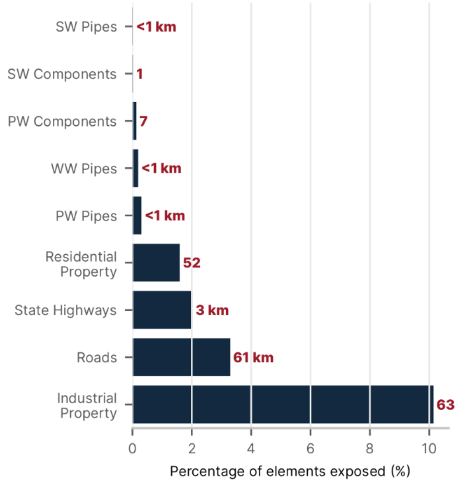


Figure 17.9. Infrastructure exposure to landslides.

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.

Ngā Tohutoro | References

[1] CCC, "Progress report: National Adaptation Plan – Assessing progress on the implementation and effectiveness of the Government's first national adaptation plan," Climate Change Commission, Report, Aug. 2024.

[2] MfE, "Coastal hazards and climate change guidance," Ministry for the Environment, Wellington, 2024.

[3] SRA, "Glossary," International Society of Risk Analysis, 2024. doi: https://www.sra.org/resources.

[4] UNDRR, "Sendai Framework for Disaster Risk Reduction 2015-2030 | United Nations Disaster Risk Reduction." Accessed: Feb. 22, 2025. [Online]. Available: https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030

[5] UNSD, "The Sustainable Development Agenda," United Nations Sustainable Development. Accessed: Feb. 22, 2025. [Online]. Available: https://www.un.org/sustainabledevelopment/development-agenda/

[6] UNFCCC, "The Paris Agreement | UNFCCC." Accessed: Feb. 22, 2025. [Online]. Available: https://unfccc.int/process-and-meetings/the-paris-agreement

[7] New Zealand Parliament, "Resource Management Act 1991." 1991. [Online]. Available: https://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html

[8] New Zealand Parliament, *Climate Change Response (Zero Carbon) Amendment Act (2019)*. 2019. [Online]. Available: https://www.legislation.govt.nz/act/public/2002/0040/latest/LMS282066.html

[9] LGA, "Local Government Act 2002 No 84 (as at 01 October 2024), Public Act Contents – New Zealand Legislation." Accessed: Feb. 21, 2025. [Online]. Available: https://www.legislation.govt.nz/act/public/2002/0084/latest/DLM170873.html

[10] DoC, *New Zealand Coastal Policy Statement*. 2010.

[11] MfE, "National Policy Statement on Urban Development 2020," Ministry for the Environment, May 2022.

[12] MfE, "National Climate Change Risk Assessment for Aotearoa New Zealand," Ministry for the Environment, 2020.

[13] "Aotearoa New Zealand's first national adaptation plan," Ministry for the Environment. Accessed: Feb. 21, 2025. [Online]. Available: https://environment.govt.nz/publications/aotearoa-new-zealands-first-national-adaptation-plan/

[14] Hawke's Bay Regional Council, "The Strategy | HB Coast." Accessed: Feb. 21, 2025. [Online]. Available: https://www.hbcoast.co.nz/the-strategy/

[15] Intergovernmental Panel on Climate Change (IPCC), "IPCC AR5 Report on Climate Change," Geneva: IPCC, 2014.

[16] Hawke's Bay Regional Council, "Hawke's Bay Regional Long Term Plan 2024-2034," Hawke's Bay Regional Council, 2024.

[17] Hawke's Bay Regional Council, "Hawke's Bay Regional Land Transport Plan 2024-2034," Hawke's Bay Regional Council, 2024.

[18] "2023 Census national and regional data | Stats NZ." Accessed: Feb. 21, 2025. [Online]. Available: https://www.stats.govt.nz/infographics/2023-census-national-and-regional-data/#hawkes-bay

[19] S. C. Moser, "Reflections on climate change communication research and practice in the second decade of the 21st century: what more is there to say?," *Wiley Interdiscip Rev Clim Change*, vol. 7, no. 3, pp. 345–369, May 2016, doi: 10.1002/wcc.403.

[20] P. Komar and E. Harris, "Hawke's Bay, New Zealand: Global Climate Change and Barrier-Beach Responses," Consulting Oceanograhers, 2014. [Online]. Available: https://www.hbcoast.co.nz

[21] C. Pizer *et al.*, "A 5000 yr record of coastal uplift and subsidence reveals multiple source faults for past earthquakes on the central Hikurangi margin, New Zealand," *Geol. Soc. Am. Bull.*, vol. 136, no. 7–8, pp. 2702–2722, 2024.

[22] Hastings District Council and Napier City Council and Hawke's Bay Regional Council and Maungaharuru-Tangitū Trust and Mana Ahuriri Trust and Tamatea Pōkai Whenua, "Clifton to Tangoio Coastal Hazards Strategy 2120." 2024. [Online]. Available: https://www.hbcoast.co.nz/

[23] J. Becker, P. Patel, E. Ryan, P. Blackett, P. Schneider, and L. Robichaux, "Understanding community perspectives on coastal issues: Hawke's Bay Coastal Survey 2017," 2017.

[24] Hawke's Bay Regional Council, "Climate change in Hawke's Bay," 2024, [Online]. Available: https://www.hbrc.govt.nz/environment/climate-actionhb/climate-change-in-hawkes-bay/

[25] Hawke's Bay Resilience Strategy Team, "Hawke's Bay Drought Resilience Strategy 2021-2026: Learning Lessons from the 2020 drought," Hawke's Bay Regional Council, 2021.

[26] P. R. Chappell, "The Climate and Weather of Hawke's Bay," Hawke's Bay Regional Council, 1987. [Online]. Available: https://www.hbrc.govt.nz/assets/Document-Library/Publications-Database/The-Climate-and-Weather-of-Hawkes-Bay.pdf/

[27] RNZ, “Houses Destroyed as large fires blaze across Hawke’s Bay.” Radio New Zealand, 2017. [Online]. Available: https://www.rnz.co.nz/news/national/324398/houses-destroyed-as-large-fires-blaze-across-hawke's-bay

[28] H. E. Management, “Flooding I& Storm Hazards,” Civil Defense Emergency Management, 2023. [Online]. Available: https://www.hbemergency.govt.nz/hazards/storms-and-floods/

[29] NIWA, “March 1924 Hawke’s Bay Flooding,” NIWA, 2023. [Online]. Available: https://hwe.niwa.co.nz/event/March_1924_Hawkes_Bay_Flooding

[30] Hawke’s Bay Independent Flood Review - Pae Matawai Parawhenua, “Report of the Hawke’s Bay Independent Flood Review.” 2024. [Online]. Available: https://www.hbrc.govt.nz/our-council/hb-independent-flood-review/

[31] A.H. Mclintock, “Disasters and Mishaps, Flood Hazards.” 1966. [Online]. Available: https://teara.govt.nz/en/1966/disasters-and-mishaps-flood-hazards/page-4

[32] NIWA, “March 1998 North Island Ex-tropical Cyclone Bola.” National Institute of Water and Atmospheric Research, 1998. [Online]. Available: https://hwe.niwa.co.nz/event/March_1988_North_Island_Ex-tropical_Cyclone_Bola.

[33] “April 2011 Hawke’s Bay Flooding,” NIWA. Accessed: Feb. 22, 2025. [Online]. Available: https://hwe.niwa.co.nz/event/April_2011_Hawkes_Bay_Flooding

[34] Tom Hunt, Stuff, “One-in-250 year Napier flood, and recommendations, a little more than two years ago.” 2023. [Online]. Available: https://www.stuff.co.nz/dominion-post/news/wellington/131285912/onein250year-napier-flood-and-recommendations-a-little-more-than-two-years-ago.

[35] FENZ, “Independent Operational Review Napier Floods,” Fire Emergency New Zealand.

[36] RNZ, “Hearing underway for 12 people who died in Hawke’s Bay during Cyclone Gabrielle,” RNZ. Accessed: Mar. 14, 2025. [Online]. Available: https://www.rnz.co.nz/news/national/534108/hearing-underway-for-12-people-who-died-in-hawke-s-bay-during-cyclone-gabrielle

[37] Laura Crimp, “Wairoa flood review finds council lacked plan and didn’t listen to locals.” 2023. [Online]. Available: https://www.rnz.co.nz/news/national/527669/wairoa-flood-review-finds-council-lacked-plan-and-didn-t-listen-to-locals.

[38] Bush International Consulting, “Review of the Management of the Wairoa River Bar,” Sep. 2024. Accessed: Apr. 12, 2025. [Online]. Available: https://environment.govt.nz/publications/review-of-the-management-of-the-wairoa-river-bar/

[39] MfE, “Review into Wairoa flood response,” Ministry for the Environment, Sep. 2024. Accessed: Apr. 12, 2025. [Online]. Available: https://environment.govt.nz/news/review-into-wairoa-flood-response-2/

[40] RNZ, “Flashbacks and feeling anxious: Hawke’s Bay flooding will re-traumatise locals.” Radio New Zealand, 2024. [Online]. Available: https://www.rnz.co.nz/news/national/521037/flashbacks-and-feeling-anxious-hawke-s-bay-flooding-will-re-traumatise-locals-psychologist

[41] S. E. Anderson *et al.*, “The dangers of disaster-driven responses to climate change,” *Nat. Clim. Change*, vol. 8, no. 8, pp. 651–653, 2018.

[42] MBIE Endeavour, “NZSeaRise: Improved sea-level rise projections for New Zealand to better anticipate and manage impacts.” Victoria University of Wellington, 2017.

[43] NIWA, “Regional Projections: Zone 3.” Nov. 2023. [Online]. Available: https://niwa.co.nz/adaptationtoolbox/regionalprojections/zone3

[44] MfE and NIWA, “Climate Projections Data.” Ministry for the Environment, National Institute of Water and Atmospheric Research, 2024.

[45] MfE, “A guide to local climate change risk assessments,” Ministry for the Environment, 2021.

[46] L. J. Keegan, R. S. A. White, and C. Macinnis-Ng, “Current knowledge and potential impacts of climate change on New Zealand’s biological heritage,” *N. Z. J. Ecol.*, vol. 46, no. 1, pp. 1–24, 2022.

[47] N. et al McArthur, “Impacts of Cyclone Gabrielle on the riverbednesting shorebirds of the Tutaekuri, Ngaruroro and Tukituki Rivers,” Hawke’s Bay Regional Council, 2024.

[48] Hawke’s Bay Regional Council, “Hawke’s Bay Biodiversity Strategy.” Nov. 2015.

[49] Hawke’s Bay Regional Council, “Hawke’s Bay State of the Environment 2018-2021,” Hawke’s Bay Regional Council, 2018.

[50] Hawke’s Bay Regional Council, “State of freshwater wetlands, Mohaka, Central Coast and Esk catchments,” Hawke’s Bay Regional Council, 2020.

[51] C. Macinnis-Ng *et al.*, “Climate-change impacts exacerbate conservation threats in island systems: New Zealand as a case study,” *Front. Ecol. Environ.*, vol. 19, no. 4, pp. 216–224, 2021, doi: 10.1002/fee.2285.

[52] Royal Society Te Apārangi, “Human Health Impacts of Climate Change for New Zealand,” Royal Society Te Apārangi, 2017.

[53] S. Harrison, “Climate change adaptation decision-making for health and wellbeing in South Dunedin,” PhD Thesis, University of Otago, 2022.

[54] WHO, “WHO Housing and health guidelines,” World Health Organization, Nov. 2018.

[55] WHO, "WHO guidelines for indoor air quality : dampness and mould," World Health Organization, Jan. 2009.

[56] IPCC, "Summary for Policymakers," in *Climate Change 2021 – The Physical Science Basis*, V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou, Eds., Cambridge University Press, 2021, pp. 3–32. doi: 10.1017/9781009157896.001.

[57] Cherie Howie of New Zealand Herald, "Cyclone Gabrielle: Who are the 11 victims." 2023. [Online]. Available: https://www.rnz.co.nz/news/national/484536/cyclone-gabrielle-who-are-the-11-victims

[58] H. Martin, "More than 360 Cyclone Gabrielle claims filed." Stuff, 2023. [Online]. Available: https://www.stuff.co.nz/national/health/300812779/more-than-360-cyclone-gabrielle-injury-claims-accepted-so-far-number-likely-to-grow.

[59] EHINZ, "Environmental Indicators." 2024. [Online]. Available: https://www.ehinz.ac.nz/social-vulnerability/about-the-social-vulnerability-indicators/

[60] "Napier flood: Slips still haunt hill residents, with some only just fixed," NZ Herald. Accessed: Feb. 22, 2025. [Online]. Available: https://www.nzherald.co.nz/hawkes-bay-today/news/napier-flood-three-years-on-slips-still-haunt-hill-residents-with-some-only-just-fixed/L3DKQX66GJHZHLW3VAHYI2DNFQ/

[61] RNZ, "Claims and counter-claims on post-cyclone crime spike," RNZ. Accessed: Feb. 22, 2025. [Online]. Available: https://www.rnz.co.nz/national/programmes/mediawatch/audio/2018879320/claims-and-counter-claims-on-post-cyclone-crime-spike

[62] RNZ, "Victim of attempted break-in at cyclone-damaged Puketapu house pleads for more back-up," RNZ. Accessed: Feb. 22, 2025. [Online]. Available: https://www.rnz.co.nz/news/national/484777/victim-of-attempted-break-in-at-cyclone-damaged-puketapu-house-pleads-for-more-back-up

[63] AgResearch, "Weed management solutions." Accessed: Feb. 22, 2025. [Online]. Available: https://www.agresearch.co.nz/our-research/weed-management-solutions/

[64] P.-J. Schweizer, R. Goble, and O. Renn, "Social Perception of Systemic Risks," *Risk Anal.*, vol. 42, no. 7, pp. 1455–1471, 2022, doi: 10.1111/risa.13831.

[65] A. J. Challinor, W. N. Adger, T. G. Benton, D. Conway, M. Joshi, and D. Frame, "Transmission of climate risks across sectors and borders," *Philos. Trans. R. Soc. Math. Phys. Eng. Sci.*, vol. 376, no. 2121, p. 20170301, Apr. 2018, doi: 10.1098/rsta.2017.0301.

[66] I. White and J. Lawrence, "Continuity and change in national riskscapes: a New Zealand perspective on the challenges for climate governance theory and practice," *Camb. J. Reg. Econ. Soc.*, vol. 13, no. 2, pp. 215–231, Jul. 2020, doi: 10.1093/cjres/rsaa005.

[67] Koi Tū, "Sustaining Aotearoa New Zealand as a cohesive society," Koi Tū: The Centre for Informed Futures, 2021. Accessed: Mar. 04, 2025. [Online]. Available: https://informedfutures.org/social-cohesion/

[68] Stats New Zealand, "New Zealanders Trust in Key Institutions Declines." 2024. [Online]. Available: https://www.stats.govt.nz/news/new-zealanders-trust-in-key-institutions-declines/#:~:text=People%20in%20Aotearoa%20New%20Zealand%20rated%20institutional%20trust%20on%20a,down%20from%207.7%20in%202021.

[69] Koi Tū, "Addressing the challenges to social cohesion," Koi Tū: The Centre for Informed Futures, 2023. Accessed: Mar. 04, 2025. [Online]. Available: https://informedfutures.org/challenges-to-social-cohesion/

[70] "Local Focus: Big rates hike for Hawke's Bay residents," NZ Herald. Accessed: Feb. 22, 2025. [Online]. Available: https://www.nzherald.co.nz/hawkes-bay-today/news/local-focus-big-rates-hike-for-hawkes-bay-residents/M7MAGYTNOJEFRKZVISTQ3PMKNE/

[71] MCH, "Māori settlement and occupation." Accessed: Feb. 22, 2025. [Online]. Available: https://teara.govt.nz/en/hawkes-bay-region/page-4

[72] "Place Summaries | Hawke's Bay Region | Stats NZ." Accessed: Feb. 22, 2025. [Online]. Available: https://www.stats.govt.nz/tools/2018-census-place-summaries/hawkes-bay-region

[73] "Te Puni Kōkiri — Kāinga." Accessed: Feb. 22, 2025. [Online]. Available: http://www.tpk.govt.nz/en/

[74] "Government Inquiry into the Response to the North Island Severe Weather Events - dia.govt.nz." Accessed: Feb. 22, 2025. [Online]. Available: https://www.dia.govt.nz/Government-Inquiry-into-the-Response-to-the-North-Island-Severe-Weather-Events

[75] S. Awatere *et al.*, "He huringa āhuarangi, he huringa ao: A changing climate, a changing world," 2021.

[76] J. Hyslop, N. Harcourt, S. Awatere, D. Hikuroa, P. Blackett, and R. L. Heron, "Kia aiō ngā ngaru, kia hora te marino: smoothing the waters in natural resource management to mitigate risk and uncertainty," *Altern. Int. J. Indig. Peoples*, vol. 19, no. 2, pp. 229–239, 2023.

[77] R. Jones, "Climate change and Indigenous health promotion," *Glob. Health Promot.*, vol. 26, no. 3_suppl, 2019, doi: https://doi.org/10.1177/1757975919829713.

[78] EHINZ, "Social Vulnerability." 2018. [Online]. Available: https://www.ehinz.ac.nz/social-vulnerability/about-the-social-vulnerability-indicators/

[79] MBIE, "Progress report: December 2022 | Ministry of Business, Innovation & Employment," Ministry of Business, Innovation & Employment. Accessed: Feb. 22, 2025. [Online]. Available: https://www.mbie.govt.nz/business-and-employment/employment-and-skills/regional-skills-leadership-groups/hawkes-bay/progress-report

[80] "Land categorisation maps | Hastings District Council." Accessed: Feb. 22, 2025. [Online]. Available: https://www.hastingsdc.govt.nz/land-categorisation-hb/land-categorisation-maps/

[81] Central Hawke's Bay District, "Outstanding Natural Landscape Assessment," May 2019.

[82] Wairoa District Council, "Wairoa District Council | New Zealand." Accessed: Feb. 23, 2025. [Online]. Available: https://www.wairoadc.govt.nz/

[83] Dot Loves Data, "Community Compass." 2024. [Online]. Available: https://app.communitycompass.co.nz/monitor/summary/overview

[84] K. Dennett, "How does a town become cut off?," Stuff. Accessed: Feb. 23, 2025. [Online]. Available: https://www.stuff.co.nz/national/300810342/cyclone-gabrielle-how-does-a-town-become-cut-off

[85] Stantec, "Otane Stormwater Systems Performance Assessment," 2019.

[86] WSP, "Waipawa Stormwater Network Model Final Enhancements Report," 2022.

[87] WSP, "Lake Whatuma Stormwater Modelling Report," 2022.

[88] WSP, "Waipukurau Stormwater Modelling Model Build, Validation and System Performance Report," 2022.

[89] NCC, "Stormwater Model Development Summary," 2024.

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).

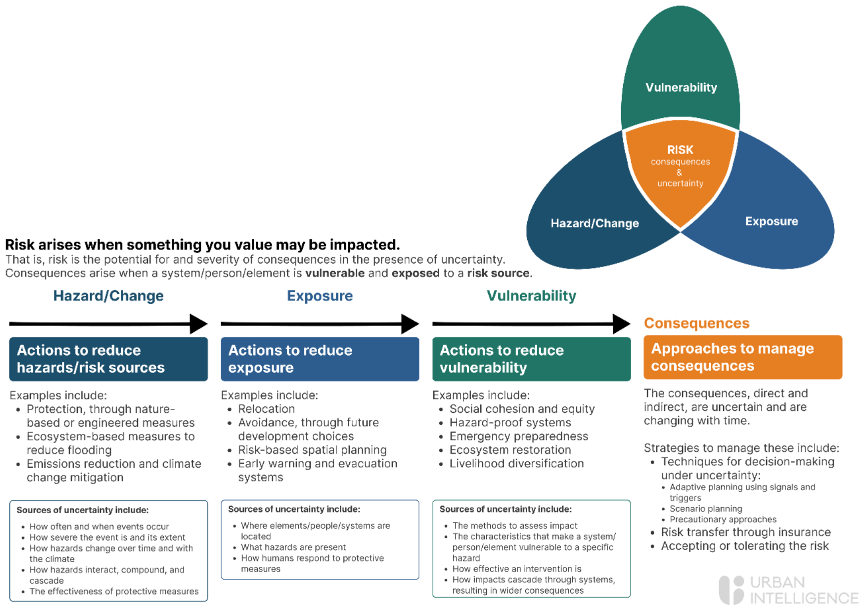


Figure A - 1. Risk arises when something you value could be impacted. That is, it's the combination of consequences and uncertainty. In a natural hazards and climate change context, consequences arise when something that is vulnerable is exposed to a hazard or change. Risk can be reduced by intervening 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 (Table A.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. 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

Layer	Creator	Coverage	Date
Pluvial Flooding Depth	Napier City Council [89]	Napier	2024
Landslide Susceptibility	Manaaki Whenua	Te Matau-a-Māui Hawke's Bay	2023
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. 2. 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. 3. 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. 4. 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	

How windiness could change in the Hawke's Bay. These maps show change in the number of days with wind above 10m/s by 2080-2100 under SSP2-4.5 compared to 1995-2014

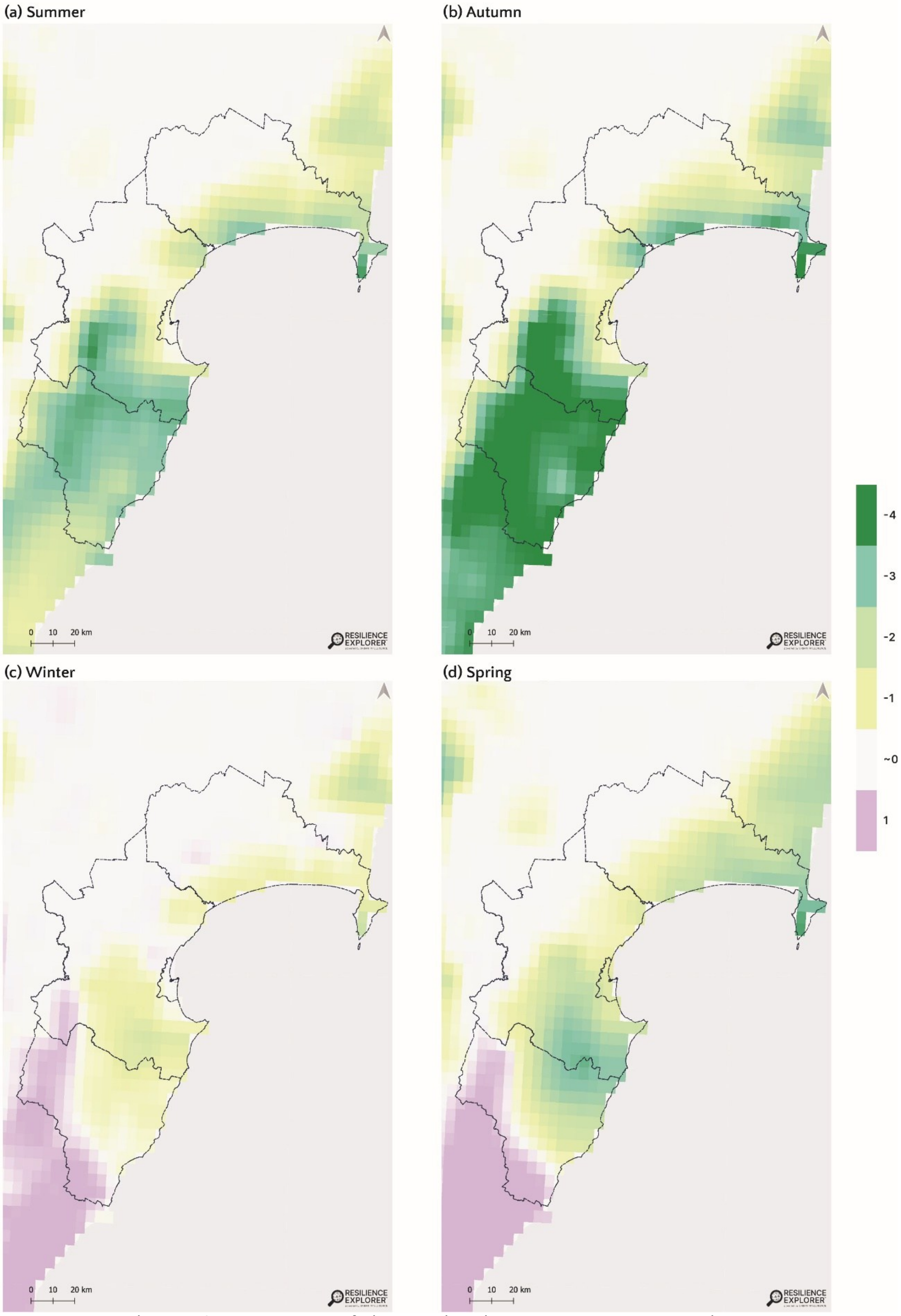


Figure A - 2. How the number of windy days is projected to change across the region.

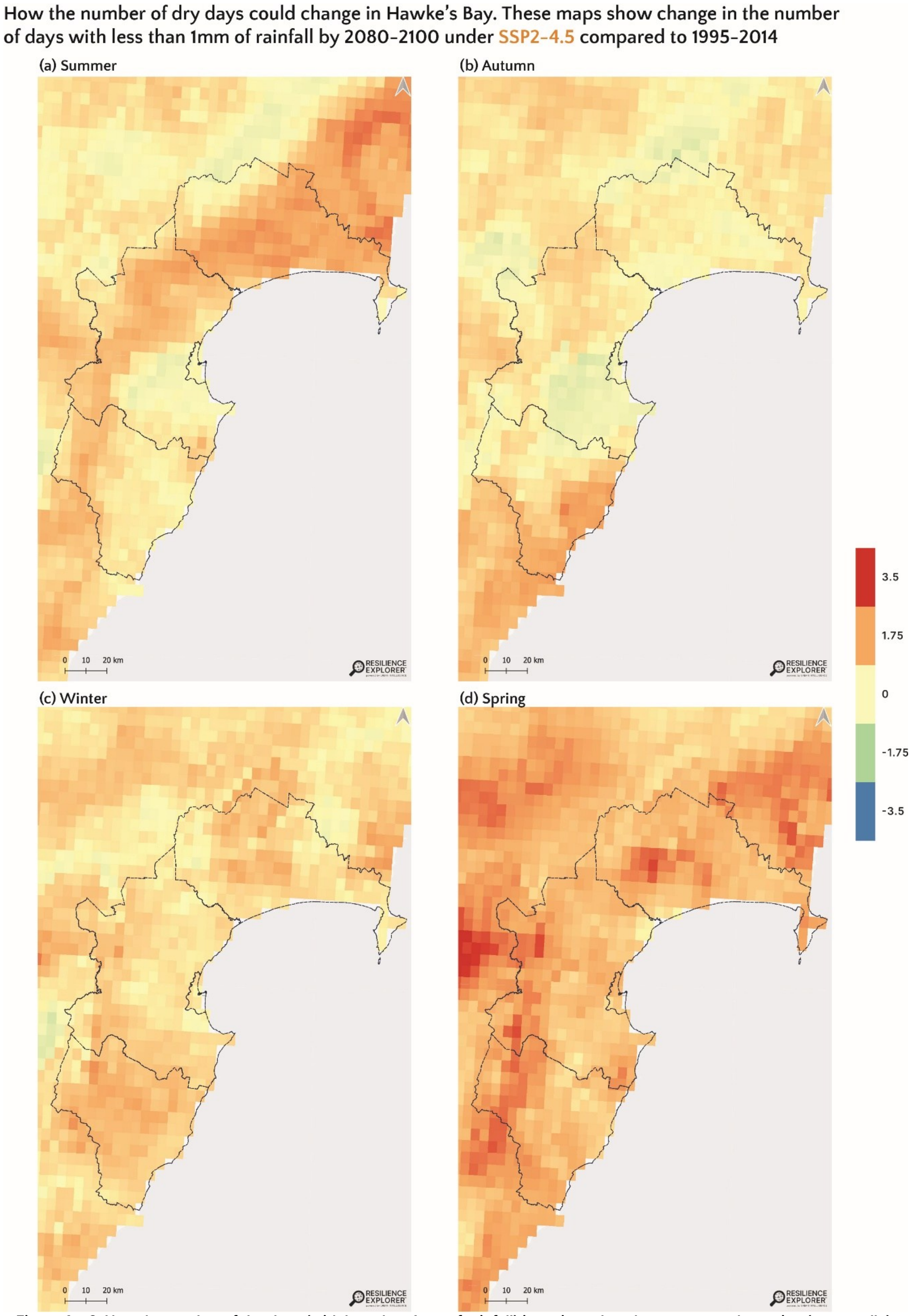


Figure A - 3. How the number of dry days (with less than 1mm of rainfall) is projected to change across the region (seasonally).

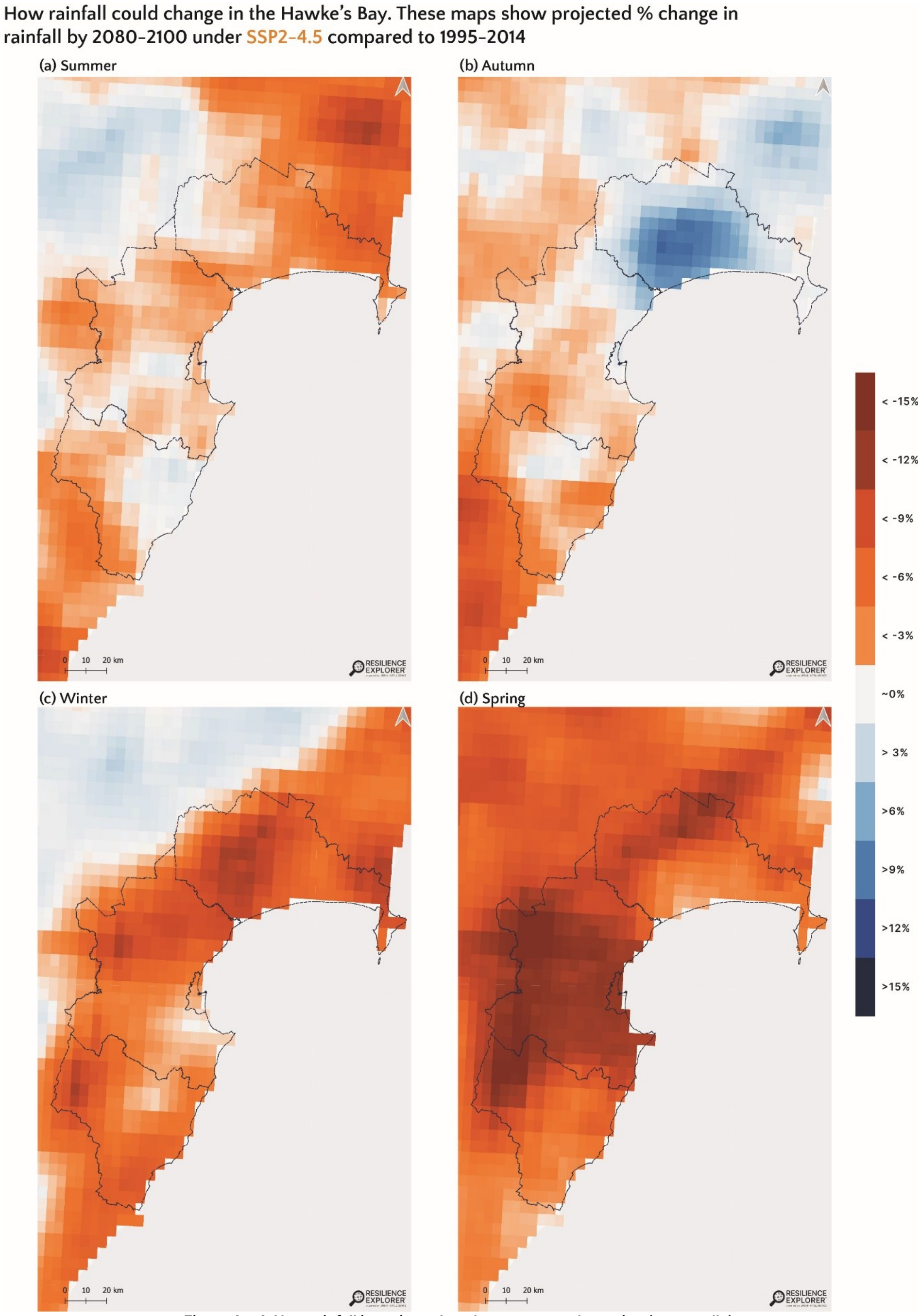


Figure A - 4. How rainfall is projected to change across the region (seasonally).

How rainfall patterns could change in Hawke's Bay. These figures show change in the number of days with more than 25mm of rain by 2080-2100 under SSP2-4.5 compared to 1995-2014

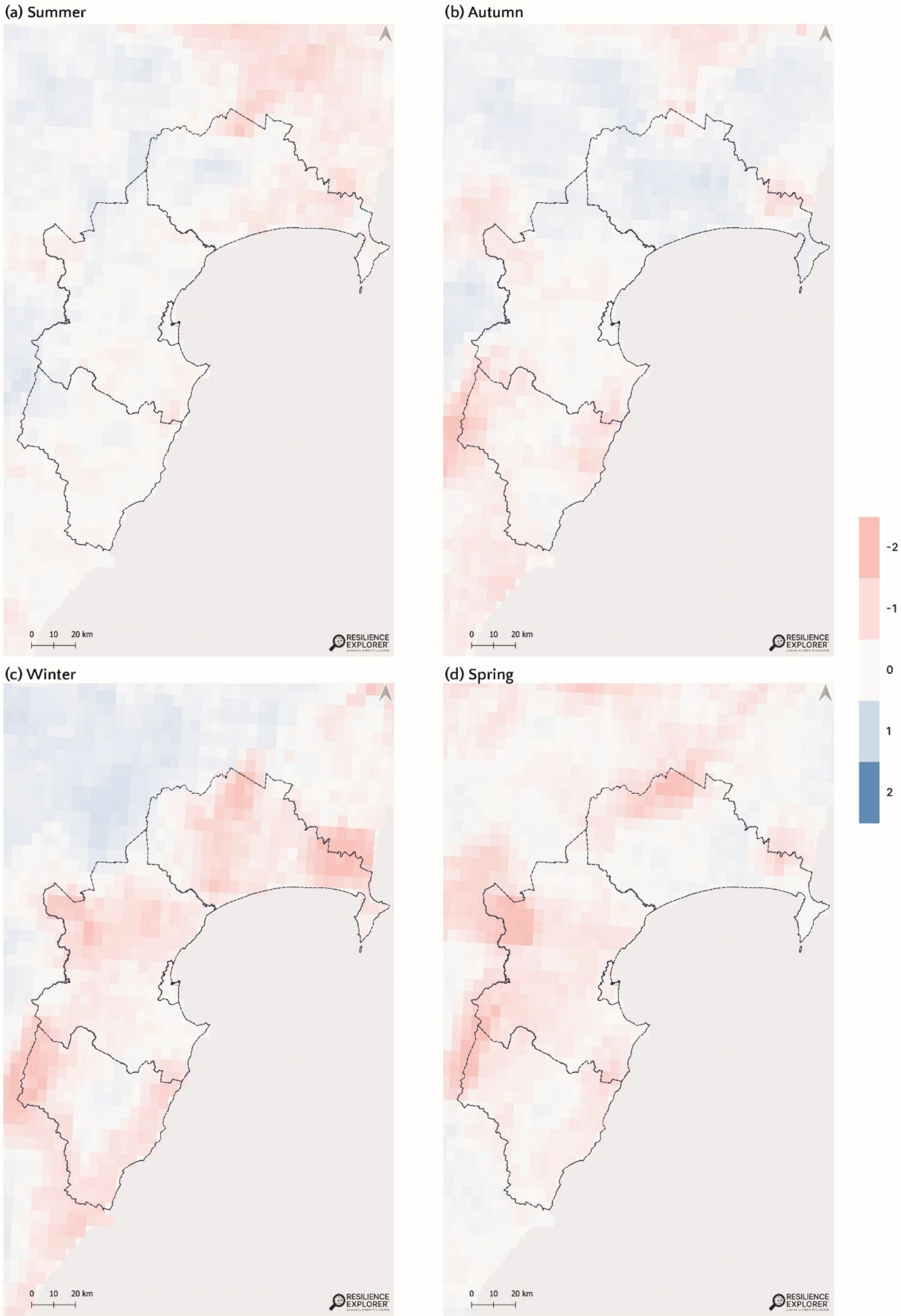


Figure A - 5. How the number of rainy days is projected to change across the region (seasonally).

How temperature could change in the Hawke's Bay. These maps show projected change in average temperature by 2080-2100 under SSP2-4.5 compared to 1995-2014

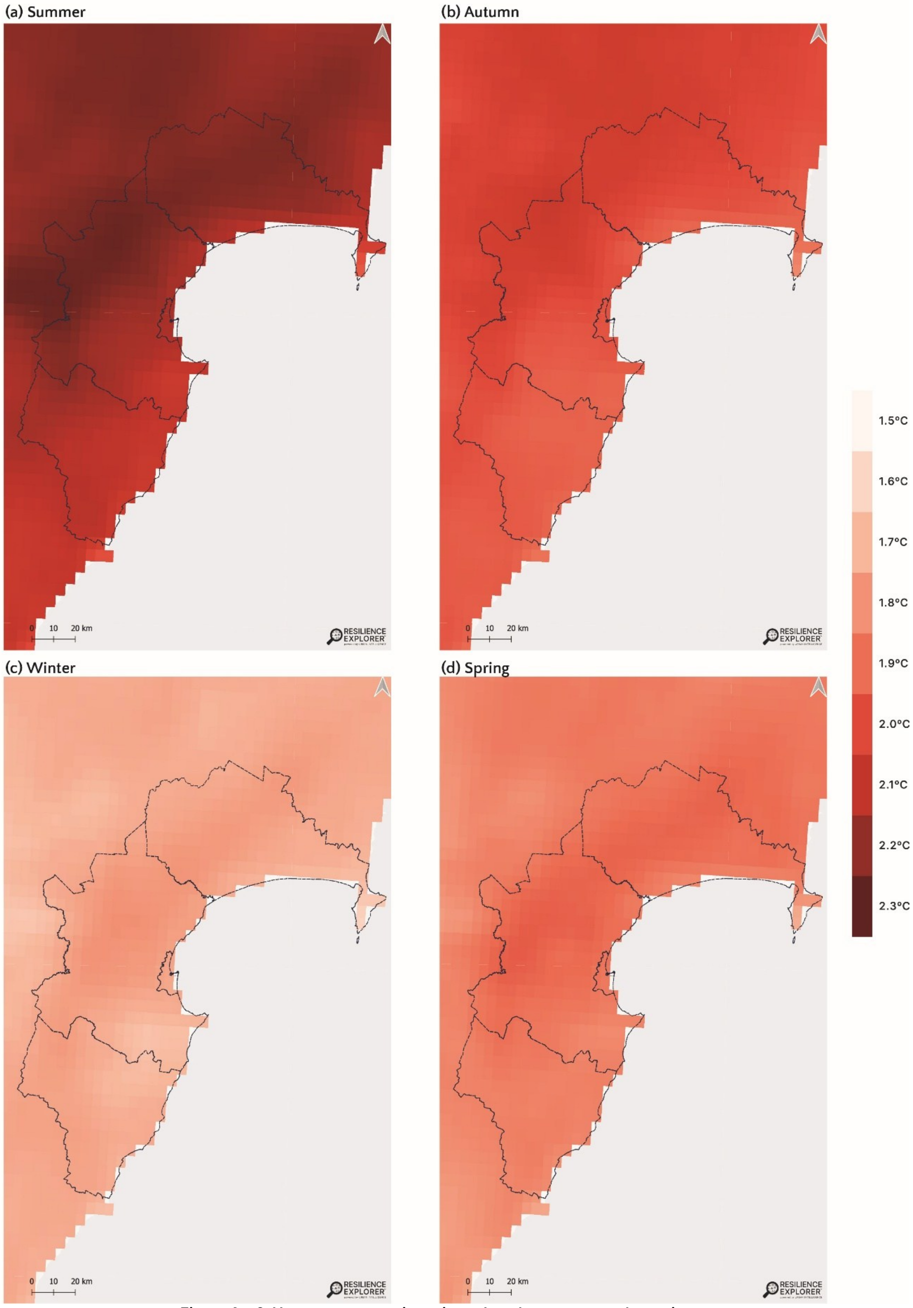


Figure A - 6. How temperature is projected to change across the region.

URBAN INTELLIGENCE

3.2 Central Hawke's Bay

Table A. 5. 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. 6. 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. 7. 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. 8. 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

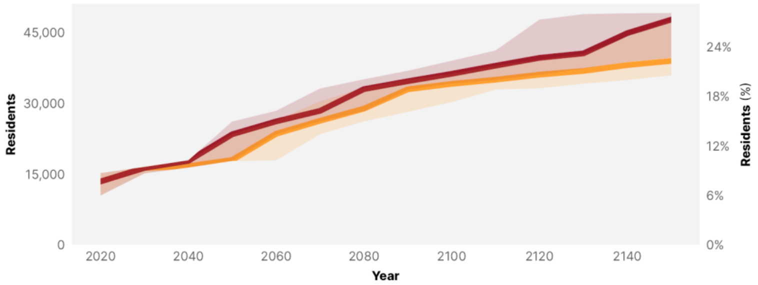
Figure A - 7 to Figure A - 18 illustrates the risk to residents and economic activity across Hawke's Bay based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects across 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?

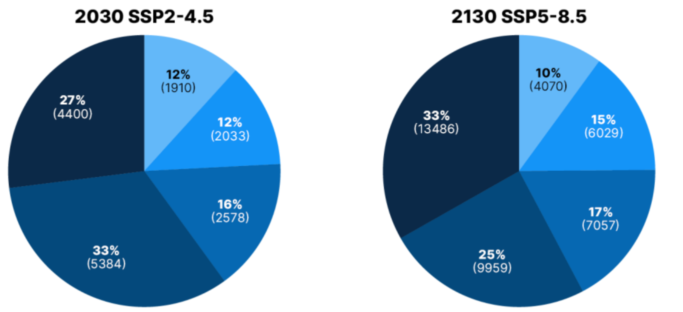
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



16,304 of 174,936 total residents

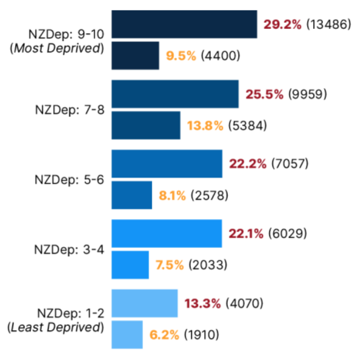
40,600 of 174,936 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

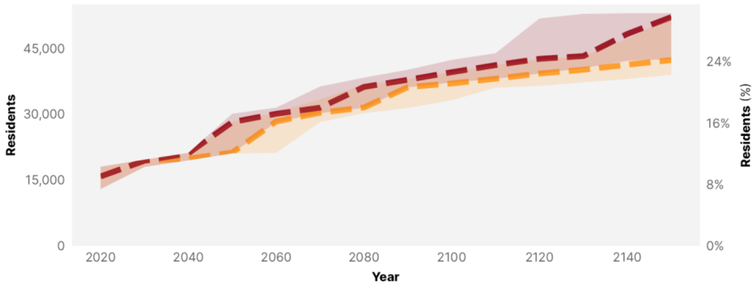
Figure A - 7.

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)?

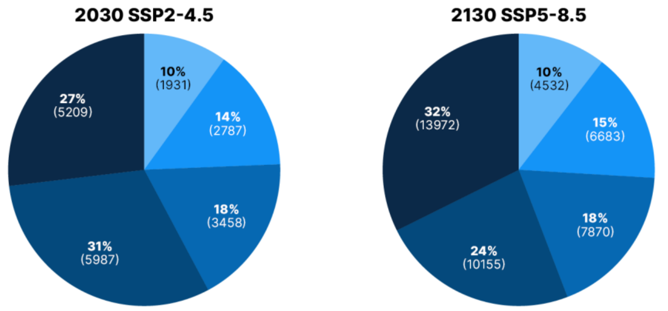
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



19,373 of 174,936 total residents

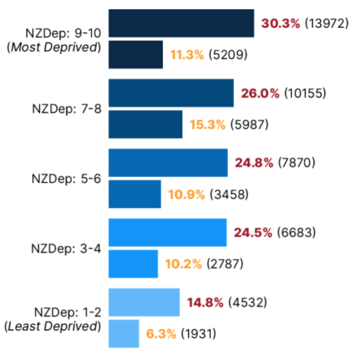
43,212 of 174,936 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

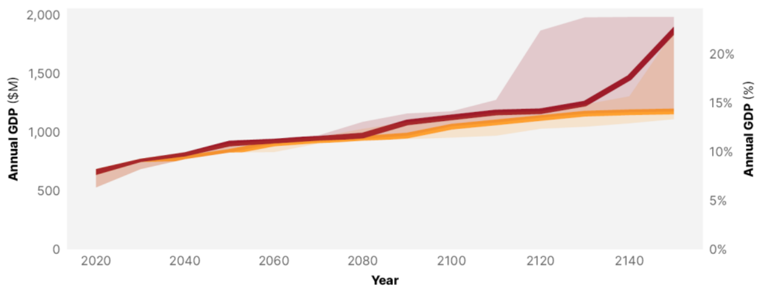
Figure A - 8.

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?

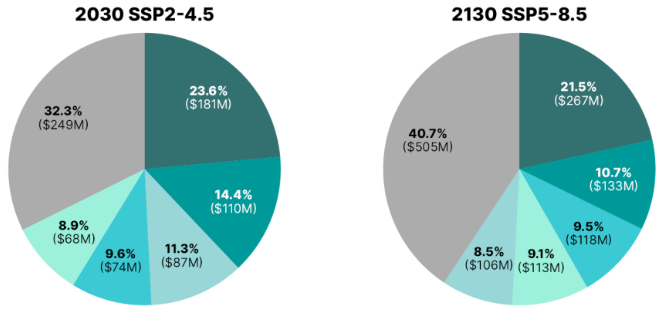
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



$768M of $8,329M total GDP

$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.

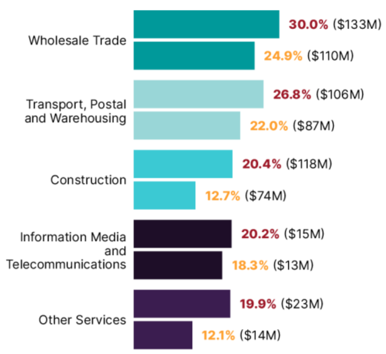
KEY

- 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)



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.

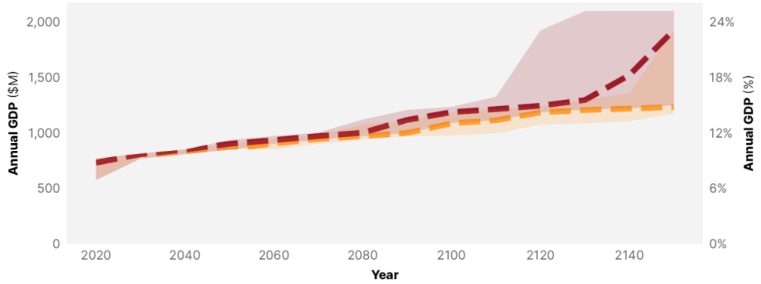
Figure A - 9.

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)?

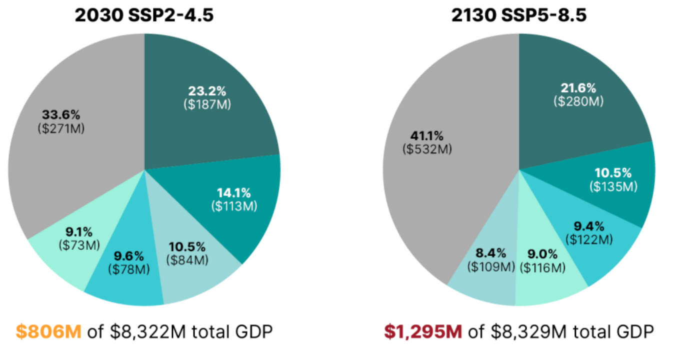
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

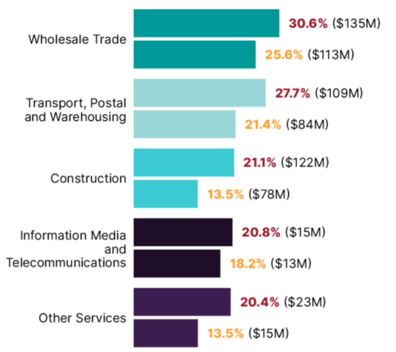
KEY

- 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)



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.

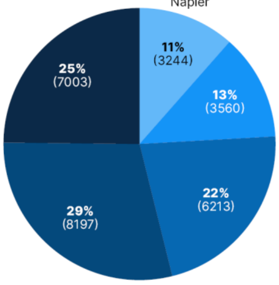
Population Exposed to River and Rainfall Flooding in the Hawke's Bay Region

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



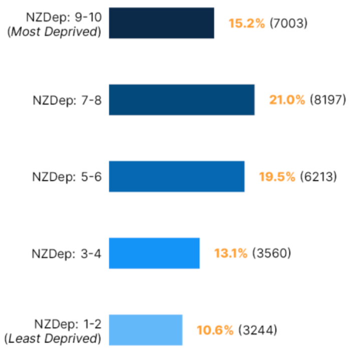
28,216 of 174,936 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

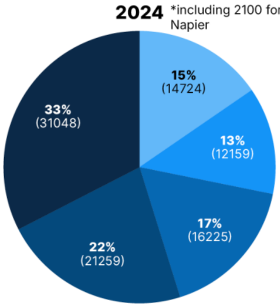
Figure A - 11.

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



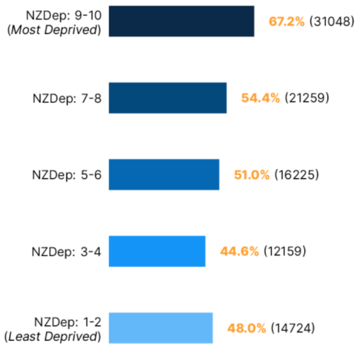
95,414 of 174,936 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

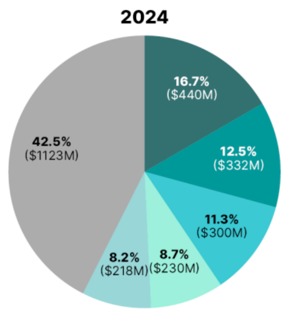
Figure A - 12.

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

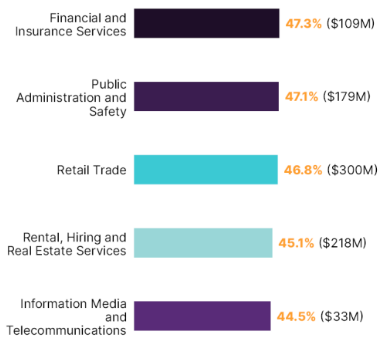


$2,642M of $8,329M total GDP

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.

(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)



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.

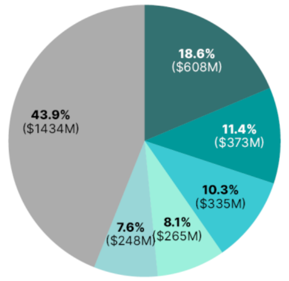
Economic Activity Isolated by River and Rainfall Flooding in the Hawke's Bay Region

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



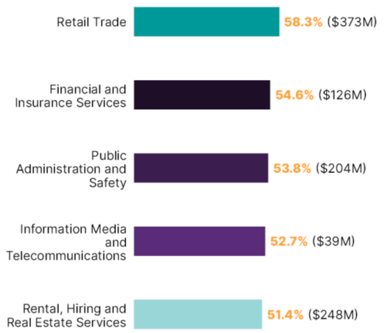
$3,263M of $8,329M total GDP

This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

KEY
- 2024
- 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

(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)



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 - 14.

URBAN INTELLIGENCE

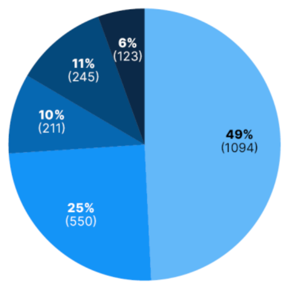
Population Exposed to Landslides in the Hawke's Bay Region

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



2,223 of 174,936 total residents

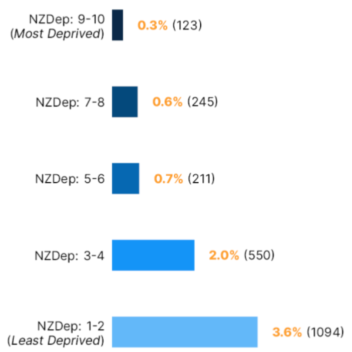
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



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.

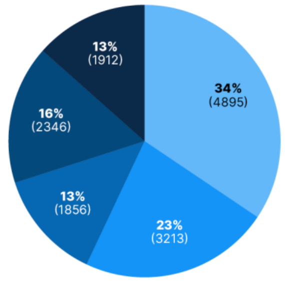
Population Isolated by Landslides in the Hawke's Bay Region

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



14,222 of 174,936 total residents

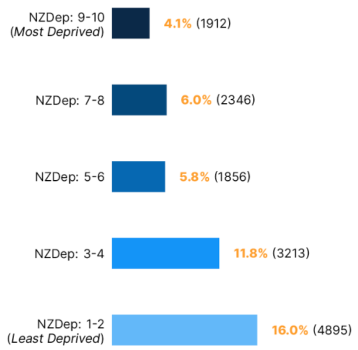
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

KEY

- 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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

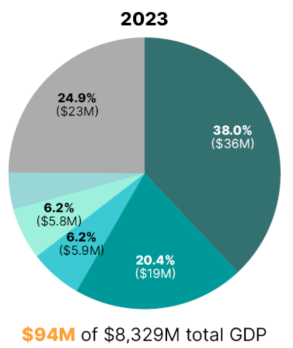
Figure A - 16.

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?

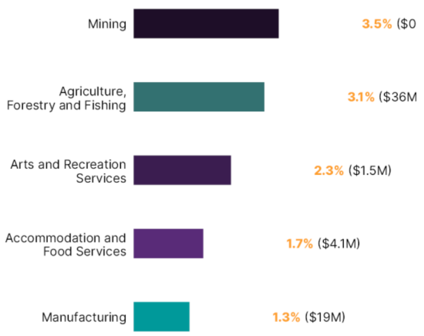
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS



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.

(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)



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
- Construction
- Health Care and Social Assistance
- Retail Trade
- Mining
- Arts and Recreation Services
- Accommodation and Food Services
- Other Sectors

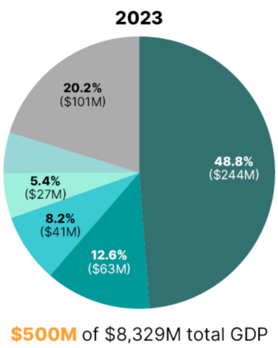
Figure A - 17.

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



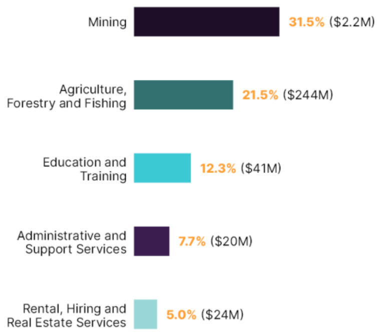
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

KEY

- 2023
- Agriculture, Forestry and Fishing
- Manufacturing
- Education and Training
- Construction
- Rental, Hiring and Real Estate Services
- 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)



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 - 18.

4.2 Central Hawke's Bay

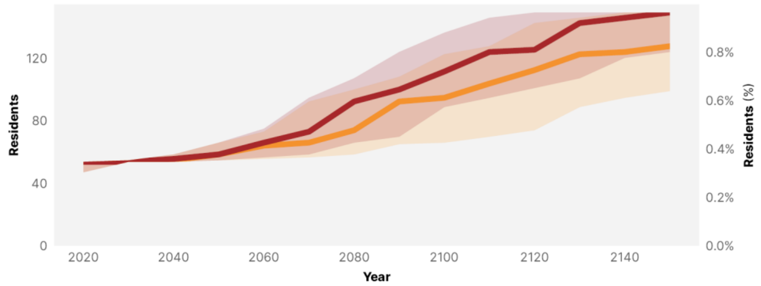
Figure A - 19 to Figure A - 28 illustrates the risk to residents and economic activity in Central Hawke's Bay based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects 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

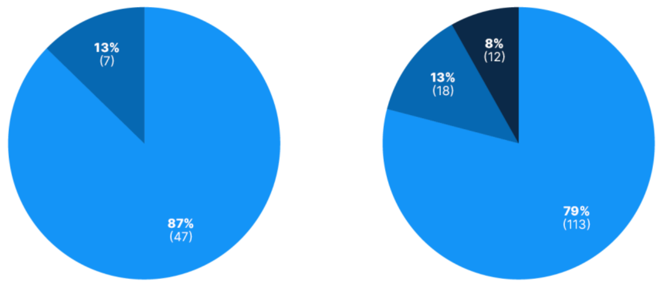


The shaded areas show the 17-83 percentile range, reflecting uncertainty in sea level rise and vertical land movement projections.

(b) How is exposure distributed across socioeconomic groups?

EXPOSED POPULATION BY NZ DEPRIVATION INDEX

2030 SSP2-4.5 **2130 SSP5-8.5**



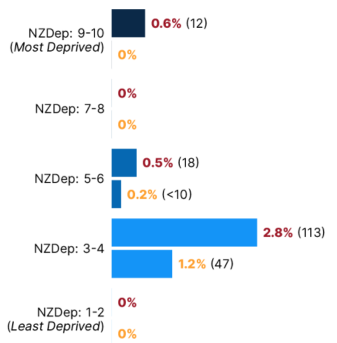
54 of 15,489 total residents **142** of 15,489 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

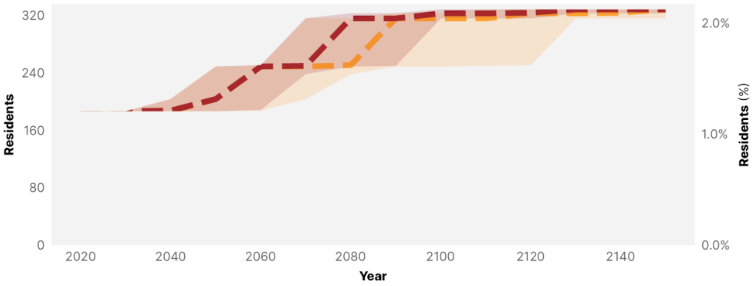
Figure A - 19.

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)?

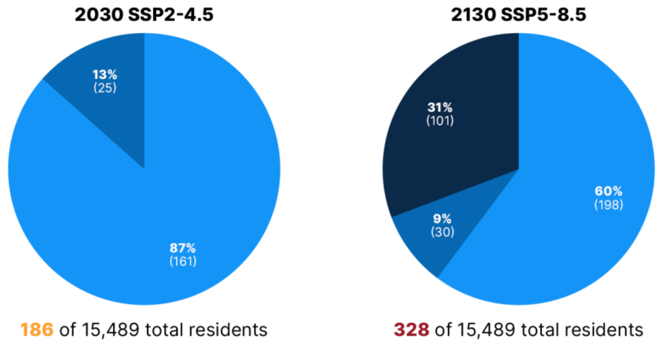
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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

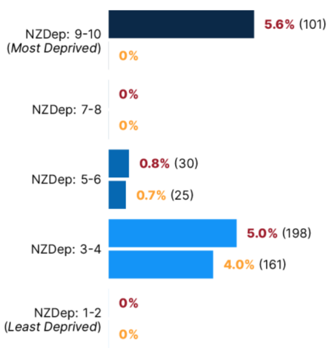


This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

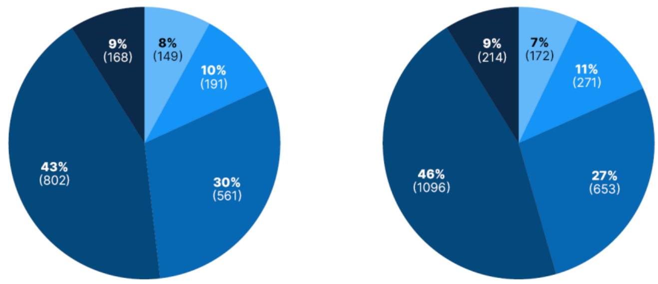
Figure A - 20.

Population Exposed to River and Rainfall Flooding in Central Hawke's Bay

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



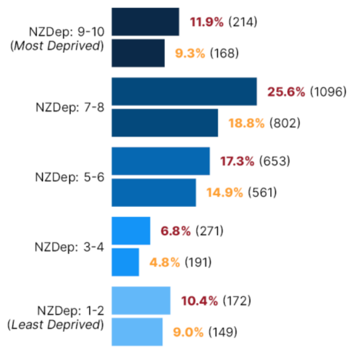
1,871 of 15,489 total residents **2,405** of 15,489 total residents

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
- 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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

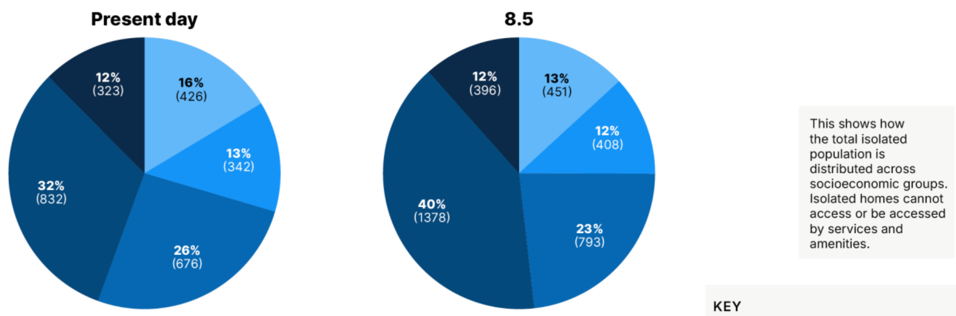
Figure A - 21.

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



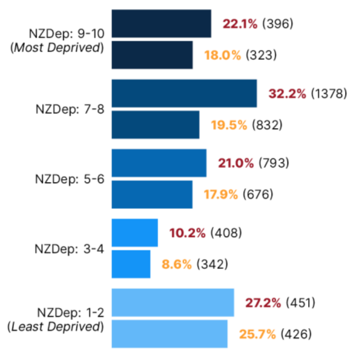
2,599 of 15,489 total residents

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.

(b) Which groups face disproportionate isolation risk relative to their size?

PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

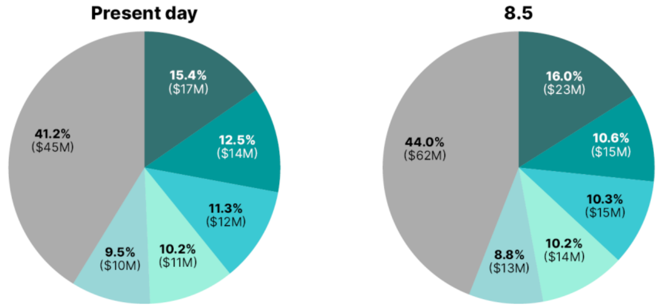
Figure A - 22.

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

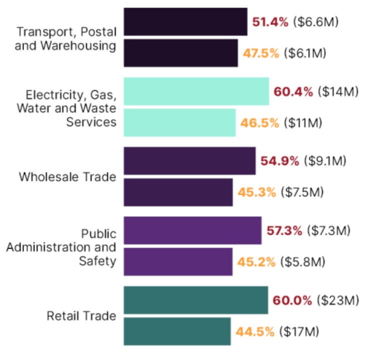


$110M of $596M total GDP **$142M** of $596M total GDP

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.

(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)



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
- 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

Figure A - 23.

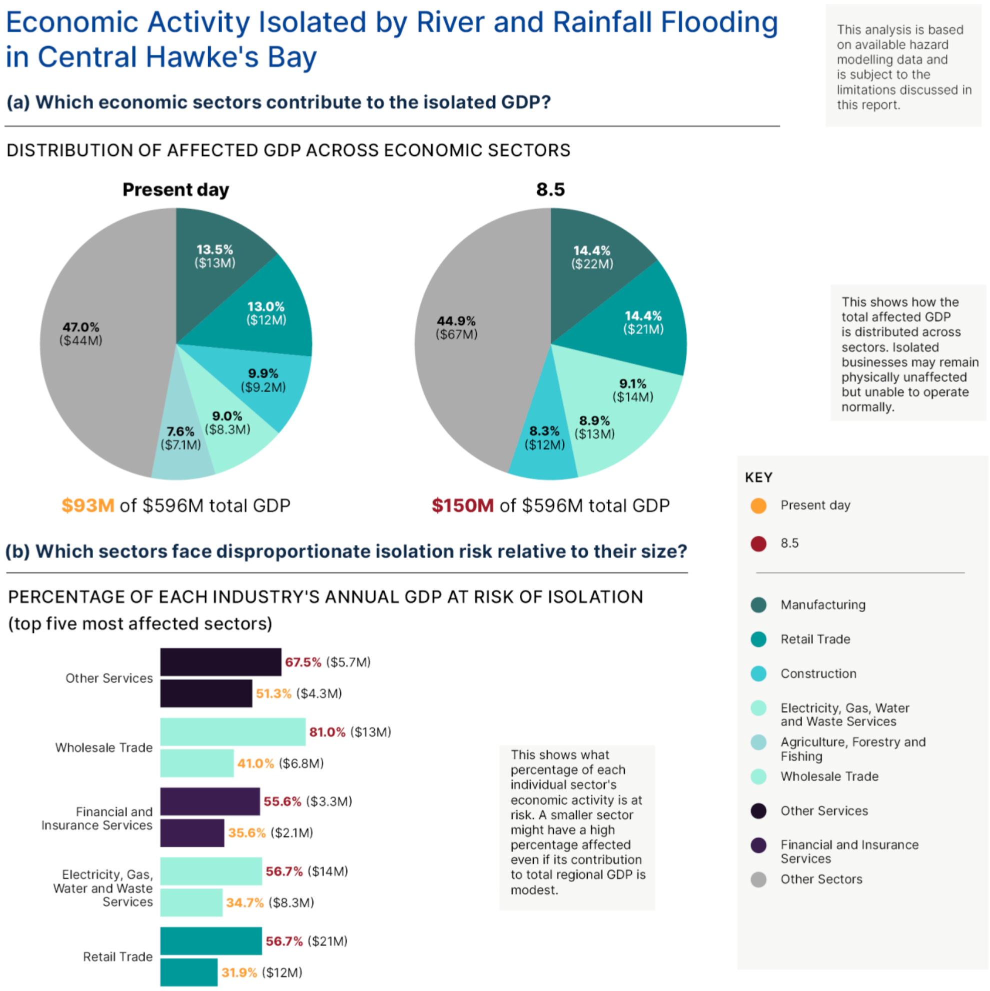

Economic Activity Isolated by River and Rainfall Flooding in Central Hawke's Bay
(a) Which economic sectors contribute to the isolated GDP?
This analysis is based on available hazard modelling data and is subject to the limitations discussed in this report.
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC 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.
(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.
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

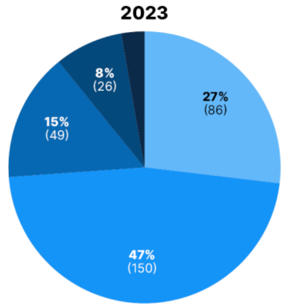
Figure A - 24.

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



318 of 15,489 total residents

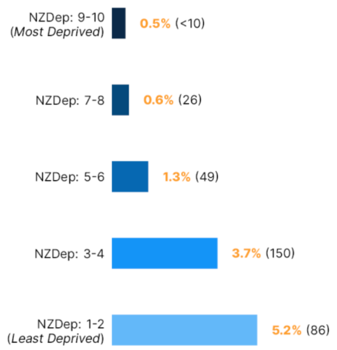
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



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.

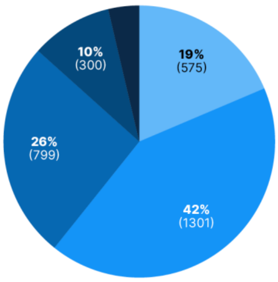
URBAN INTELLIGENCE

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



3,087 of 15,489 total residents

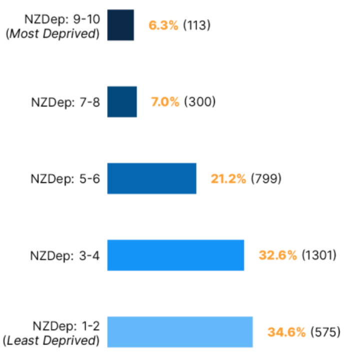
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

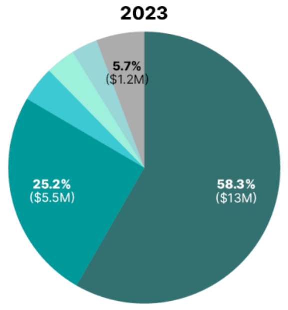
Figure A - 26.

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



$22M 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.

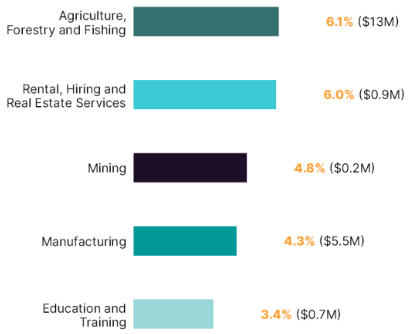
KEY

- 2023

- Agriculture, Forestry and Fishing
- Manufacturing
- Rental, Hiring and Real Estate Services
- Construction
- Education and Training
- Mining
- 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)



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.

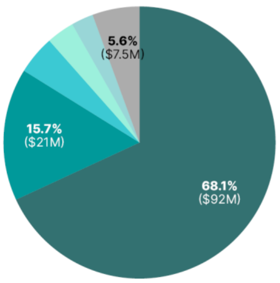
Figure A - 27.

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

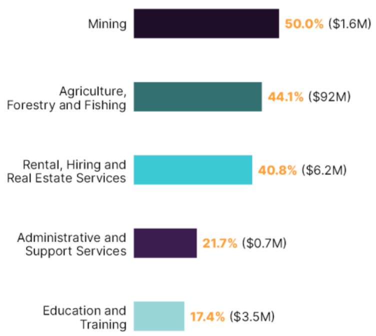


$135M of $596M total GDP

This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

(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)



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
- Administrative and Support Services
- Other Sectors

Figure A - 28.

4.3 Hastings District

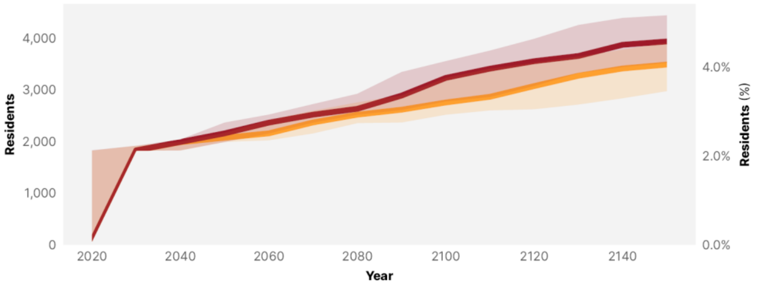
Figure A - 29 to Figure A - 40 illustrates the risk to residents and economic activity in Hastings based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects across 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?

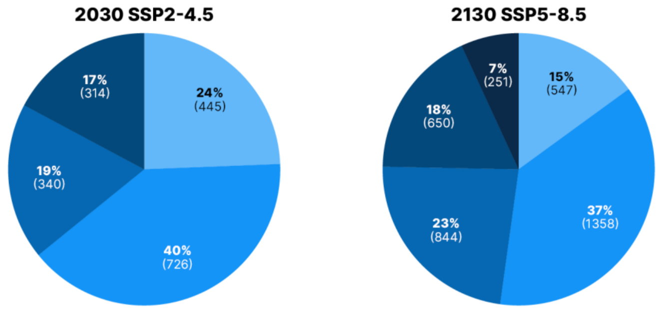
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



1,825 of 85,968 total residents

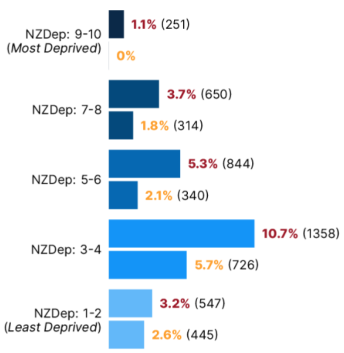
3,650 of 85,968 total residents

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



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.

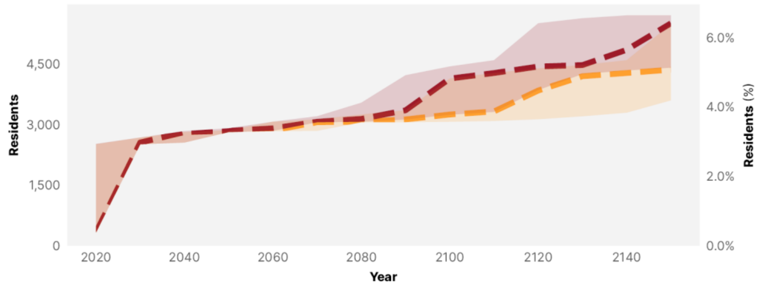
URBAN INTELLIGENCE

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)?

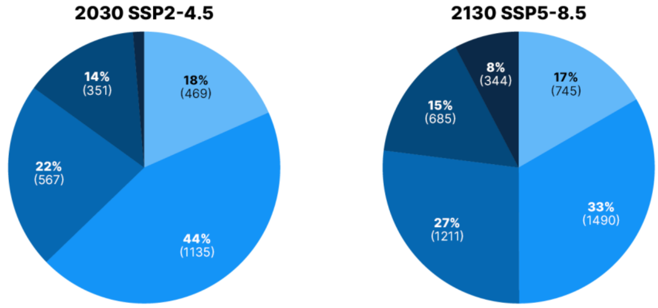
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



2,556 of 85,968 total residents

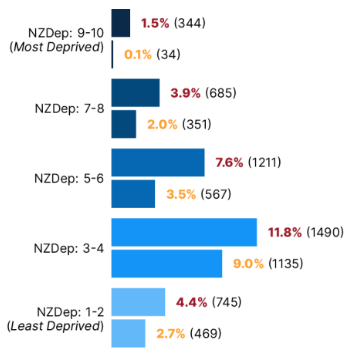
4,475 of 85,968 total residents

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



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.

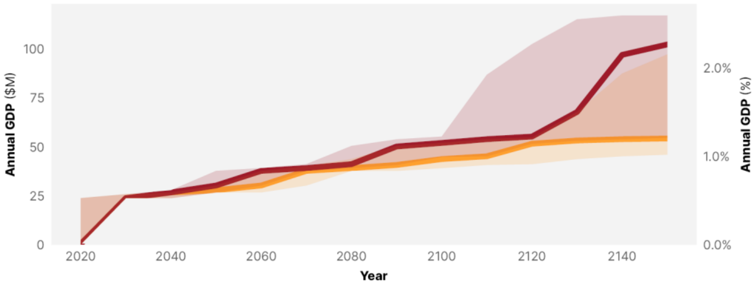
URBAN INTELLIGENCE

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?

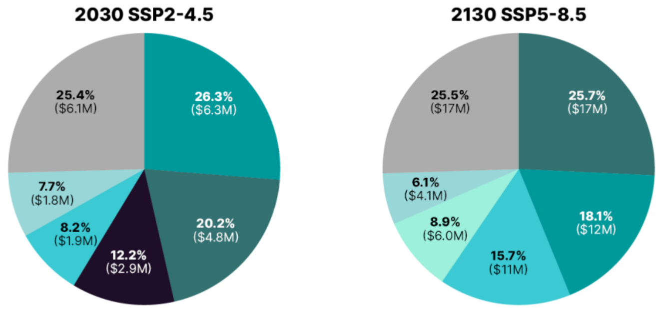
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



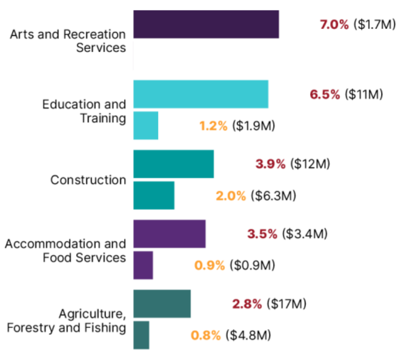
$24M of $4,509M total GDP

$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.

(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)



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

- 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

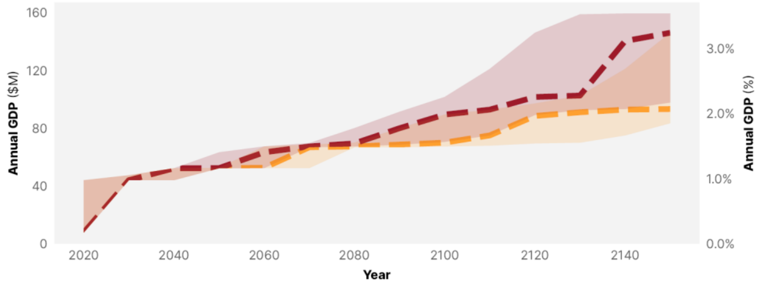
Figure A - 31.

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)?

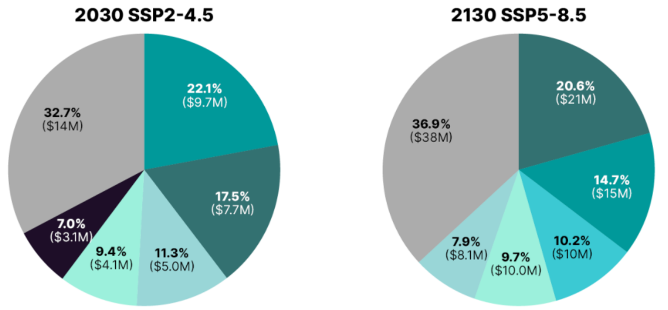
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



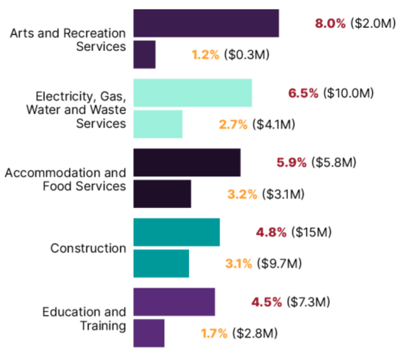
$44M of $4,326M total GDP

$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.

(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)



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

- 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

Figure A - 32.

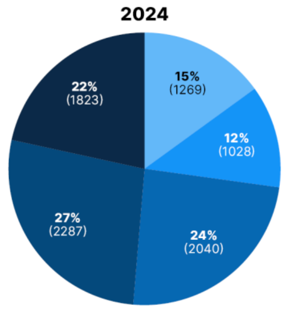
URBAN INTELLIGENCE

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



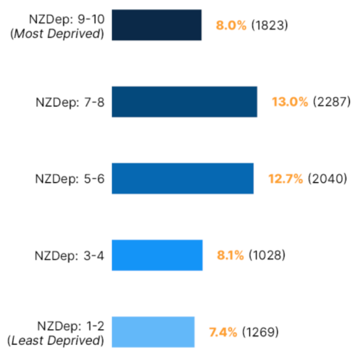
8,447 of 85,968 total residents

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

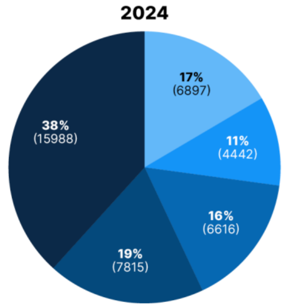
Figure A - 33.

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



41,759 of 85,968 total residents

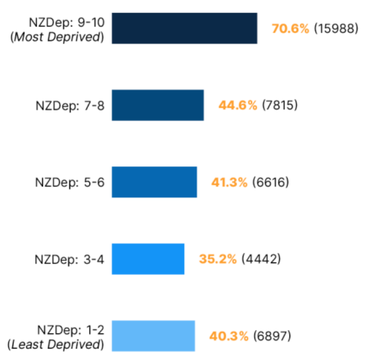
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



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.

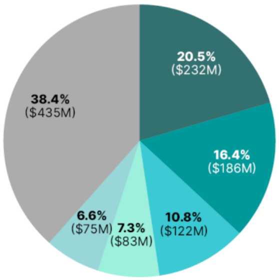
Economic Activity Exposed to River and Rainfall Flooding in Hastings

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



$1,133M of $4,509M total GDP

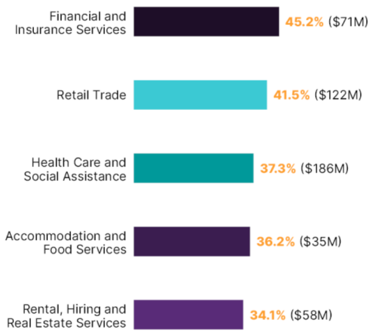
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.

KEY

- 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)



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

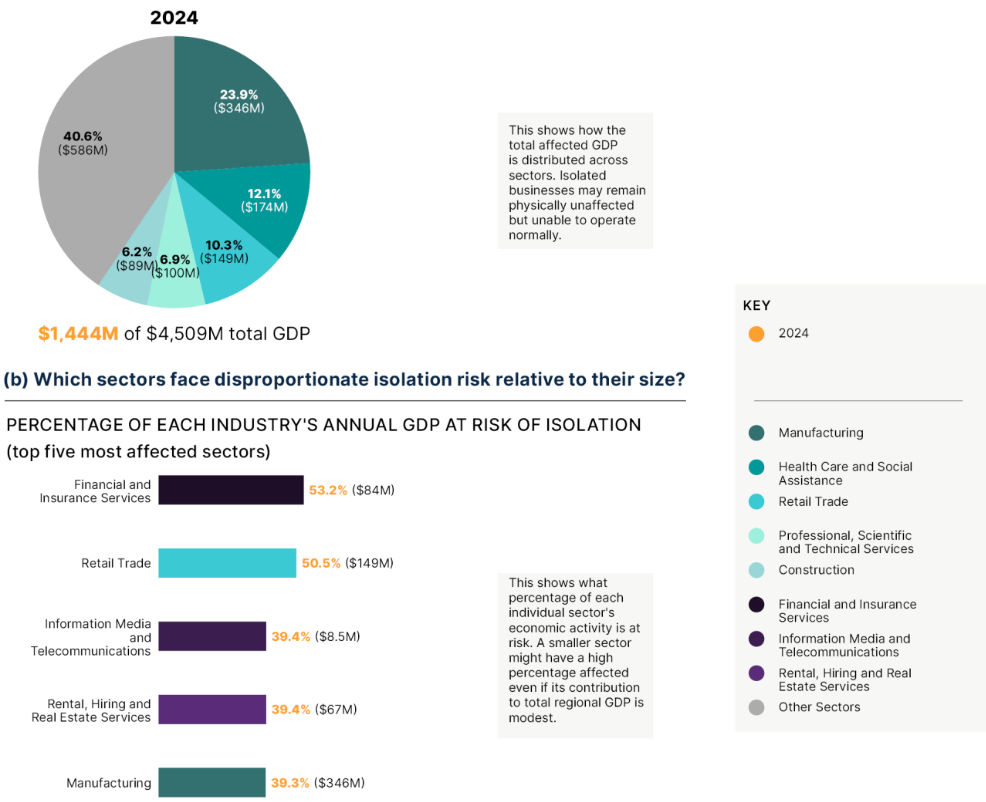


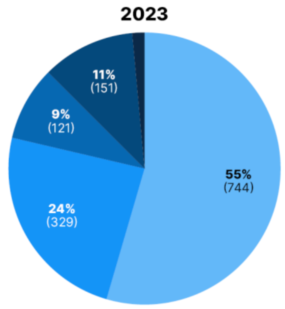
Figure A - 36.

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



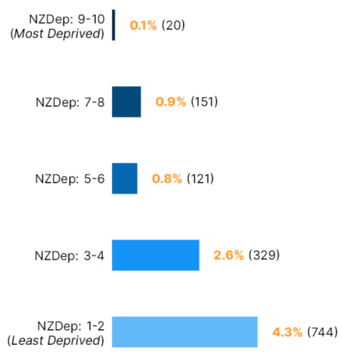
1,364 of 85,968 total residents

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
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



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.

URBAN INTELLIGENCE

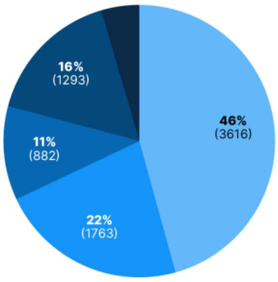
Population Isolated by Landslides in Hastings

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



7,912 of 85,968 total residents

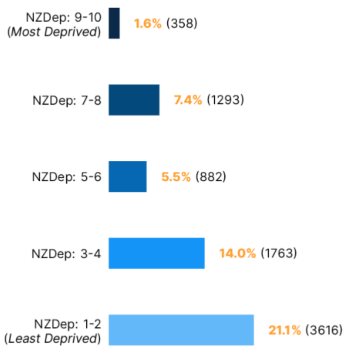
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



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.

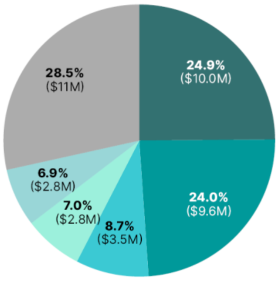
Economic Activity Exposed to Landslides in Hastings

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

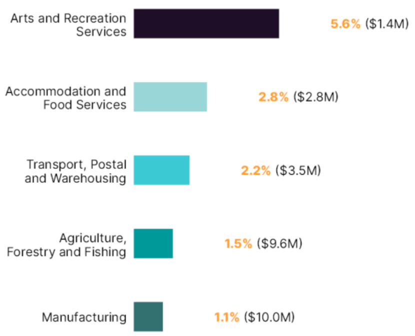


$40M of $4,509M total GDP

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.

(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)



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

- Manufacturing
- Agriculture, Forestry and Fishing
- Transport, Postal and Warehousing
- Construction
- Accommodation and Food Services
- Arts and Recreation Services
- Other Sectors

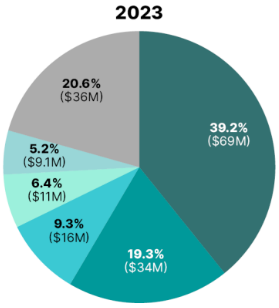
Figure A - 39.

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

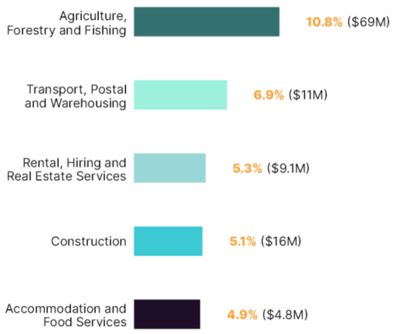


$175M of $4,509M total GDP

This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

(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)



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.

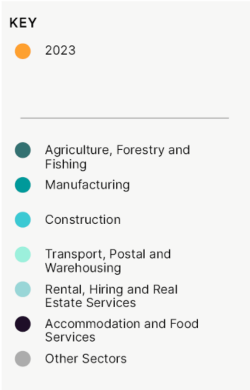


Figure A - 40.

4.4 Napier City

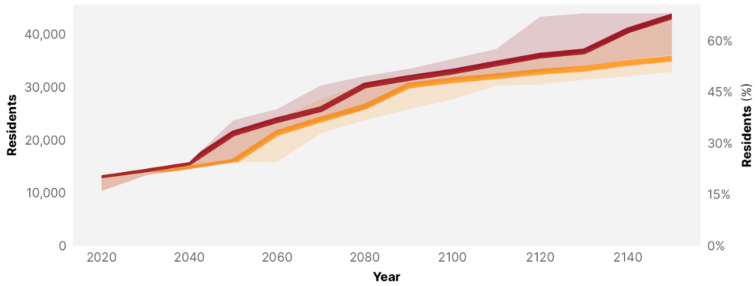
Figure A - 41 to Figure A - 48 illustrates the risk to residents and economic activity in Napier based on exposure to and isolation resulting from coastal flooding, and river and rainfall flooding. Due to limited landslide data provided/available for this assessment, landslide results are not included. 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?

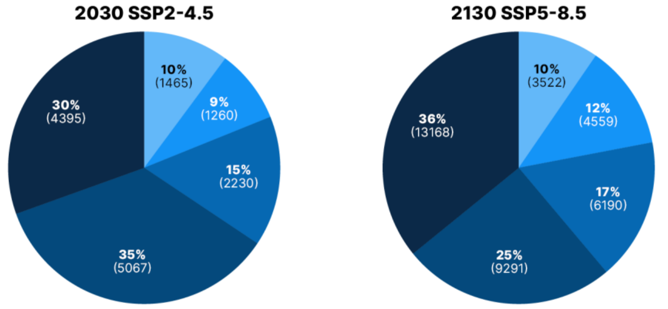
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



14,417 of 64,668 total residents

36,729 of 64,668 total residents

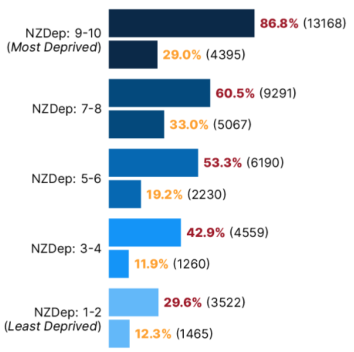
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

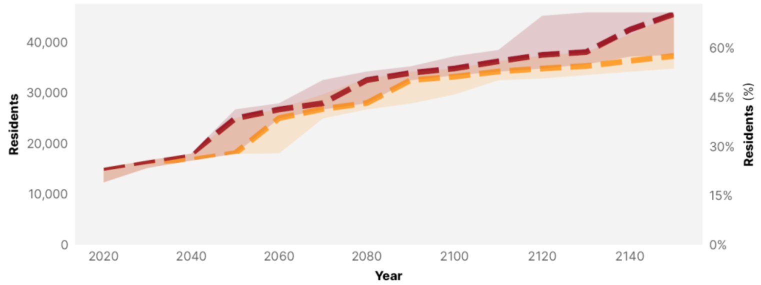
Figure A - 41.

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)?

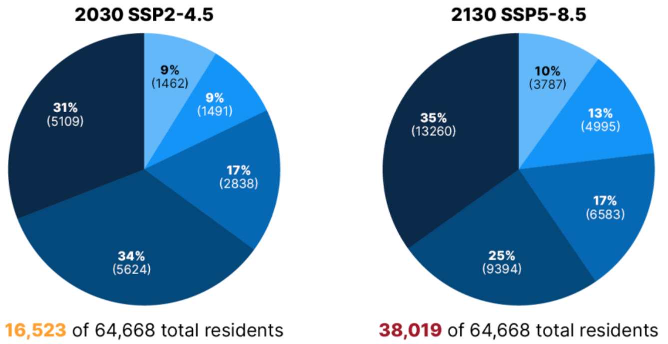
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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

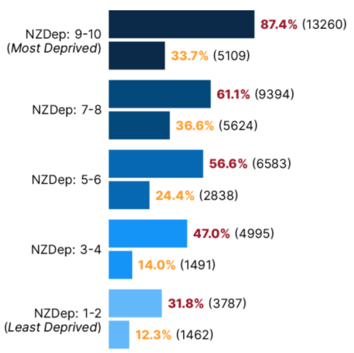


This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

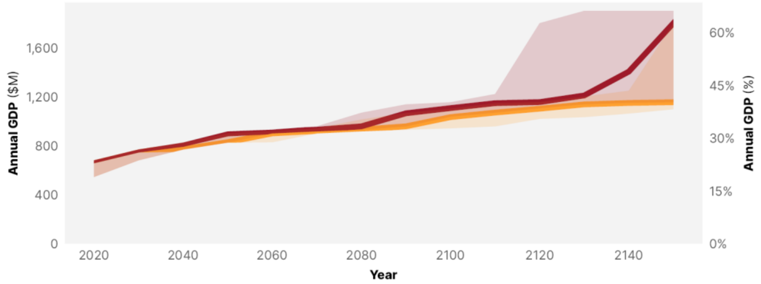
Figure A - 42.

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?

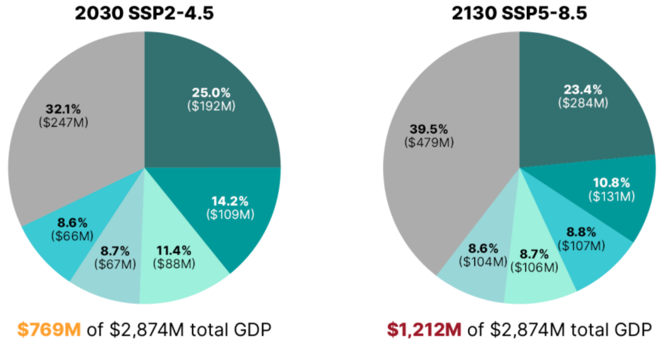
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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

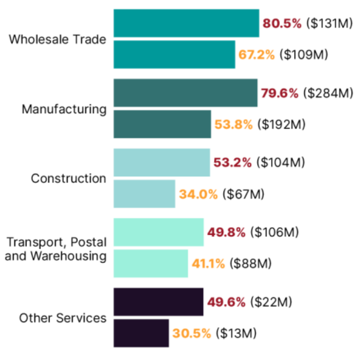


This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.

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)



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.

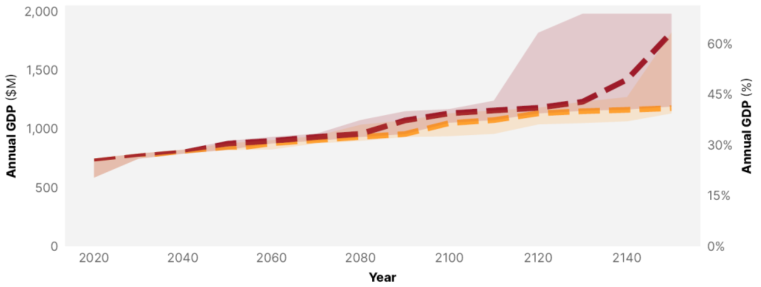
Figure A - 43.

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)?

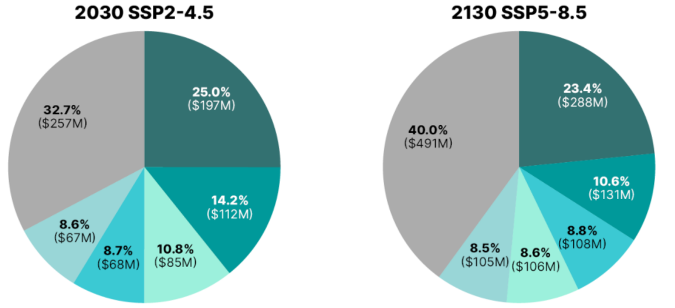
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



$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.

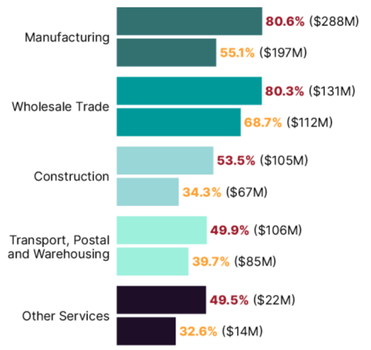
KEY

- 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)



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.

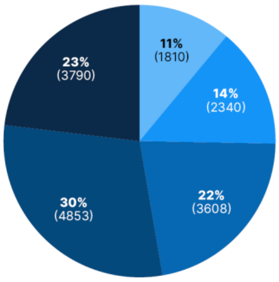
Population Exposed to River and Rainfall Flooding in Napier

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



16,401 of 64,668 total residents

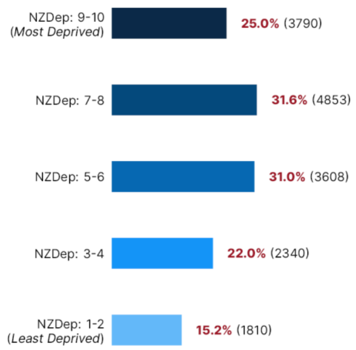
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



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.

URBAN INTELLIGENCE

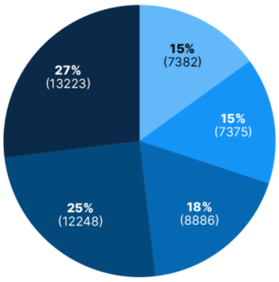
Population Isolated by River and Rainfall Flooding in Napier

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



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.

(b) Which groups face disproportionate isolation risk relative to their size?

PERCENTAGE OF EACH NZ DEPRIVATION GROUP THAT IS ISOLATED

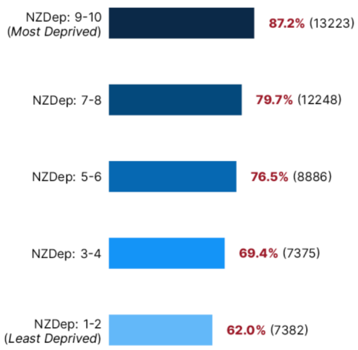


Figure A - 46.

This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

KEY
- 2100 SSP5-8.5

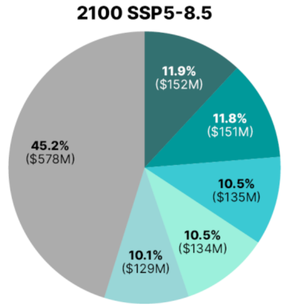
- NZDep 1-2
- NZDep 3-4
- NZDep 5-6
- NZDep 7-8
- NZDep 9-10

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



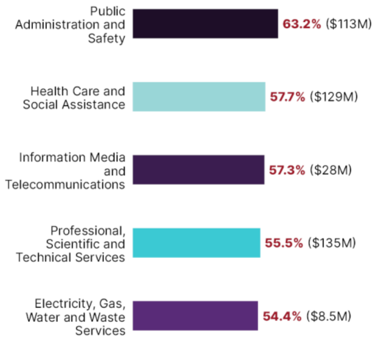
$1,278M of $2,874M total GDP

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)



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.

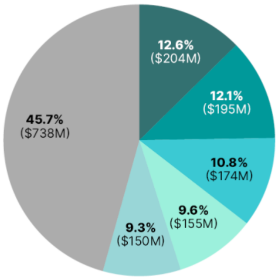
Economic Activity Isolated by River and Rainfall Flooding in Napier

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



$1,616M of $2,874M total GDP

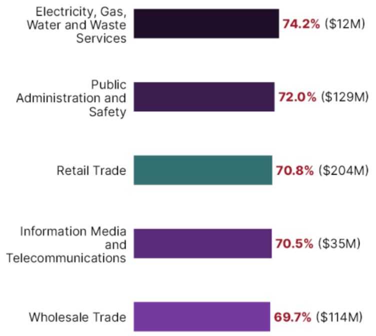
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

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)



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

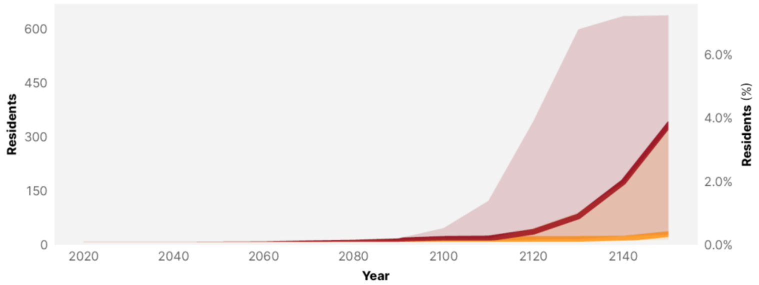
Figure A - 49 to Figure A - 60 illustrates the risk to residents and economic activity in Wairoa based on exposure to and isolation resulting from coastal flooding, river and rainfall flooding, and landslides. These visualisations include both direct exposure and potential isolation effects across different 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?

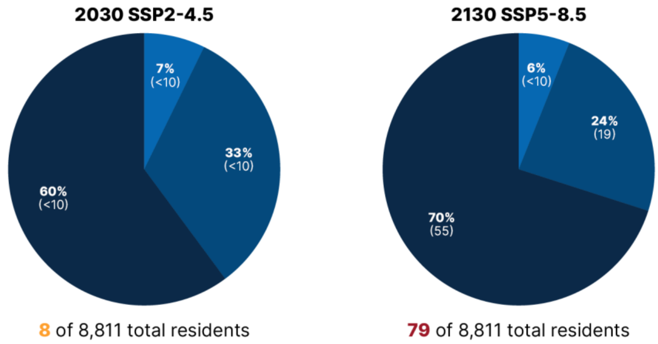
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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

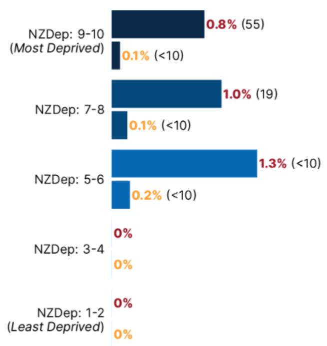


This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

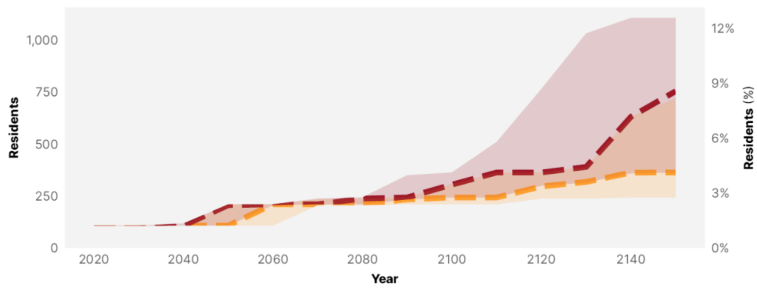
Figure A - 49.

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)?

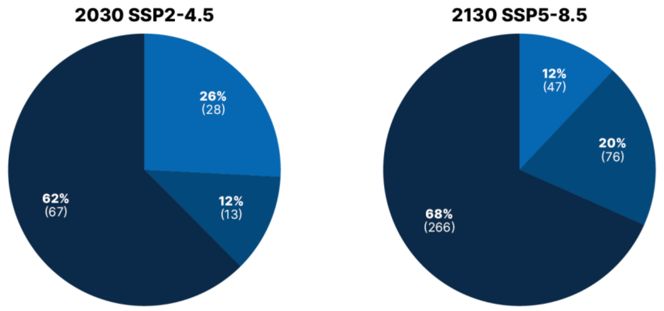
NUMBER AND PERCENTAGE OF RESIDENTS AT RISK



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



107 of 8,811 total residents

389 of 8,811 total residents

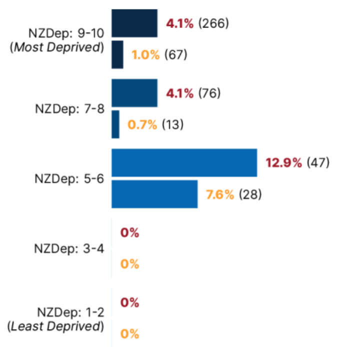
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

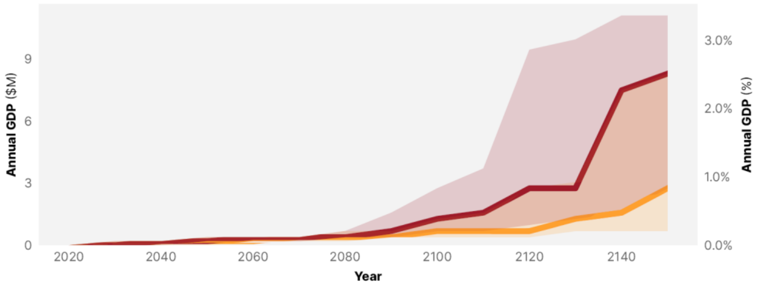
Figure A - 50.

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?

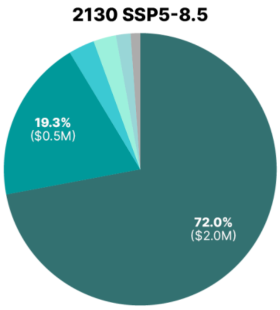
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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

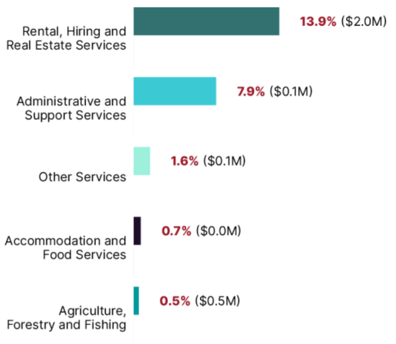


$3M of $330M total GDP

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.

(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)



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
- 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

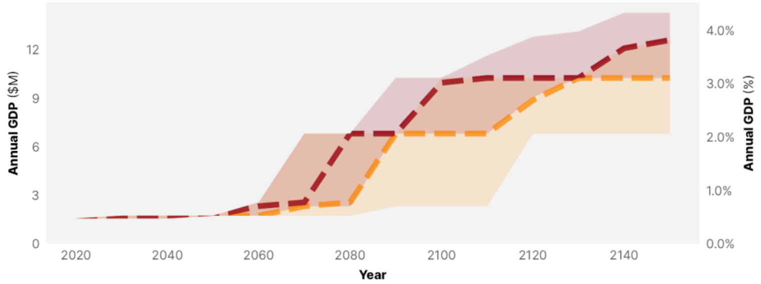
Figure A - 51.

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)?

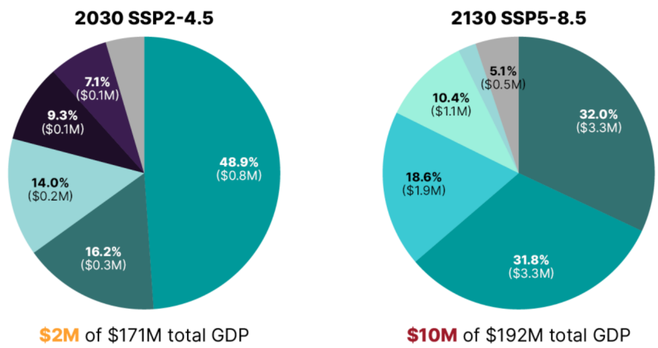
DOLLAR VALUE AND PERCENTAGE OF REGIONAL GDP AT RISK



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



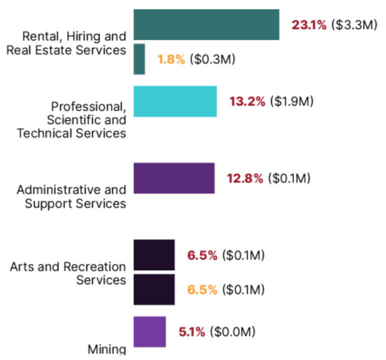
This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

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)



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.

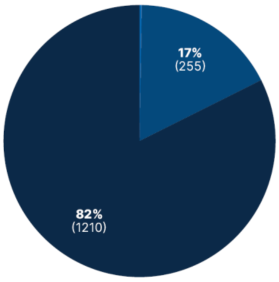
Population Exposed to River and Rainfall Flooding in Wairoa

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



1,469 of 8,811 total residents

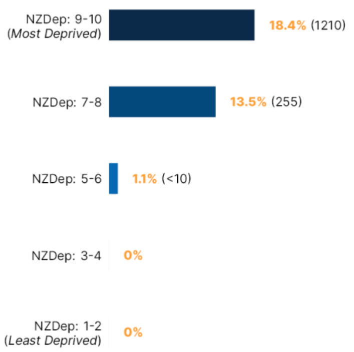
This shows how the total exposed population is distributed across socioeconomic groups. NZ Deprivation Index ranges from 1-2 (least deprived) to 9-10 (most deprived).

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



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.

URBAN INTELLIGENCE

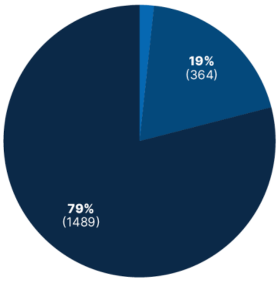
Population Isolated by River and Rainfall Flooding in Wairoa

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



1,885 of 8,811 total residents

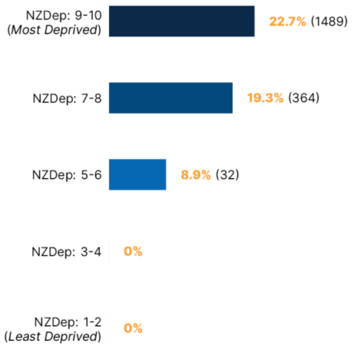
This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



This shows what percentage of people within each NZ deprivation group is at risk. This indicates which groups face the greatest relative impact.

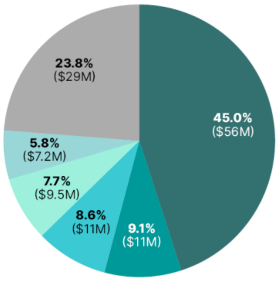
Figure A - 54.

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

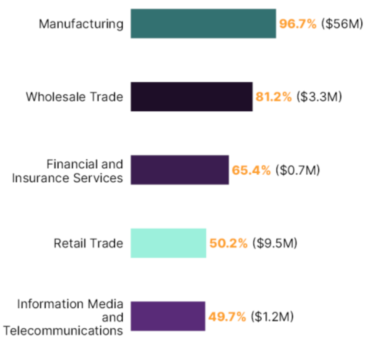


$123M of $330M total GDP

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.

(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)



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
- 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

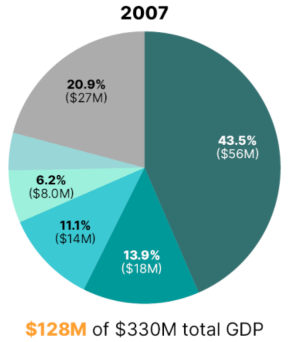
Figure A - 55.

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?

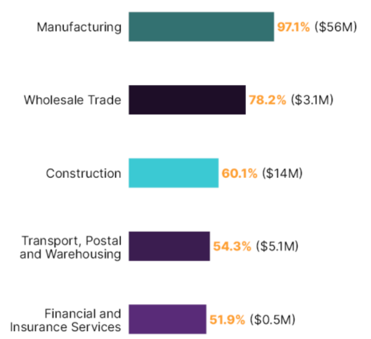
DISTRIBUTION OF AFFECTED GDP ACROSS ECONOMIC SECTORS



This shows how the total affected GDP is distributed across sectors. Isolated businesses may remain physically unaffected but unable to operate normally.

(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)



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
- 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

Figure A - 56.

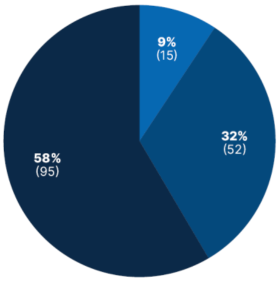
Population Exposed to Landslides in Wairoa

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



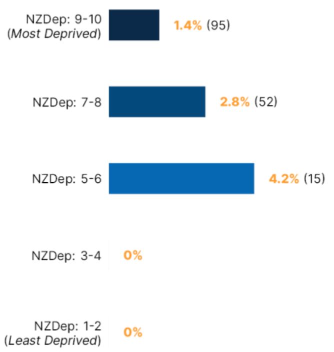
162 of 8,811 total residents

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
- 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



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.

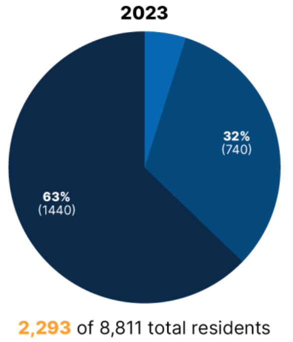
URBAN INTELLIGENCE

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

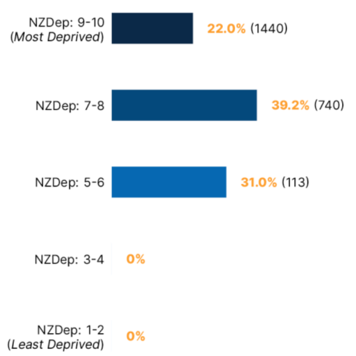


This shows how the total isolated population is distributed across socioeconomic groups. Isolated homes cannot access or be accessed by services and amenities.

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



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.

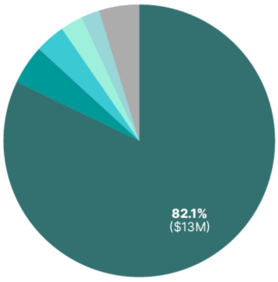
Economic Activity Exposed to Landslides in Wairoa Region

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



$16M of $330M total GDP

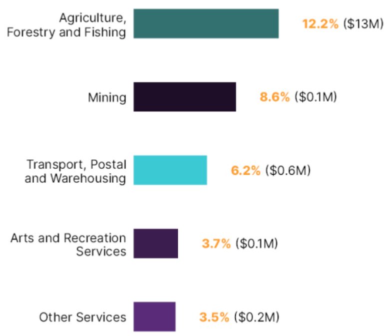
This shows how the total affected GDP is distributed across sectors. Larger sectors may dominate even if only a small percentage of their activity is affected.

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)



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.

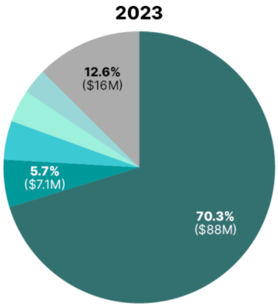
Figure A - 59.

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



$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.

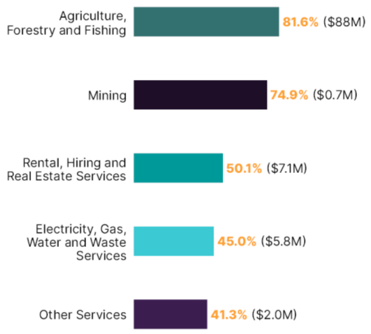
KEY

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)



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.

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