Te Kāwanatanga o Aotearoa

Te Puni Kōkiri
MINISTRY OF MĀORI DEVELOPMENT

Understanding Climate Hazards for Hapori Māori

Insights for Policy Makers

Photo: Tangoio Marae, Hawke's Bay after Cyclone Gabrielle. Photo courtesy of NZ Herald.

Rārangi Take

Contents

Vision

A climate-resilient future where all communities, including hapori Māori, thrive despite the challenges posed by te ao hurihuri, a changing world.

Photo: Te Ataarangi Parata, Te Kaha Nursery 2IC, nurturing the young plants in Te Heriko, the plant nursery owned and operated by Te Kaha Landowners Group (TKG). TKG are supporting aspirations for whānau, including whenua and employment. Photo credit: Josie McClutchie.

He Kupu Whakataki
Foreword

In the year preceding the completion of this research, Aotearoa New Zealand repeatedly experienced the impact that climate change is having on te taiao[1] and our communities. In 2022 heavy rain and flooding caused extensive damage to parts of the North and South Islands, and states of emergency were declared for Tairāwhiti, Nelson, Westland, and Marlborough. In early 2023 a national state of emergency was declared when cyclone Hale and cyclone Gabrielle tore through towns and cities across the North Island causing widespread flooding, destroying homes, submerging marae in silt and sediment, cutting off communities and tragically claiming lives.

At the same time the Intergovernmental Panel on Climate Change (IPCC) released another global report assessing the impacts of climate change on nature and humanity, and communities' capacity to adapt.[2] This recent report cautioned about maladaptation, which has increased since they last reported on this subject. Maladaptive responses to climate change can create lock-ins of vulnerability, exposure and risks that are difficult and expensive to change and exacerbate existing inequalities.

The impact of climate change on Aotearoa is undeniably significant. The floods and landslides witnessed in early 2023 are expected to become more frequent. Some regions may also face prolonged periods of drought and extreme rainfall, while others could experience contrasting weather patterns. Gradual changes such as ocean warming and increased hot days will also introduce new climate hazards, emphasizing the need for preparedness and adaptability.

While all New Zealanders will feel the impact of these climate hazards, the ability of communities to adapt and their resilience will vary considerably across the motu. In particular, hapori Māori[3], face heightened risks due to their geographical locations, the industries they work in, and current socio-economic circumstances.

As policymakers, it is imperative that we understand these risks and incorporate them into our decisions and interventions. The more informed we are, the more effective our efforts will be in addressing disparities, preventing maladaptation, and enhancing the adaptive capacity and resilience of all communities. Policy-makers and regulators need to actively consider maladaptation as part of any response and subsequent recovery to extreme weather events and other climate impacts.

With this in mind, Te Puni Kōkiri has undertaken a first step exploratory analysis to understand the projected risks of climate hazards on hapori Māori. The findings, presented in this report, shed light on the specific challenges and needs of Māori households concerning future and current climate hazards. It is our hope that this information will be used by policy makers working on climate change policy across the public sector to better understand where support for building resilience and enabling adaptation for hapori Māori might be most needed.

Our vision is to foster collaboration in building a climate-resilient future, where all communities, including hapori Māori, can thrive despite the challenges faced by te ao hurihuri, a changing world.

1 In this report te taiao is denoted broadly as the world, Earth, natural world, environment, nature, country.

2 Intergovernmental Panel on Climate Change 'Sixth Assessment Report Summary for Policymakers' [February 2022] at www.ipcc.ch.

3 In this report hapori Māori is denoted broadly as Māori communities.

Executive summary

Climate change presents significant challenges that necessitate robust policies and implementable strategies to support resilience and avoid maladaptation. The first step towards effective policy interventions is gaining a comprehensive understanding of the risks faced by our communities. By tailoring adaptation actions to address these risks, we can better serve our communities.

As the principal policy advisors to the government on Māori wellbeing and development, Te Puni Kōkiri has embarked on an initial exploratory analysis to examine what risks exist specifically for hapori Māori. By assessing the socio-economic circumstances and resilience of hapori Māori exposed to various climate hazards, the findings presented in this report offer valuable insights to inform the immediate shaping of future climate change policy design.

The report highlights key findings from the analysis, such as the climate hazards projected to affect the greatest number of Māori households in the future, namely heatwaves, droughts, extreme hot days, wet spells, extreme rainfall and sea level rise. It also addresses the hazards already significantly impacting Māori households, such as flooding.

Furthermore, the report delves into the socio-economic circumstances and resilience of Māori communities exposed to these climate hazards, shedding light on disparities and areas that may require targeted policies. For instance, it emphasises the vulnerability of hapori Māori in coastal areas due to sea level rise, as well as the challenges faced by older Māori households with lower adaptability due to factors like social isolation and lack of support systems.

While this initial analysis provides valuable insights, it is important to acknowledge its caveats and limitations. The methodology employed is primarily risk-based, focusing on climate hazards expected to have the most immediate and substantial impact on households. Other hazards have not been explored. The determination of household resilience utilised select social indicators from the Integrated Data Infrastructure (IDI), chosen for their ability to capture resilience and adaptive capacity. However, these indicators do not encompass all factors contributing to resilience. There was also no technical guidance on how to link climate hazards (environmental data) and quantitative effects on households (social data). Consequently, we had to make subjective choices around threshold values for climate hazards. Additionally, the analysis does not explore potential opportunities arising from climate change. Recognising these limitations, ongoing efforts will refine and expand the dataset to address these information gaps, as detailed in the methodology and next steps sections.

For now, this initial exploration and dataset serves as a valuable resource for policy practitioners. It serves as a catalyst for action and contributes to an expanding knowledge base regarding the unique needs of hapori Māori and the necessary measures to enhance their adaptive capability and foster resilience.

Achieving a climate-resilient future necessitates collaborative efforts and inclusive policies that empower all communities to thrive amidst the challenges posed by climate change. This report marks the initial step towards gaining a better understanding of these dynamics.

Methodology

Focus on Māori households

Our analysis primarily focused on Māori households, which were defined as households where at least one occupant self-identified as Māori. This means the analysis also includes people of other ethnicities where they are part of a Māori household, as well as Māori individuals who identified with more than one ethnicity.

All counts of households have been randomly rounded to satisfy Statistics NZ confidentiality requirements. SA2s with 30 or less Māori households were excluded from the analysis (the data we collated was summarised at the Statistical Area 2 (SA2) level, see pg. 9 for further detail on this).

Marae

The number of marae sourced in our analysis comes from Te Puni Kōkiri source data (https://hub.arcgis.com/maps/TPK::map-marae/explore) and includes ancestral and tribal marae, as well as non-tribal marae, such as those that belong to Urban Māori Authorities, adhere to educational and other institutions, or otherwise do not have a specific link to iwi, hapū or whānau. Where we refer to number of marae, this is summarised at the SA2 level. An SA2 area often has a larger area than the town/city boundary by which it is named. This means some marae numbers may appear conflated.

Methodology framework

We employed a schematic developed by Oppenheimer et al. in 2014[4] as a useful framework for describing our methodology.

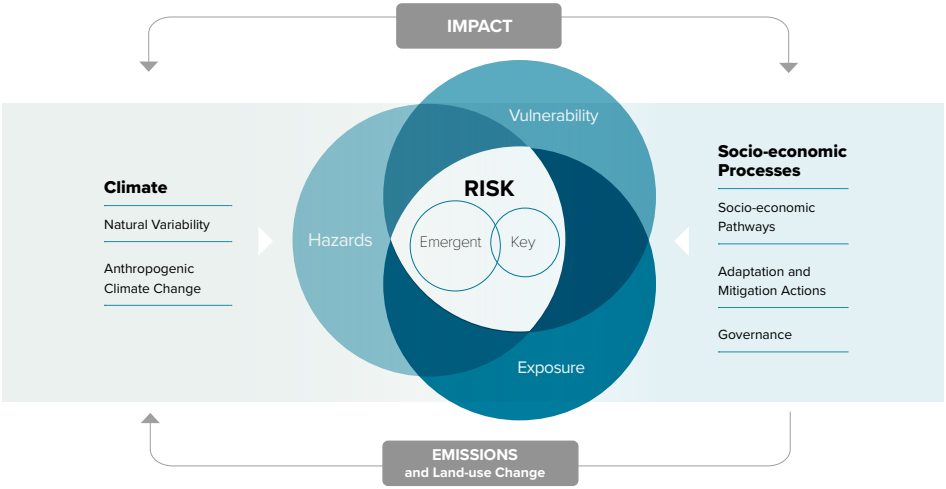


Figure 19-1 Schematic of the interaction among the physical climate system, exposure, and vulnerability producing risk. The figure visualises the different terms and concepts discussed in this chapter. Risk of dimate-related impacts results from the interaction of dimate related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems. The definition and use of "key" and "emergent" ere indicated in Box 19-2 and the Glossary. Vulnerability and exposure are, as the figure shows, largely the result of socio-economic pathways and soxietal conditions (although changing harard patterns also play a role; see Section 19.6.1.1). Changes in both the climate system (left side) and socio-economic processes (right side) are central drivers of the different core components (vulnerability, exposure, and hazards) that constitute risk (modified version of SEX Figure SPM. 1 (IPCC, 2012a)).

Exposure to climate hazards

We concentrated our analysis on the intersection area depicted in the middle of the schematic. Our goal was to examine the exposure of Māori communities to projected climate hazards while considering their current socio-economic circumstances. We used socio-economic circumstances as a proxy measure for community vulnerability.

4 Oppenheimer et al 'AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability' Part A: Global and Sectoral Aspects. Chapter 19. Pg. 1046. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [2014] at www.ipcc.ch.

Climate hazards

The climate hazards we focused on are those projected to have the most substantial and immediate impact on human lives. These included sea level rise and variations in the occurrence and intensity of extreme climate events such as floods, droughts, heatwaves, and heavy rainfall. These selections were based on the identification of significant risks to human wellbeing outlined in the 2020 National Climate Change Risk Assessment published by the Ministry for the Environment.[5]

Selection of climate hazard indicators

To identify indicators for these hazards, we considered various climate datasets covering different aspects of human risk, including physical and mental health impacts. The final choices were determined through consultation with climate data providers.

Specific datasets and indicators

For each hazard, we utilised specific datasets and indicators, which were as follows:

Sea level rise:
Areas susceptible to inundation at extreme coastal sea levels with no sea level rise (baseline) and a future projection of 50cm sea level rise based on the 1% Annual Exceedance Probability.

Extreme rainfall:
Number of days per year with rainfall greater than 30mm.

Wet spells:
Number of days per year with rainfall exceeding 1mm for five or more consecutive days.

Extreme hot days:
Number of days per year with maximum temperatures exceeding 30°C.

Flooding:
Areas prone to flooding.

Heatwave days:
Number of days per year where maximum temperature exceeds 25°C for three or more consecutive days.

Drought:
Probability of potential evapotranspiration deficit (PED) exceeding 200mm.

5 Ministry for the Environment 'National Climate Change Risk Assessment for New Zealand' [August 2020] at www.environment.govt.nz.

Climate data and timeframe

All climate datasets used in our analysis were provided by the National Institute of Water and Atmospheric Research (NIWA). We obtained climate maps for a baseline period from 1986 to 2005 and projected changes averaged over time. The projections for this analysis were based on a low-moderate global emission trajectory called Representative Concentration Pathways (RCP), developed by IPCC and used in global climate models.

For flooding, we obtained the 2021 composite flood hazard area maps from NIWA, with consent from district and regional councils. These were created from modelled and historic flood hazard maps and flood prone soil maps, publicly available in August 2018.

Threshold values and exploration

The analysis aimed to link information about climate hazards (environmental data) with the effect on people and their households (social data). However, there was limited technical guidance on threshold values for environmental data indicating significant effects on people. Therefore, we adopted an exploratory approach and made subjective choices for the environmental thresholds based on: the 90th percentile of the baseline climatology value from 1986 to 2005; any projected change from the baseline climatology above zero; and any percentage change in the projected value exceeding 10 per cent. Climate hazard values above these thresholds were assumed to have a significant impact on communities and no impact below the threshold.

Socio-economic circumstances

To construct household-level measures of socio-economic circumstances, we utilised the Integrated Data Infrastructure (IDI). The social indicators were selected based on their ability to capture the resilience and adaptive capacity of hapori Māori. These indicators included variables such as income, employment, education, health, and housing. Statistical techniques and feedback from subject matter experts were used to consolidate the numerous social indicators (approximately 100) into composite indices representing different aspects of socio-economic risk.

Adaptability risk index

The adaptability risk index was based on measures that were not already included in other indices, but might be associated with adaptation issues. For example, having vulnerable members in the household (e.g. older people), not being enrolled in education, or training, or being employed (and hence potentially socially isolated), having no highest qualification (a proxy measure for literacy issues) and not having access to telecommunication services.

Adult and child split

We also split the health and justice and protection indices into adult and child-related versions due to the strong age-dependence of the underlying social indicators. Households with no children or youth had zero for child-related indices because the risk was considered to be zero.

Risk indices and resilience indicators

The following figure presents an overview of the resilience indices that we used to summarise the socio-economic characteristics of households predicted to be affected by climate change. The indices cover the broad domains of poverty, health, justice and protection and the ability to adapt to climate change.

Data summary and joining social and climate information

We collated the data and summarised it at the Statistical Areas (SA2)[6] level. These areas typically have a population of around 1,000 to 4,000 residents. While climate and social data was available at a finer resolution, the socio-economic summaries had to comply with Statistics New Zealand's confidentiality requirements to protect personal information. As a result, aggregate socio-economic information of households at the broader SA2 level was utilised. Information from SA2s with fewer than 30 Māori households were excluded from the analysis to ensure confidentiality concerns and less reliable statistics.

Overall risk indices

Overall socio-economic risk index definition: The overall socio-economic risk index was constructed by combining the six socio-economic indices explored in the analysis. A combined score for an SA2 was obtained by averaging its percentage rank on each of the six variables[7]. The resulting score is scaled into a range of 0 to 1, where a higher number indicates that an area faces relatively greater risks due to socio-economic factors.

Overall climate risk index definition: The overall climate risk index was created by combining all seven climate hazards analysed in this study. Each area was ranked based on its exposure to various climate hazards and the average rank for each area was calculated. This combined score is scaled from 0 to 1, where a higher number corresponds to a relatively higher exposure to climate hazards.

6 Statistical Area 2 (SA2) is an output geography that provides higher aggregations of population data than can be provided at the statistical area 1 (SA1) level. The SA2 geography aims to reflect communities that interact together socially and economically. In populated areas, SA2s generally contain similar sized populations Stats NZ 'Statistical Area 2 2023 (generalised)' [2023] at https://datafinder.stats.govt.nz

7 A weighting factor of 0.5 was assigned to each of the variables that measured adult and child indices separately.

Caveats

It is important to consider that Māori households may face climate hazards beyond those explored in this first-step analysis[8] and in other locations, such as in their workplaces, schools, hospitals, and other settings. These were not considered in this project. Additionally, the methodology employed is primarily risk-based, focusing on climate hazards expected to have the most immediate and substantial impact on households. Other hazards, such as extreme cold, wildfire, tropical cyclones and storms have not been considered. The impact of climate hazards on infrastructure, including wāhi tapu (sites of cultural significance) and the subsequent impact on community resilience was also not explored. Considering these factors, Māori households may experience a disproportionate level of exposure to climate hazards compared to the overall population.

The determination of household resilience utilised select social indicators from the Integrated Data Infrastructure (IDI), chosen for their ability to capture resilience and adaptive capacity. However, these indicators do not encompass all factors contributing to resilience. Additionally, variables describing socio-economic resilience of Māori communities were limited to those that could be derived from administrative or survey data in the IDI. Therefore, they do not provide a complete holistic picture of community resilience, including important factors such as social cohesion, or community leadership, which will strongly influence how Māori communities respond to climate change events.

The analysis also does not take into account changes in resilience over time and it examines current (as at 2021) socio-economic profiles of Māori communities against baseline and projected climate hazards. As the effects of climate change become more pronounced, people with the ability and willingness to do so may choose to relocate to areas where the impacts are lower. This would change the average socio-economic profiles in areas exposed to climate events.

8 See the methodology section (page 7) for detail on the climate hazards explored.

Caveats *continued*

It is also important to note that the analysis may overestimate the number of Māori households affected by various climate hazards since it does not account for variations within SA2 areas. For this initial exploratory work, all households within an SA2 area exposed to a specific climate hazard were considered exposed.

For this first-step, exploratory project, we also did not take into account governance, or adaptation and mitigation plans and we did not explore potential opportunities arising from climate change.

We recognise the importance of acknowledging these limitations and continuing to refine and expand this dataset over time to address these gaps and information needs. Refer to the next steps section on page 34 for further detail on this.

Disclaimer

The results in this report are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit https://www.stats.govt.nz/integrated-data.

The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

Background

This project is part of work that Te Puni Kōkiri has committed to deliver under the National Adaptation Plan (NAP), specifically aligning with action 3.10 in the Communities chapter.

> *"Assess socio-economic and climate vulnerability for Māori." This action will collect and analyse social data against climate change-related data to determine where support for resilience is most needed. This will allow the Government to better understand what support is needed to strengthen resilience for Māori communities.*

The project also intersects with broader Te Puni Kōkiri initiatives focused on community resilience for Māori. This includes engagement with our regional offices and their communities to understand their adaptation requirements.

Photo: Esk Valley, Hawke's Bay after Cyclone Gabrielle hit in 2023. Photo courtesy of New Zealand Defence Force (NZDF).

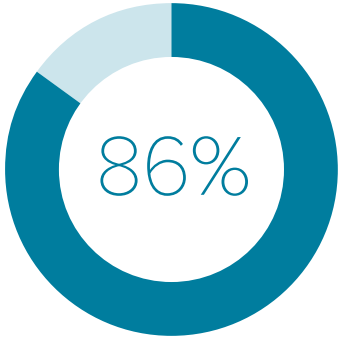
Key findings

The following key findings emerged from our research, providing insights into the exposure, risks, resilience, and adaptability of Māori households to the climate hazards we explored.

The findings shed light on the disproportionate challenges and vulnerabilities experienced by hapori Māori across Aotearoa, emphasising the importance of targeted interventions to address disparities, avoid maladaptation and enhance resilience.

Overall exposure and risks

- Despite Māori households having similar exposure to climate hazards as the overall population, they are projected to face greater risks due to a higher proportion of Māori households at risk related to poverty, health disparities, justice and protection concerns.



Flooding already affects a significant number of Māori households, with 86 per cent of households located in flood-exposed SA2 areas.

Photo: Hawke's Bay showing flooding damage after Cyclone Gabrielle hit in 2023. Photo courtesy of NZDF.

Climate hazards

- Heatwaves, droughts, and extreme rainfall are projected to affect the greatest number of Māori households in the future, with almost all Māori households expected to experience some increase in these climate hazards.

- As of 2021, approximately 14 per cent of Māori households were situated in SA2 areas projected to experience at least 0.5 square kilometres of coastal inundation with a future sea level rise of 50cm.

- The majority of SA2s exposed to flooding have at least one area of heightened risk associated with health, poverty, and justice, surpassing the average level of risk. This suggests that communities exposed to flooding may also be the most susceptible to the impacts of flooding based on their socio-economic risk.

Resilience and adaptability of hapori Māori

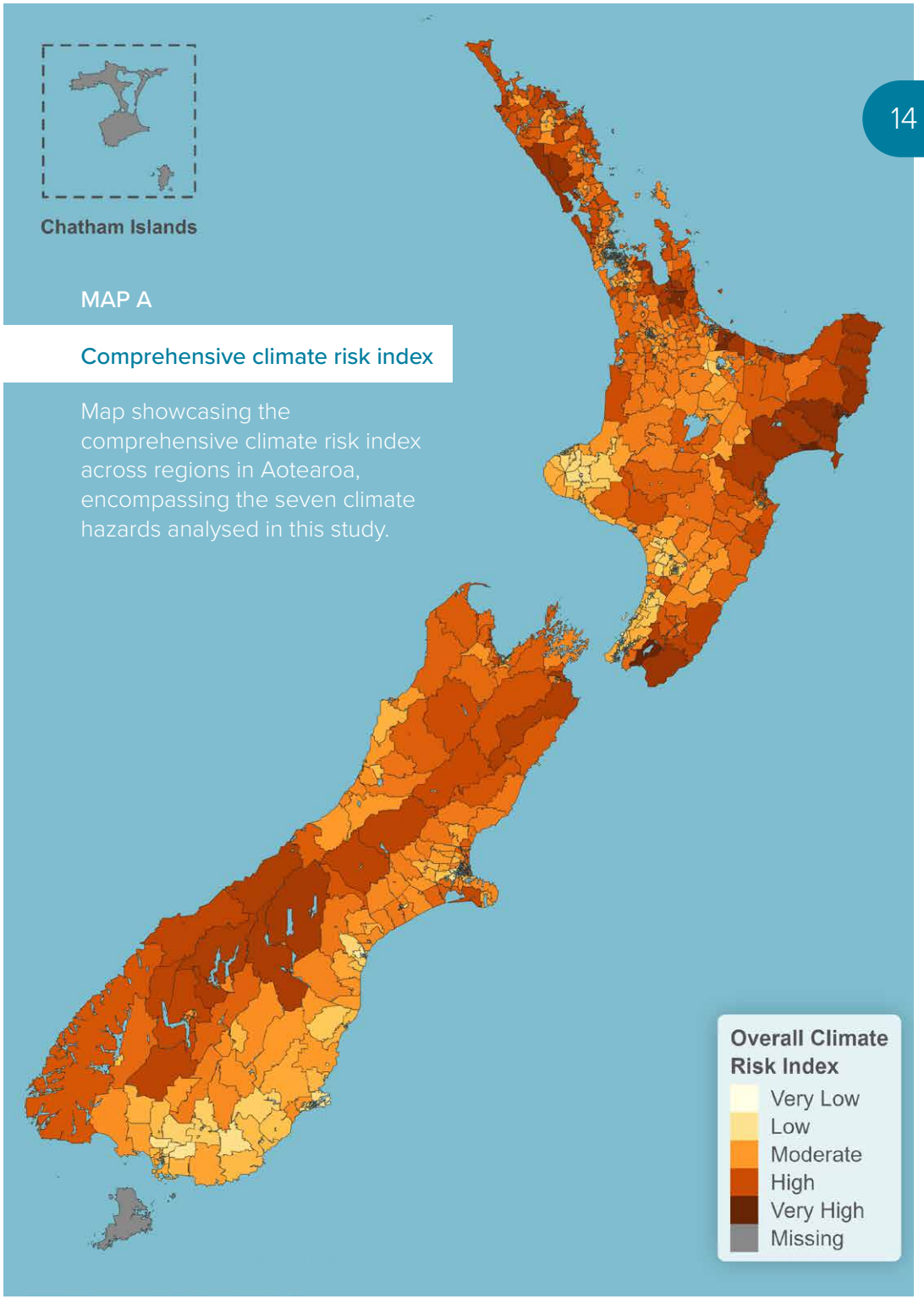
- Hapori Māori have potentially higher resilience to future climate change based on one aspect of socio-economic risk – the adaptability risk index. This is partly attributed to the younger age composition of the Māori population. On the other hand, other socio-economic risk indices covering other aspects of resilience (poverty, health and justice and protection) were higher than average for hapori Māori, suggesting higher susceptibility to the impacts of climate change.

- However, the areas projected to experience changes in sea level rise and extreme rainfall events have a relatively higher proportion of older Māori households, indicating potentially lower resilience in adapting to these events.

- Adaptability risk was found to be low for Māori households in cities and higher in rural areas. This disparity may be due to the lack of access to amenities and resources in rural areas, while cities attract younger populations with better access to education and opportunities.

Adaptability risk is lower for Māori households in cities.

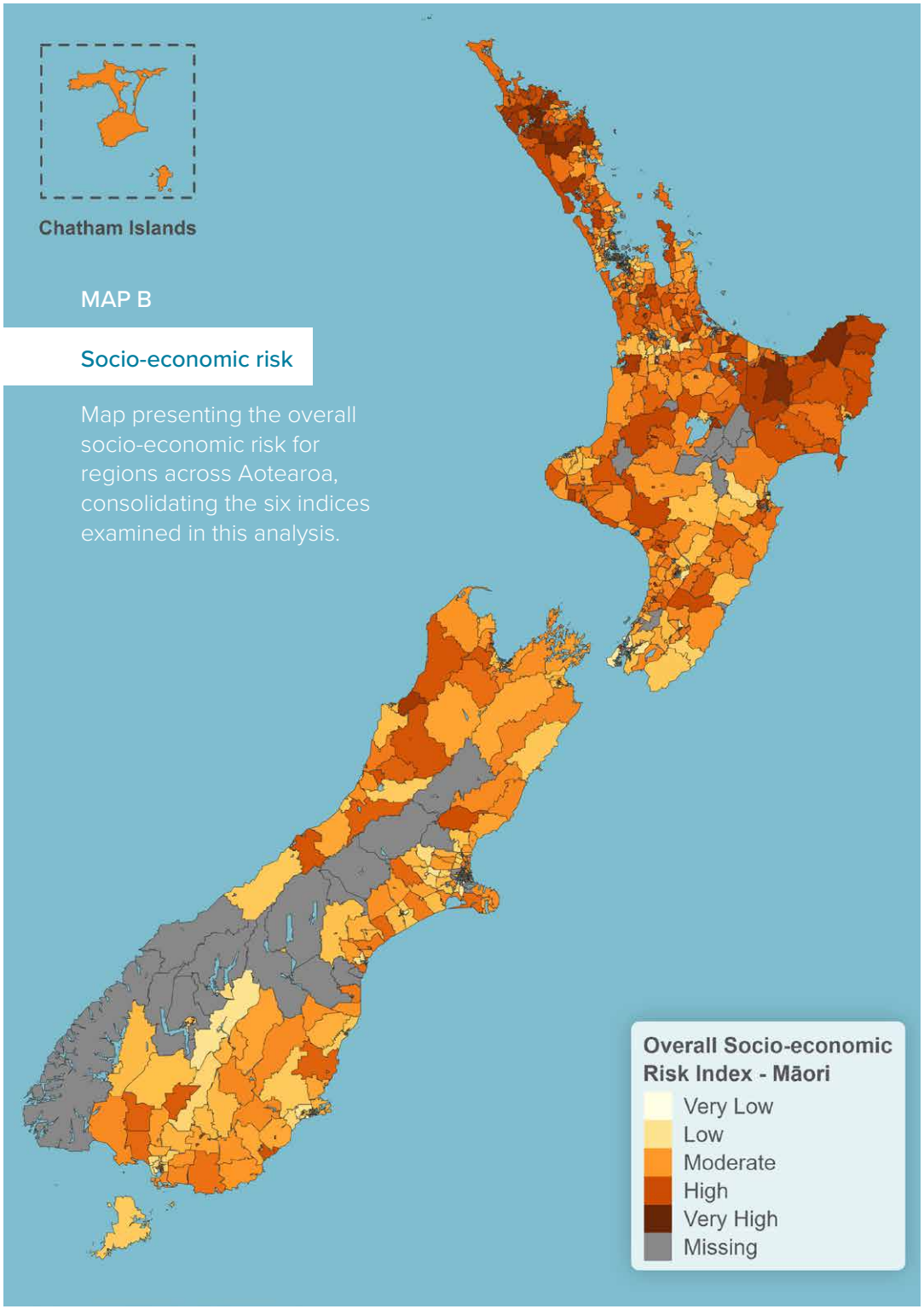
Adaptability risk is higher for Māori households in rural areas.



MAP A

Comprehensive climate risk index

Map showcasing the comprehensive climate risk index across regions in Aotearoa, encompassing the seven climate hazards analysed in this study.



MAP B

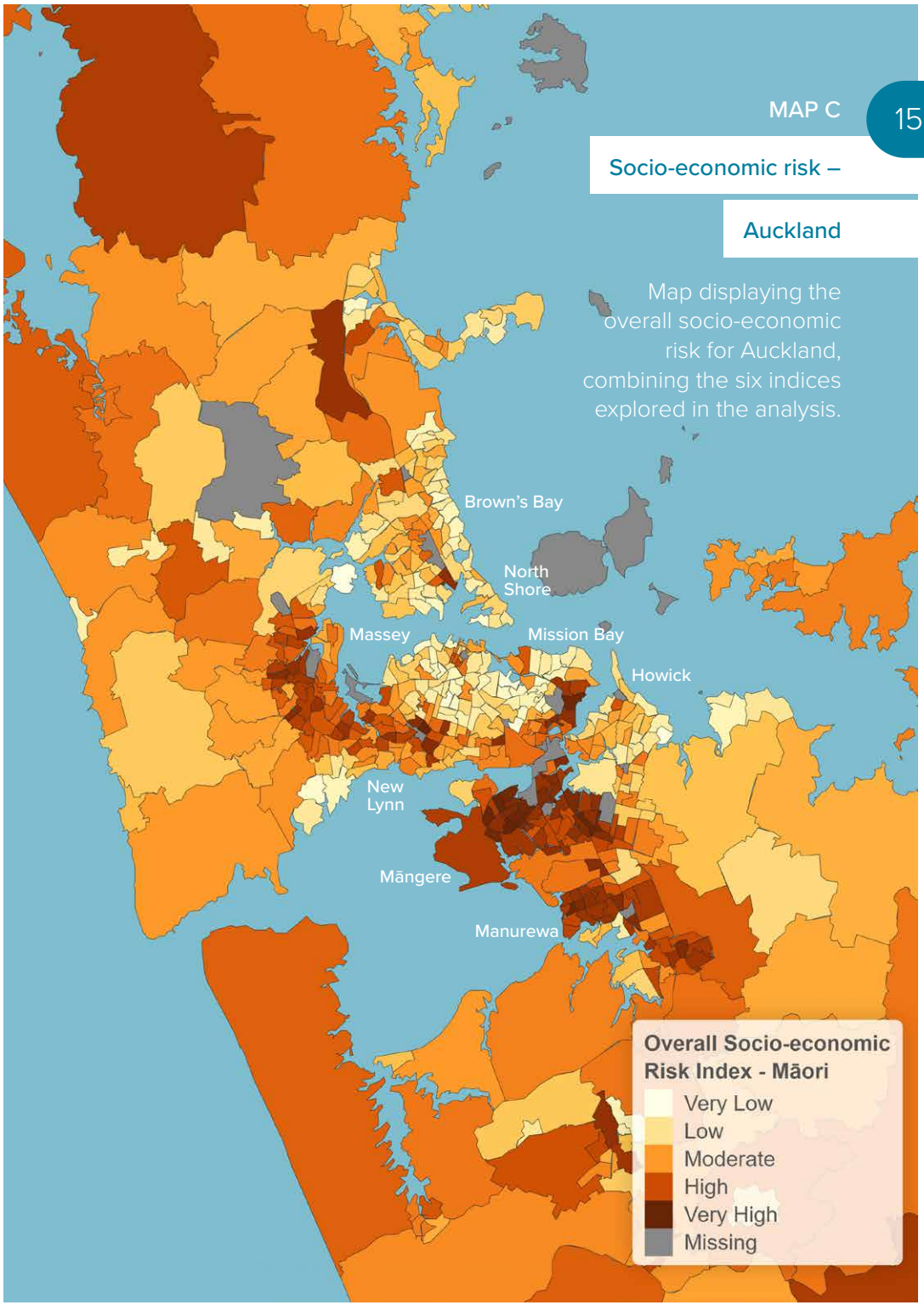
Socio-economic risk

Map presenting the overall socio-economic risk for regions across Aotearoa, consolidating the six indices examined in this analysis.

MAP C

Socio-economic risk – Auckland

Map displaying the overall socio-economic risk for Auckland, combining the six indices explored in the analysis.



Chatham Islands

MAP D

Adaptability risk index

Map displaying the adaptability risk index for regions in Aotearoa, refer to page 8 for details on the measurement of 'ability to adapt'.

Adaptability Risk Index - Māori
- Very Low
- Low
- Moderate
- High
- Very High
- Missing

MAP E

Adaptability risk index – Auckland

Map displaying the adaptability risk index for Auckland and surrounding regions. Showcasing the low adaptability risk for Māori households in cities.

Brown's Bay
North Shore
Massey
Mission Bay
Howick
New Lynn
Māngere
Manurewa

Adaptability Risk Index - Māori
- Very Low
- Low
- Moderate
- High
- Very High
- Missing

Top 30 SA2s for socio-economic risk

- The top 30 SA2s with the highest overall socio-economic risk are in Auckland, Manawatū-Whanganui, Gisborne, Waikato, Hawke's Bay, Bay of Plenty, and Northland; these areas may be the most susceptible to the impacts of climate change due to their socio-economic risk.
- Among the top 30 SA2s, the Auckland region has the highest number of SA2s at risk (15 out of 30). This can be attributed to high concentrations of Māori households in the region, facing challenges relating to poverty, health disparities, justice and protection and adaptability issues. Within these SA2s, there are 3,324 Māori households and four marae.
- Northland, Waikato, Bay of Plenty and Hawke's Bay regions are identified as the regions most at risk in terms of their adaptability risk index (one of the measures that make up the overall socio-economic risk). Thames Coast and Pirongia Forest in Waikato, Oponae in the Bay of Plenty and Waipoua Forest and Hokianga North in Northland have been identified as the top five SA2s in terms of adaptability risk.
- The figure presented on map F, highlights the top 30 SA2s in terms of overall socio-economic risk. Households in these areas are potentially the most susceptible to climate change based on their socio-economic risk. It also provides information on the number of Māori households and marae within each SA2.

Refer to Appendix A for a table of the top 30 SA2s that were rated highest in overall socio-economic risk, along with the associated number of Māori households and number of marae in those SA2s.

All SA2s across Aotearoa

- Among all SA2s, Northland emerged as the region with the highest average overall socio-economic risk, followed by Gisborne, Bay of Plenty, Manawatū-Whanganui, Hawke's Bay, and Waikato.
- In contrast, when considering all SA2s together, Auckland has relatively lower overall socio-economic risk.
- In terms of adaptability risk, Northland, West Coast, and Tasman exhibited the highest average values and Auckland, Wellington and Nelson demonstrated the lowest.
- The figure presented on map G presents the number of SA2s and the number of Māori households and marae within each region. It also presents the average overall socio-economic risk index.

Refer to Appendix B for a table of all SA2s by region, that provides details on their overall socio-economic risk, along with the associated number of SA2 and Māori households and number of marae in those SA2s.

SA2s at risk for both climate hazards and socio-economic indicators

A novel aspect of this study is its exploration into the relationship between climate hazards and socio-economic risk indicators and their effects on Māori households. Our analysis, based on data regarding all seven climate hazards and all six socio-economic indices, found:

- Bay of Plenty has the most number of SA2s in the top 20 per cent quantile for both socio-economic and climate hazard risk (28 SA2s), followed by Northland (24 SA2s).
- In the areas identified as very high risk for both overall climate risk and socio-economic risk across Aotearoa, there are 313 marae and 110,934 people, in 31,341 Māori households,
- The top 3 ranked SA2s (based on number of Māori households) identified as most at risk across both overall climate risk and socio-economic risk are: Wairoa in the Hawkes Bay (2 marae and 3,759 people in 1,131 Māori households); Opōtiki in the Bay of Plenty (1 marae and 3,348 people in 912 Māori households); Kaitaia West in Northland (2,772 people in 780 households).

Refer to Appendix J for a comprehensive table of the top regions that were rated highest in overall socio-economic risk and overall climate hazard risk.

MAP F

Top 30 SA2s for socio-economic risk

Auckland

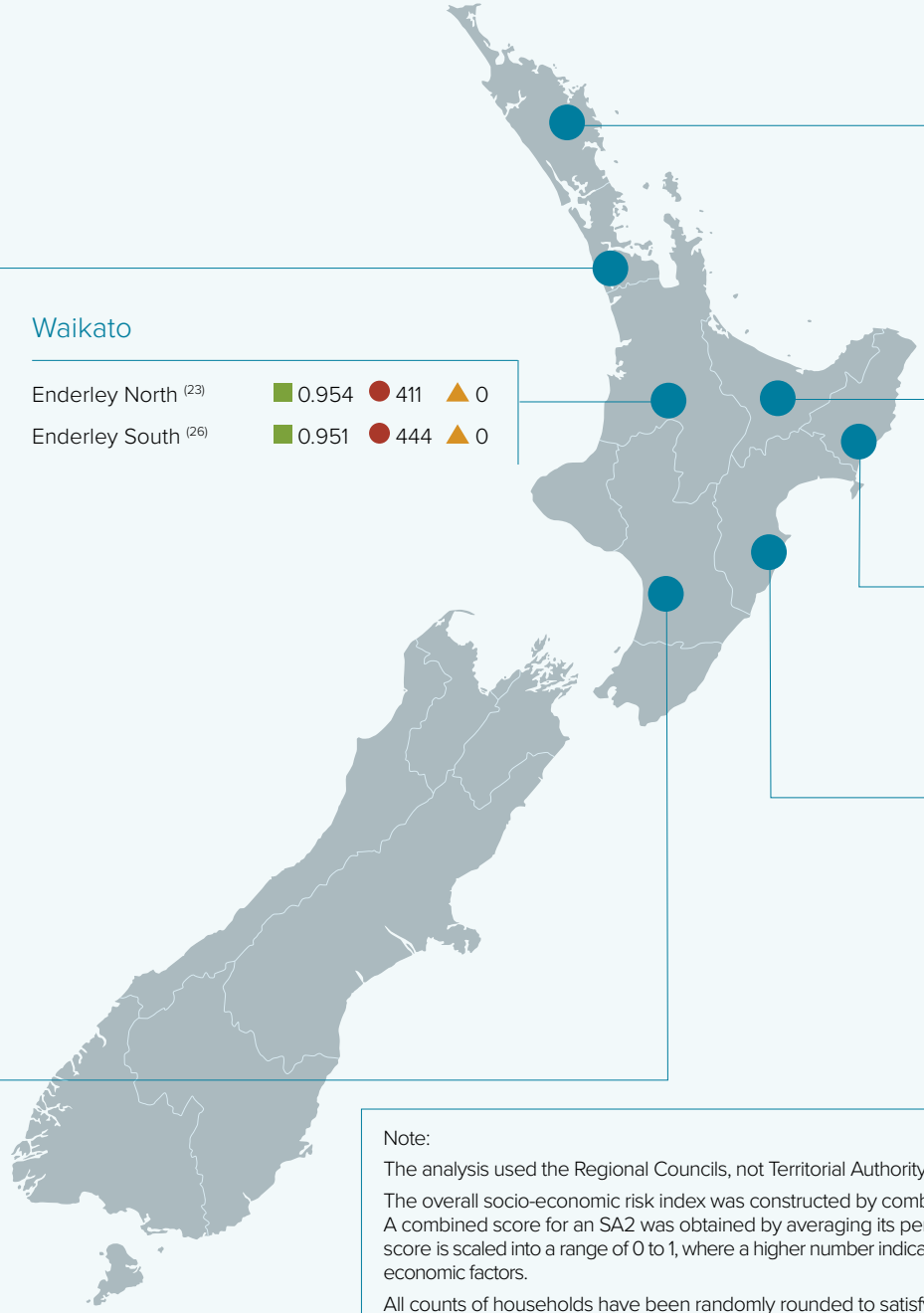
Māngere Mascot [3]	0.998	210	0
Favona West [4]	0.991	168	1
Wesley East [5]	0.990	102	0
Ōtara South [6]	0.988	282	0
Rongomai West [7]	0.984	183	0
Māngere West [8]	0.982	294	0
Harania South [9]	0.980	204	1
Point England [13]	0.975	465	0
Clendon Park East [15]	0.974	216	0
Massey Road West [16]	0.971	237	0
Sutton Park [17]	0.968	204	0
Favona North [18]	0.966	186	0
Māngere South [20]	0.962	171	0
Ōtara West [25]	0.953	282	2
Massey Road South [29]	0.946	120	0

Manawatū-Whanganui

Highbury East [12]	0.976	465	1
Gonville West [14]	0.975	321	0
Taitoko [27]	0.948	297	0

Waikato

Enderley North [23]	0.954	411	0
Enderley South [26]	0.951	444	0



Northland

Otangarei [1]	1.000	498	1
Omahuta Forest-Horeke [11]	0.977	243	9
Tikipunga North [21]	0.957	480	0
Kaitaia West [30]	0.945	780	0

Bay of Plenty

Tauranga Hospital [19]	0.963	249	0
Glenholme North [22]	0.956	480	0

Gisborne

Elgin [24]	0.954	582	0

Hawke's Bay

Camberley [2]	0.999	393	0
Flaxmere South [9]	0.980	498	0
Marewa East [28]	0.947	576	1

Key

- Overall socio-economic risk index
- Number of Māori households
- Number of marae in the SA2 area

Note:

The analysis used the Regional Councils, not Territorial Authority, or Te Puni Kōkiri regions.

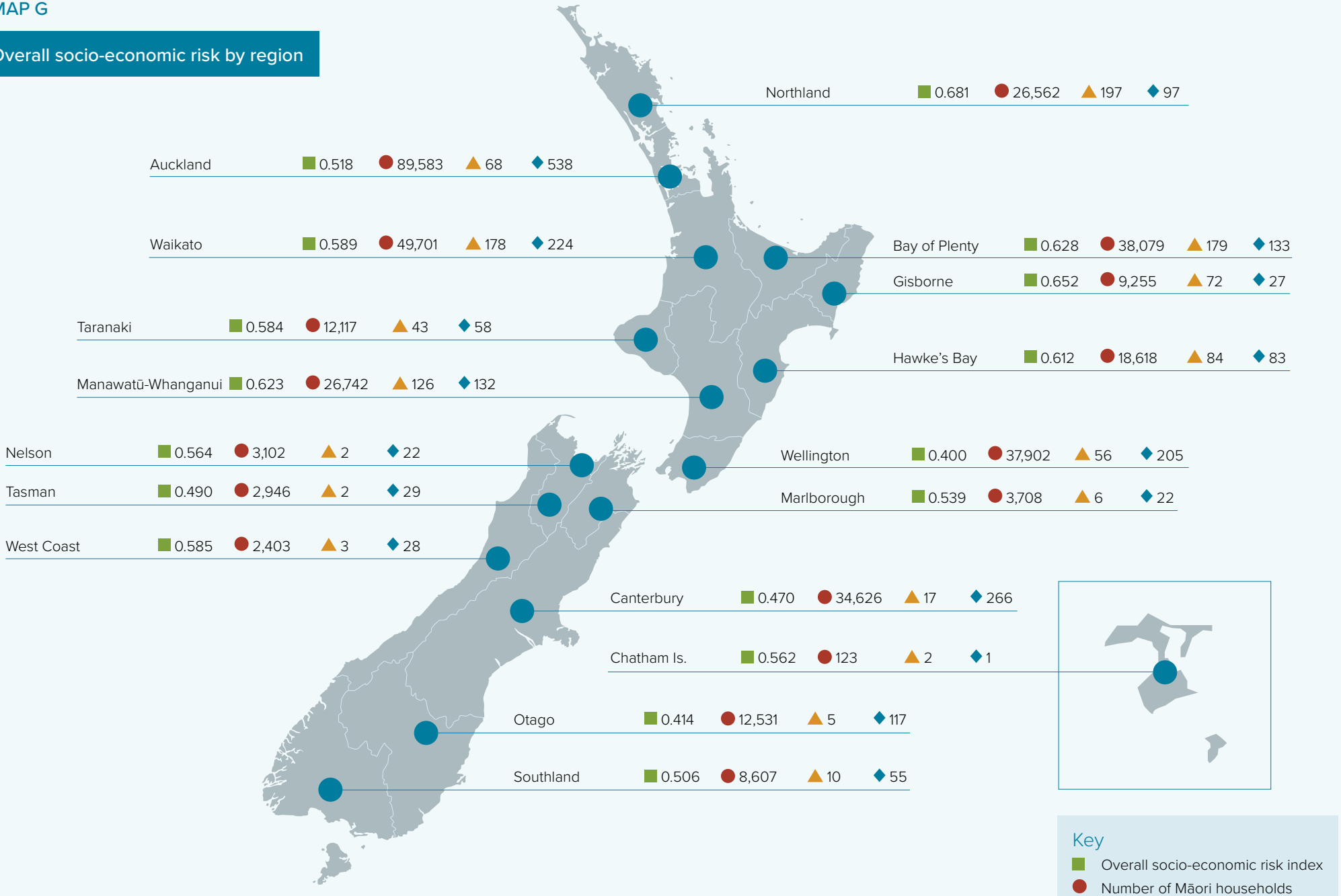
The overall socio-economic risk index was constructed by combining the six socio-economic indices explored in the analysis. A combined score for an SA2 was obtained by averaging its percentage rank on each of the six variables*. The resulting score is scaled into a range of 0 to 1, where a higher number indicates that an area faces relatively greater risks due to socio-economic factors.

All counts of households have been randomly rounded to satisfy Statistics NZ confidentiality requirements. SA2s with 30 or less Māori households were excluded from the analysis.

*A weighting factor of 0.5 was assigned to each of the variables that measured adult and child indices separately.

MAP G

Overall socio-economic risk by region



Note:
These numbers exclude marae that are located in the SA2s with less than 30 Māori households.

Key
- Overall socio-economic risk index
- Number of Māori households
- Number of marae in the SA2 area
- Number of SA2s

Climate Hazards

In this section, we delve into the core findings derived from our research, focusing on the individual climate hazards investigated in our analysis. By examining each hazard separately, we aim to provide an understanding of their specific impacts and implications. These key findings shed light on the unique challenges posed by each hazard and offer valuable insights into their potential consequences.

As we present these findings, it's important to note that our intent is to provide a concise summary of implications at the end of each section, sparking thought and conversation among readers. However, we recognise that developing comprehensive policy solutions requires expertise from policy makers in their respective areas.

Sea level rise

Wet spells

Heatwave days

Extreme rainfall

Extreme hot days

Flooding

Drought

Photo: Damaged road sign in Esk Valley, Hawke's Bay after Cyclone Gabrielle hit in 2023. Photo courtesy of NZDF.

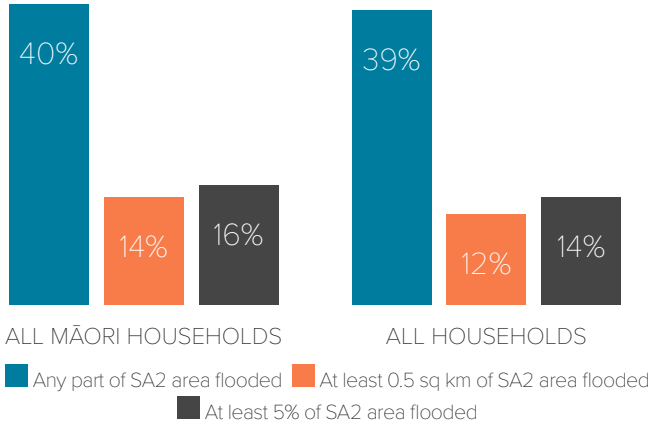
Sea level rise

Our research focussed on examining the areas across Aotearoa that are vulnerable to coastal inundation, considering both the baseline scenario with no sea level rise and a future projection of 50cm sea level rise.

Sea level rise[9] presents a significant concern for hapori Māori, particularly those residing in coastal areas. The physical consequences of sea level rise include the erosion of beaches, coastal inundation, and the loss of marshes and wetlands.

Coastal inundation refers to the flooding of typically dry, low-lying coastal land. This inundation brings about various effects, such as the flooding of roads, walking paths, and reserves, infrastructure damage, and the degradation of drinking water due to saltwater intrusion. Additionally, it has significant implications for the social, cultural, and spiritual wellbeing of communities, as it can lead to the loss of land, cultural sites, and the displacement of communities.

Approximately 14 per cent of Māori households are in areas highly susceptible to coastal inundation due to projected sea level rise.[10]



Key Findings

- Among the top 30 SA2s in terms of projected area exposure to coastal inundation, the Waikato region has the greatest number of SA2 areas affected (six), while Northland has the greatest number of households (1,956) and marae (30) within the affected SA2 areas.
- In these top 30 SA2s, there are a total of 58 marae and 5,838 Māori households. However, further assessment is needed to determine the actual exposure of these households and marae to coastal inundation, as some may be situated in parts of the SA2 that remain unaffected by flooding.
- The Hauraki Plains South and North are projected to have the largest surface areas among the top 30 SA2s, measuring 100 square kilometres and 94 square kilometre, respectively.
- The areas projected to be most exposed have a relatively higher proportion of older Māori households, potentially affecting their adaptive capacity.
- Considering all SA2s, the Waikato region exhibits the largest projected flood area exposed to sea level rise (458.8 km^2).

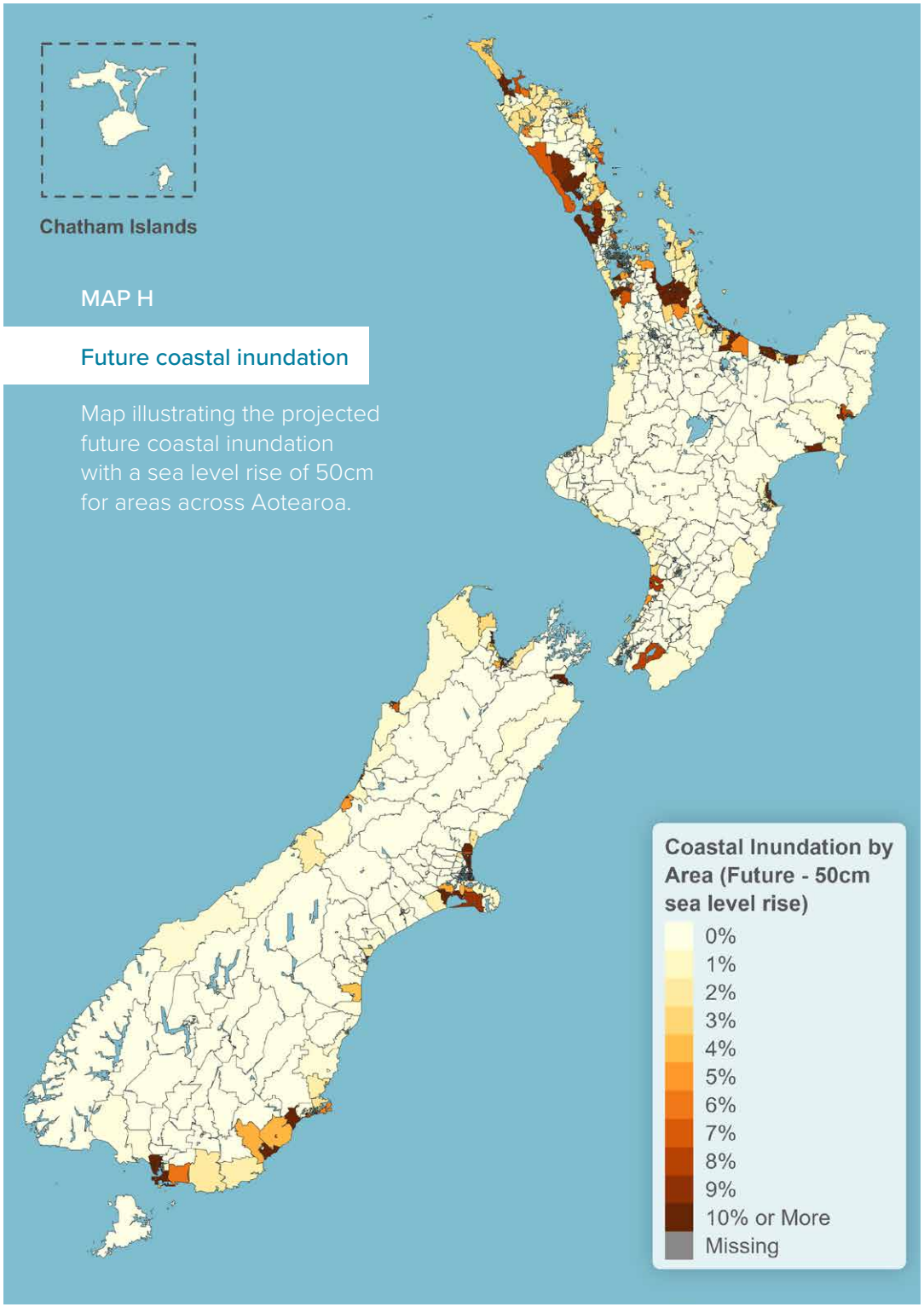
These findings bring attention to the significance of acknowledging and effectively addressing the vulnerabilities and risks experienced by Māori households residing in coastal areas. In particular, it highlights the challenges are more pronounced for older Māori households, necessitating greater adaptability measures. It underscores the need for targeted strategies, well-planned interventions, and continuous assessments to safeguard the resilience and wellbeing of this group.

Policy initiatives that prioritise fostering strong social networks and community cohesion could prove key focus areas, ensuring vulnerable groups have the necessary support systems to aid in their adaptability to changing environmental conditions. By implementing such policies, we can strengthen their ability to cope with the challenges posed by sea level rise and create a more sustainable and inclusive environment for all members of the community.

For a summary of the top SA2 areas identified at risk of sea level rise, please refer to Appendix C. The table includes information on the projected flood area in square kilometres, as well as the number of Māori households and marae in the affected SA2s.

9 For sea level rise, the choice of threshold was more intuitive than for other climate variables, such as heatwave days or wet spells, because we expected any level of inundation would affect people's health and wellbeing and that the magnitude of the impact on people's health and wellbeing would increase in proportion to the flooded area. We selected three different thresholds associated with inundation 1) any level of inundation; 2) at least 5% of the SA2 was flooded and 3) at least 500sqkm within the SA2 area was flooded.

10 Located in an SA2 area projected to experience at least 0.5 square kilometres of coastal inundation with a future sea level rise of 50cm.



MAP H

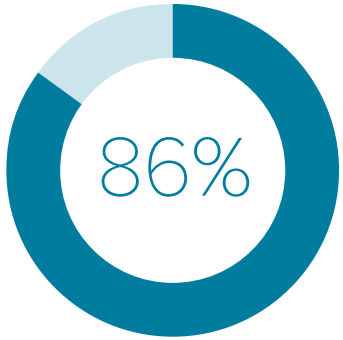
Future coastal inundation

Map illustrating the projected future coastal inundation with a sea level rise of 50cm for areas across Aotearoa.

Flooding

Our research focused on examining areas prone to flooding by using composite flood hazard area maps provided by regional and district councils to NIWA. These maps were created from modelled and historic flood hazard maps and flood prone soil maps, publicly available in August 2018.

Flooding has significant direct and indirect impacts on people's health and wellbeing. As evidenced by the extreme weather events of early 2023, it can cause extensive physical damage to employment sites, personal property, and critical infrastructure, including homes, roads, and utilities. Additionally, flooding can result in displacement, disruptions to families, community facilities, and essential services. In the worst cases, it poses a significant threat to human life. The aftermath of such damage can lead to prolonged displacement, loss of belongings, and emotional distress for affected individuals and families. The social and psychological effects can be profound, enduring, and wide-ranging.



Currently 86 per cent of Māori households are situated in SA2 areas exposed to some level of flooding.

Key Findings

- The SA2s areas with a flooding risk of at least half a square kilometre have a slightly higher proportion of Māori households (37 per cent) compared with all households (34 per cent).
- Among the top 30 SA2s at high flood risk (95%+ area flooded), there are 6 marae exposed to flooding. Additionally, these areas are home to 4,761 Māori households. The regions with the highest number of Māori households in this list are in Auckland, Bay of Plenty, Canterbury, Gisborne, Hawke's Bay, Manawatū-Whanganui, Otago, Southland, Tasman, Waikato, and Wellington regions.
- The majority of SA2s exposed to flooding have at least one area of heightened risk associated with health, poverty, and justice, surpassing the average level of risk. This indicates that communities facing higher exposure to flooding may also be more vulnerable due to their heightened socio-economic risk. On the other hand, the average adaptability risk for households in these exposed SA2s is generally lower than average suggesting higher resilience than average.

These findings emphasise the need for implementing comprehensive flood management strategies and resilience-building initiatives that target the challenges encountered by Māori households. One approach for example could be the development of policies that focus on supporting households facing higher socio-economic risks due to poverty and justice issues. Such policies can provide targeted assistance and resources to help these communities better prepare for and respond to flooding events.

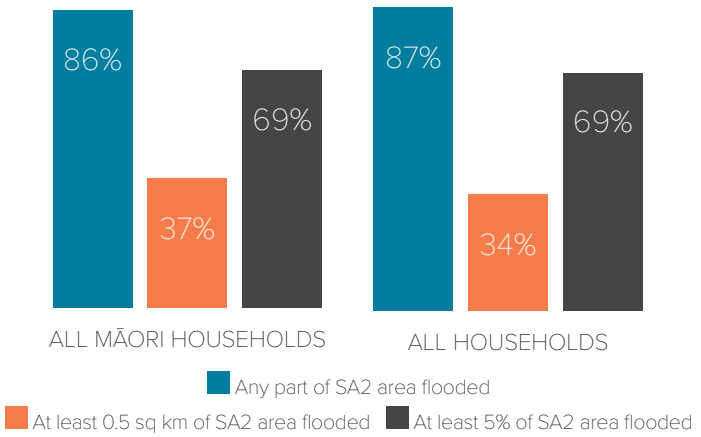
Moreover, proactive measures to enhance the resilience of infrastructure across Aotearoa is an important focus area. By investing in infrastructure improvements, we can reduce the impact of flooding and protect critical assets, ensuring the safety and wellbeing of the communities they serve.

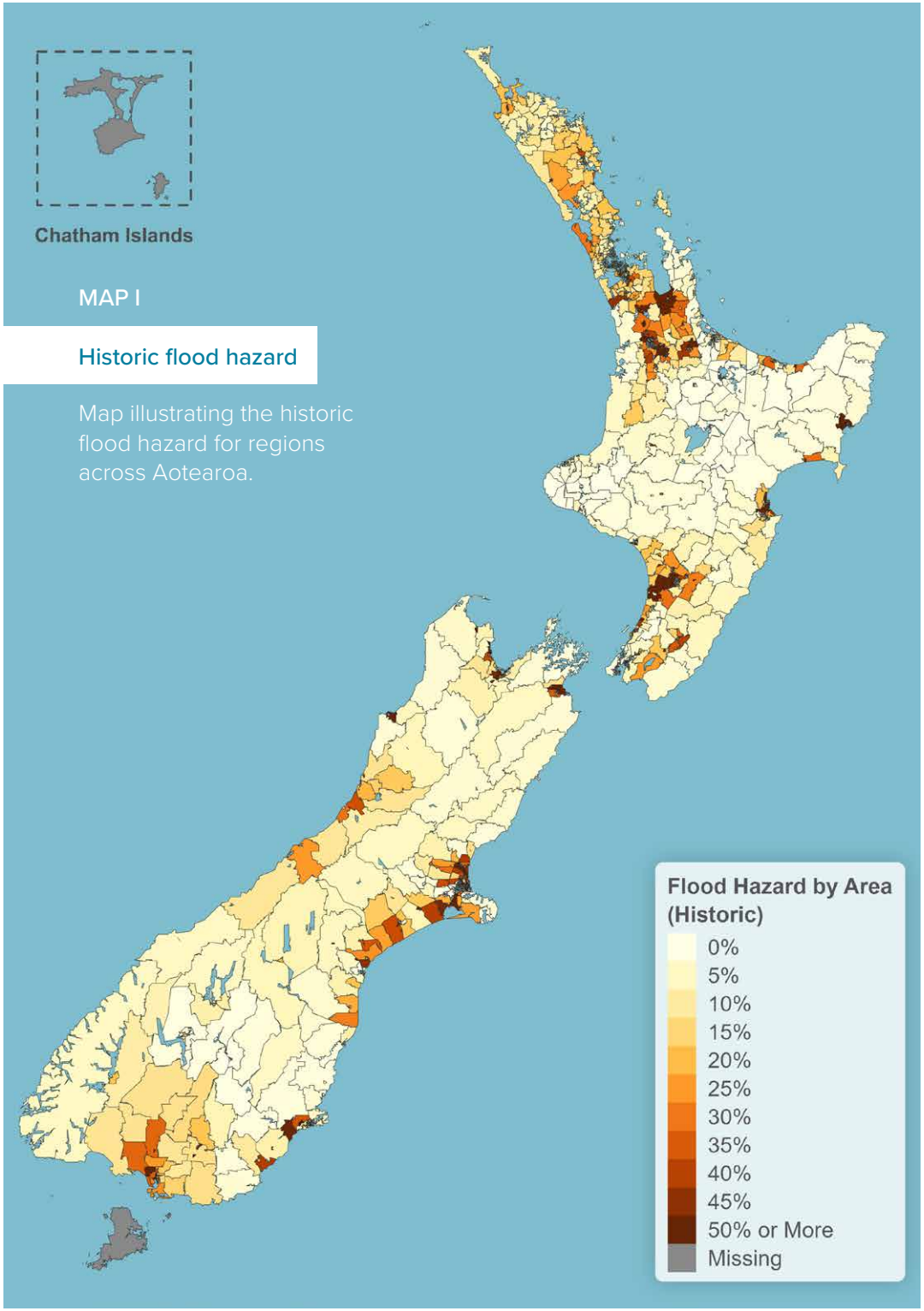
In parallel, fostering community engagement and preparedness becomes equally important. Building a sense of shared responsibility and preparedness within communities can strengthen their ability to respond effectively to flood events and facilitate a more cohesive and supportive environment during challenging times.

By combining these approaches, we can significantly minimise the adverse effects of flood events and enhance the overall resilience of Māori households and communities, ensuring a safer and more sustainable future for all.

Appendix D lists the top 30 SA2s at risk of flood based on the proportion of SA2 area flooding. It includes information on Māori household numbers in each SA2 and the number of marae exposed to flood risk.

86 per cent of Māori households are in areas exposed to some level of flooding.





MAP I

Historic flood hazard

Map illustrating the historic flood hazard for regions across Aotearoa.

Extreme rainfall and wet spells

Our research focused on two climate hazards related to rainfall: wet spell days (the number of days per year with rainfall exceeding 1mm for five or more consecutive days) and extreme rainfall (the number of days per year with rainfall greater than 30mm). These hazards have different effects on people. The wet spells day indicator was selected to cover impacts such as housing-related health problems and mental health issues. The extreme rainfall indicator was selected to cover displacement due to landslides, infrastructure failure and resulting effects e.g., water contamination.

In Aotearoa, extreme rainfall and wet spells are already relatively common occurrences. Often, a significant amount of precipitation transpires within a few hours, resulting in severe flooding and landslide risks (as observed during the severe weather events of early 2023). The mountainous topography of Aotearoa can alter and amplify precipitation, leading to frequent heavy rainfall events.

Older Māori households are more likely to be located in areas at risk of extreme rainfall.

All regions are projected to experience some increase in extreme rainfall and wet spell days in the future.

West Coast and Taranaki are the areas most vulnerable to future extreme rainfall and wet spells.

Prolonged periods of wet spells and extreme rainfall can give rise to various hazards, including flooding, landslides, damage to buildings and infrastructure (including culturally significant sites), and disruptions to transportation and communication systems. Such significant rainfall events can also have substantial health-related impacts, such as housing-related health problems and mental health issues.

Key Findings

- Within the top 30 SA2s where extreme rainfall and wet spells are projected to have a significant impact, there are 2,901 Māori households projected to be most affected by extreme rainfall and 3,081 Māori households projected to be most affected by wet spells.
- Wet spells and extreme rainfall events are projected to impact a smaller number of Māori households compared to other climate events. However, the analysis revealed that most Māori households across the country are in SA2 areas that will see an increase in extreme rainfall days in the future. This has implications for infrastructure, housing, and public health, particularly in flood-prone areas, thereby indirectly affecting hapori Māori.
- The West Coast and Taranaki have been identified as the top two regions projected to have the highest exposure to future extreme rainfall and wet spells.
- The areas projected to experience changes in extreme rainfall and wet spells events have a relatively higher proportion of older Māori households. This suggests potential challenges in adapting to these events. However, these areas were found to have relatively low risk in other domains such as health, poverty, and justice and protection-related issues.

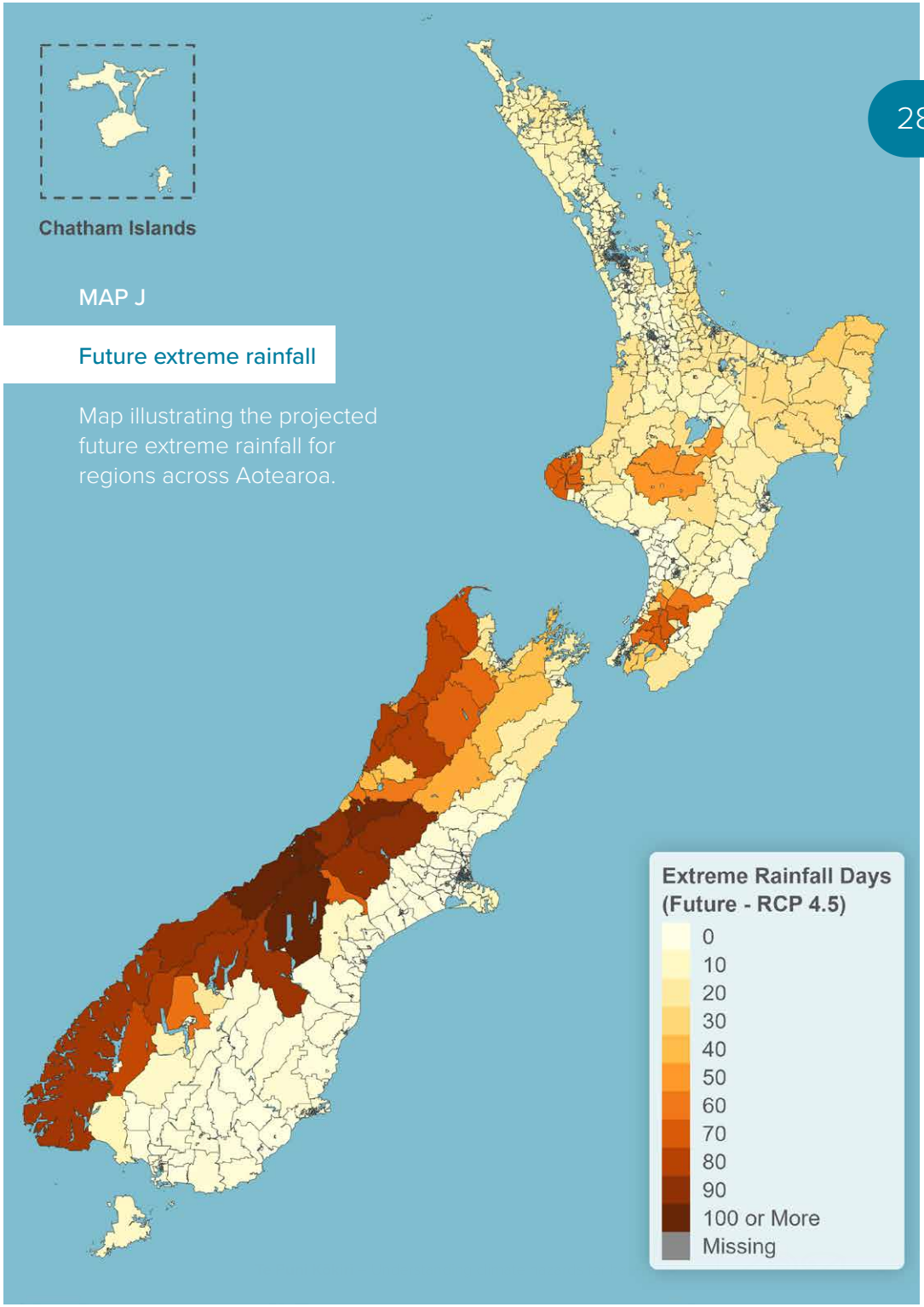
Although extreme rainfall and wet spell days are projected to impact fewer Māori households directly, it remains crucial to recognise the potential indirect consequences on hapori Māori. These findings underscore the importance of implementing targeted interventions nationwide to mitigate such impacts.

For example, one approach could be investing in infrastructure resilience, especially in areas that have already experienced significant damage during extreme weather events in 2023. By bolstering roading and other critical infrastructure, we can better prepare these regions for future challenges and reduce potential disruptions to communities.

Additionally, effective land management strategies play a vital role in enhancing resilience. Adopting approaches that align with te ao Māori perspectives can be pivotal in safeguarding the land and its resources, protecting communities, and preserving cultural heritage.

Furthermore, fostering community preparedness specifically for extreme wet weather events is essential. Empowering communities with knowledge, resources, and support networks can significantly improve their ability to respond and recover when faced with adverse weather conditions.

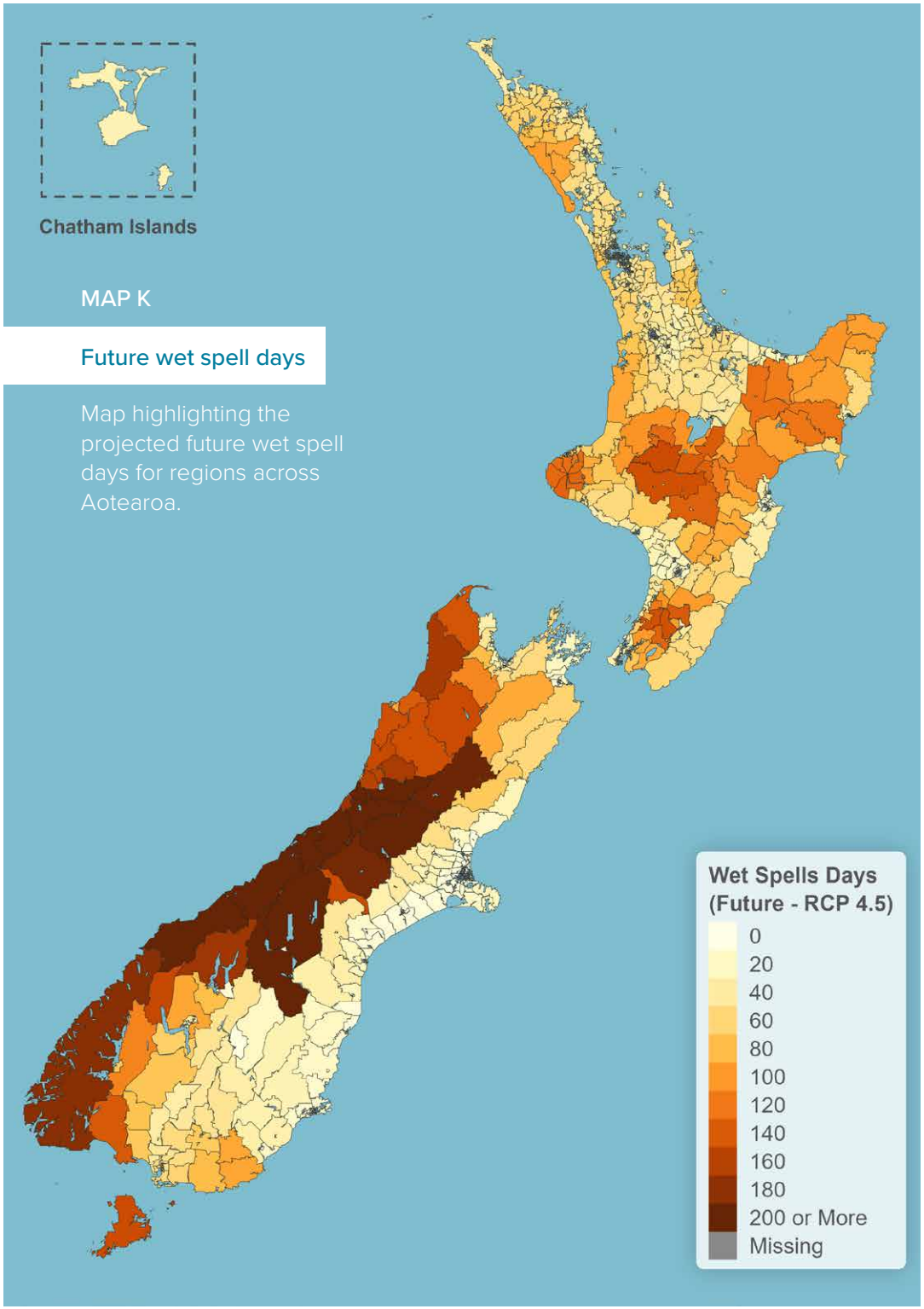
For a summary of the top SA2 areas projected to have the highest exposure to extreme rainfall and wet spells days, please refer to Appendix E and F. The tables include information on the projected number of wet spell days and extreme rain days, as well as the number of Māori households and marae in the affected SA2s.



MAP J

Future extreme rainfall

Map illustrating the projected future extreme rainfall for regions across Aotearoa.



MAP K

Future wet spell days

Map highlighting the projected future wet spell days for regions across Aotearoa.

Heatwaves, extreme hot days & droughts

Our research focused on three climate hazards related to dry periods: extreme hot days (the number of days per year with maximum temperatures exceeding 30°C), heatwave days (the number of days per year with maximum temperatures exceeding 25°C for three or more consecutive days), and drought (the probability of Potential Evapotranspiration Deficit, PED exceeding 200mm).

Extended dry periods, including droughts, are experienced in New Zealand in most years, and their frequency is increasing. Droughts occur due to inadequate precipitation over an extended period, leading to soil dryness and reduced water levels in rivers, streams, lakes, and dams. In recent years, the impact of droughts has been evident, such as the half-empty dams in Auckland during the 2019-2020 summer and severe meteorological droughts affecting the North Island and parts of the South Island. Notably, regions like Thames-Coromandel and Northland have experienced prolonged drought periods.

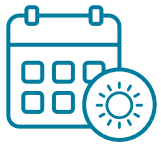
Heatwaves are characterised by sustained and significantly higher temperatures than the usual climate values of a specific location. Global warming has contributed to the increased frequency and intensity of heatwaves worldwide. Heatwaves often occur alongside other climate hazards, such as droughts and wildfires.

The impacts of heatwaves and droughts encompass economic, environmental, and social dimensions. Droughts can severely affect agriculture, leading to limited food and water availability for animals, increased fire risk, and challenges related to water quality and availability. Heatwaves have direct health implications, especially for vulnerable individuals with pre-existing medical conditions.

Key Findings

- Heatwaves, extreme hot days, and droughts are projected to affect a substantial number of Māori households in the future:
  - Approximately 86 per cent of Māori households are located in areas projected to experience an increase in the frequency and intensity of extreme hot days.
  - All Māori households are expected to experience an increase in the number of heatwave days, with 93 per cent potentially seeing a rise of 10 per cent or more.
  - Nearly all Māori households are situated in areas projected to experience some level of increase in the drought indicator.
- The Bay of Plenty, Otago and Gisborne are the regions with the highest number of SA2s in the top 30 projected to experience heatwave days in the future. Otago and Canterbury have the highest number of SA2s projected to experience extra hot days. For droughts, Otago, Marlborough, Canterbury have the greatest number of SA2s predicted to be most affected.
- Notably, only three of the top 30 SA2 areas projected to be exposed to extreme hot days have overall above-average socio-economic risk scores, with all areas having below-average poverty risk. Just over half of these areas exhibit higher-than-average adaptability risk index values.
- Overall, the top 30 SA2 areas projected to be exposed to drought have relatively low socio-economic risk, although about one-third exhibit above-average poverty and/or justice-related risk.

A significant number of Māori households are projected to be exposed to heatwaves and droughts.



93% of Māori households are expected to experience 10% or more increase in heatwave days.

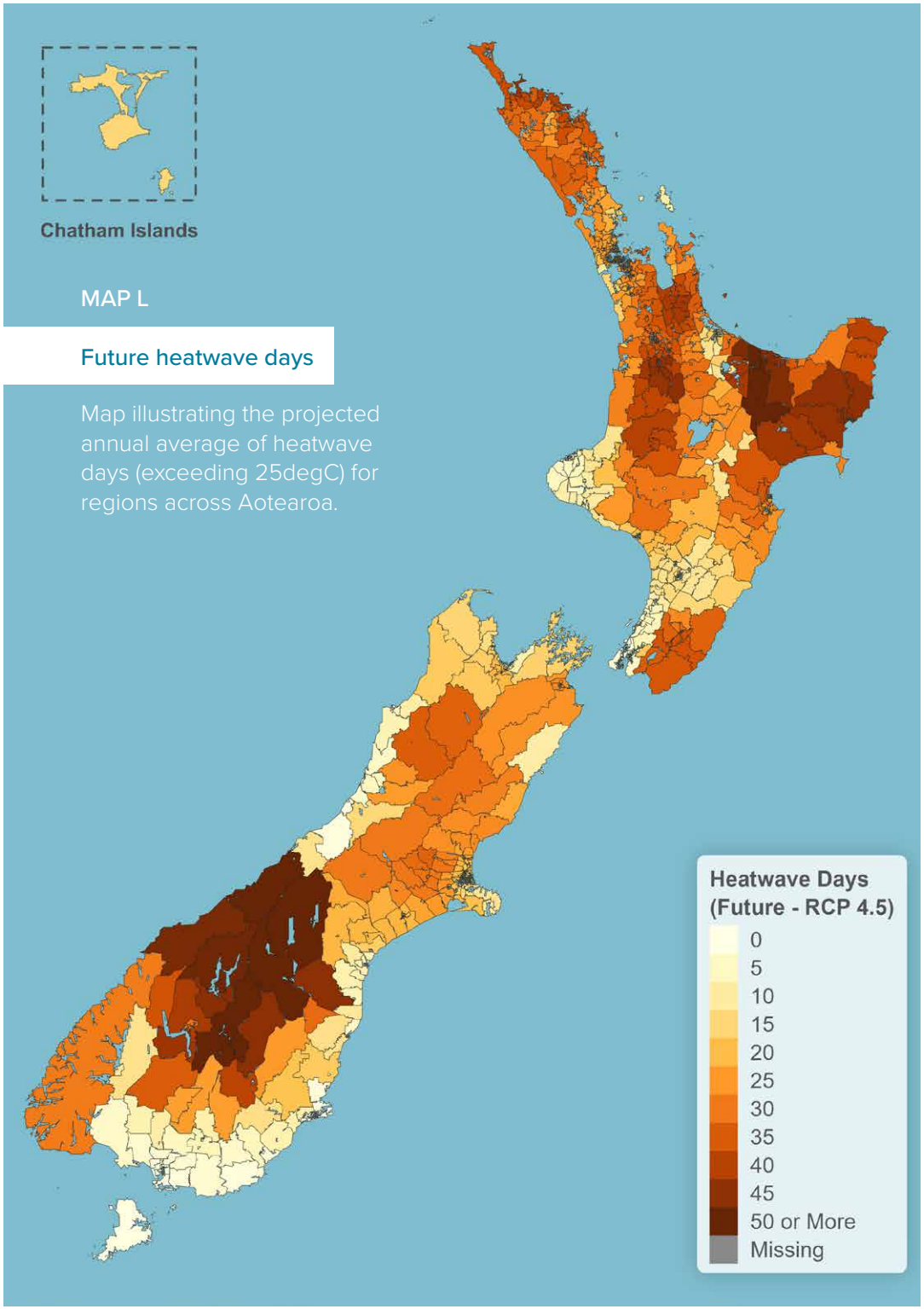
Nearly all Māori households face increasing drought risk.

Given the substantial impact these hazards will have on Māori households in the future, these findings strongly emphasise the need to implement targeted strategies that effectively mitigate the effects of heatwaves and droughts on hāpori Māori. It is essential to prioritise the wellbeing of vulnerable groups within these communities, such as the elderly and individuals with pre-existing health conditions.

For example, to address heat-related challenges, implementing targeted te ao Māori health policies could be a key focus area. These policies can raise awareness about heat-related illness symptoms and educate at-risk groups on when and how to seek treatment, ensuring their safety and wellbeing during heatwaves.

Furthermore, droughts will likely significantly affect Māori communities, especially in rural areas heavily reliant on agriculture and primary industries. It is essential to carefully address these vulnerabilities and take proactive measures to enhance the resilience of the Māori economy in regions identified as most susceptible to drought.

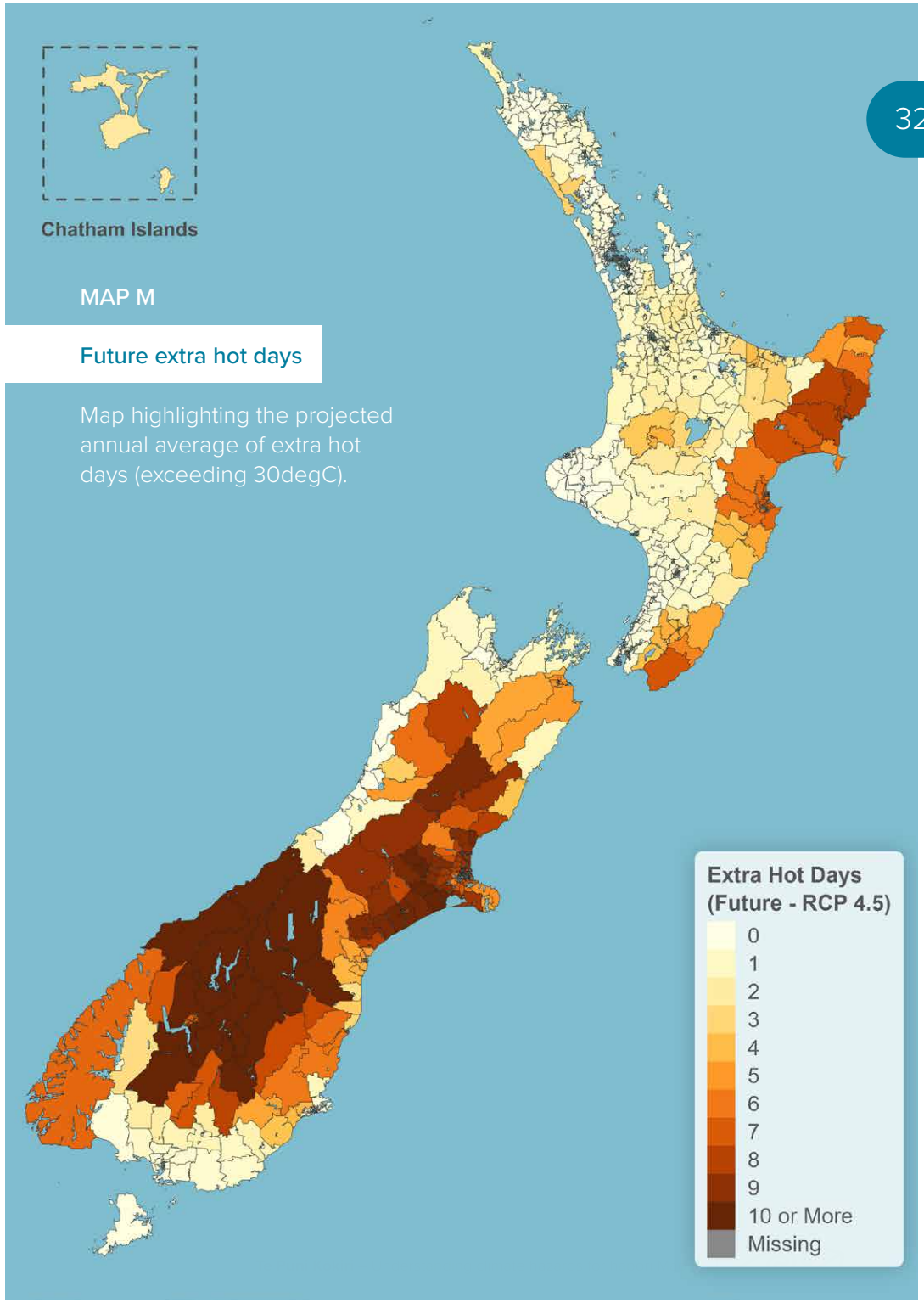
For a summary of the top SA2 areas projected to be at risk of heatwaves, extreme hot days, and droughts, refer to Appendix G, H and I. The tables include information on the number of Māori households and marae in the affected SA2s.



MAP L

Future heatwave days

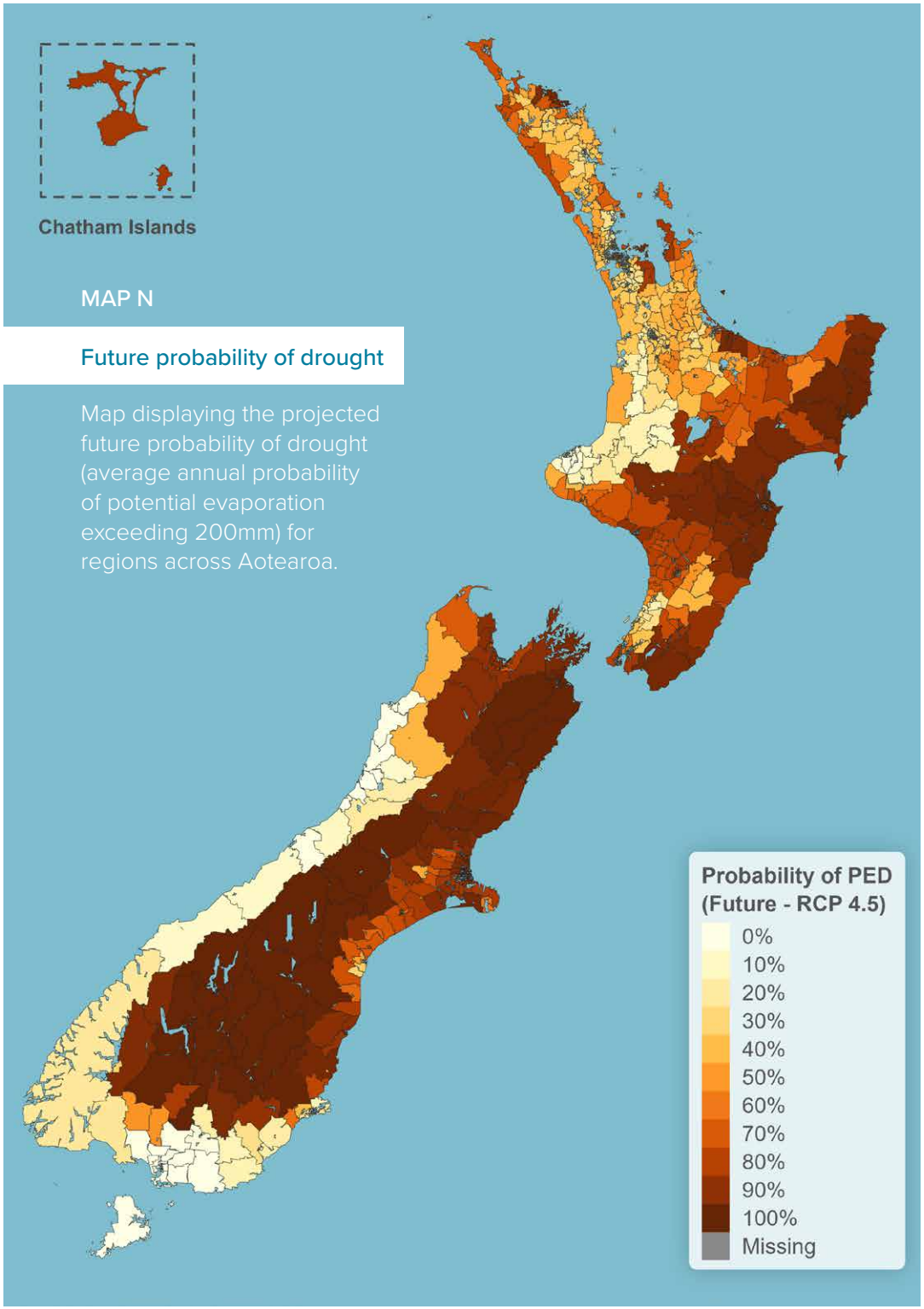
Map illustrating the projected annual average of heatwave days (exceeding 25degC) for regions across Aotearoa.



MAP M

Future extra hot days

Map highlighting the projected annual average of extra hot days (exceeding 30degC).



MAP N

Future probability of drought

Map displaying the projected future probability of drought (average annual probability of potential evaporation exceeding 200mm) for regions across Aotearoa.

Next Steps

Strengthening our understanding and engagement

Building upon the findings of this report, Te Puni Kōkiri recognises the importance of further research and analysis to refine our understanding of the socio-economic circumstances and resilience of hapori Māori exposed to climate hazards.

The following section outlines some of the key areas we intend to focus on in future iterations of this research to deepen our knowledge and engagement, ensuring that policies and interventions are informed by hapori Māori perspectives and priorities.

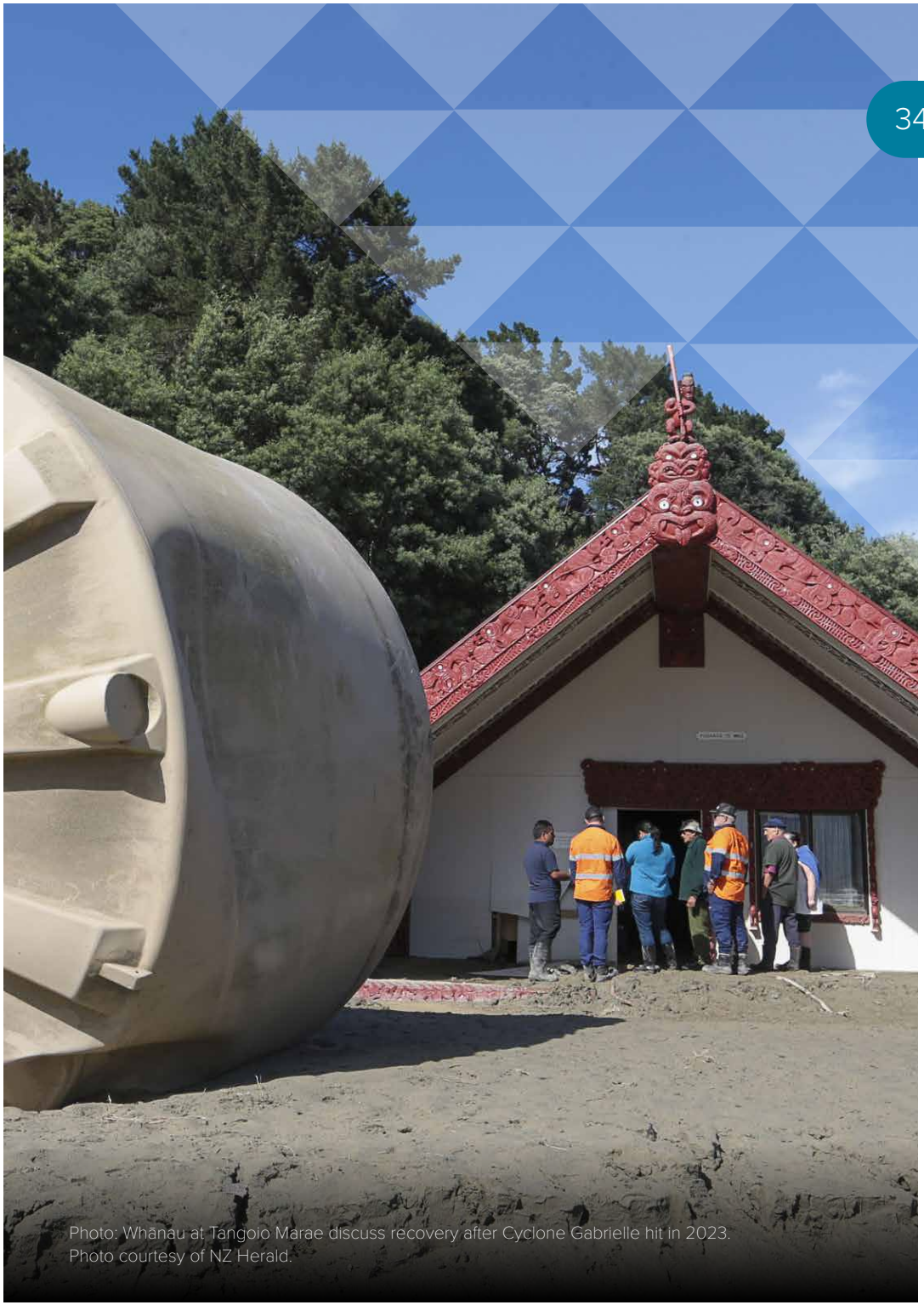


Photo: Whānau at Tangoio Marae discuss recovery after Cyclone Gabrielle hit in 2023. Photo courtesy of NZ Herald.

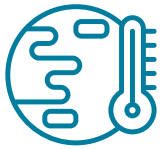
Key focus areas

Expanding data and analysis

We will continue to explore additional datasets and sources of information to enhance our understanding of the socio-economic risks faced by Māori households. This will involve analysing new data on climate hazards, social indicators, and their intersection, allowing for a more comprehensive assessment of vulnerability and resilience. Additionally, we will explore the potential opportunities that may arise from climate change.

Qualitative studies and community perspectives

Recognising the importance of community-specific factors, we will collaborate with our regional teams to capture the nuanced experiences, challenges, and aspirations of hapori Māori across Aotearoa. Engaging directly with communities will enable us to incorporate their perspectives, ensuring that our policies and interventions are culturally relevant and responsive.



Climate adaptation strategies

We acknowledge that this research does not consider existing or planned climate adaptation measures, such as Council, iwi or hapū climate adaptation plans. In future iterations, we will explore how these measures could be integrated or considered, taking into account their impact on a community's ability to adapt to climate change.

Collaboration and knowledge sharing

We intend to continue to foster collaboration and knowledge sharing among government agencies, iwi, hapū, hapori Māori and whānau. By pooling resources, sharing expertise, and collectively addressing the challenges of climate change, we can maximise the effectiveness of our efforts and ensure a coordinated response.

Enhancing data accessibility

We will create opportunities for hapori Māori to access well managed and trusted data to mitigate and identify risks due to climate change. This will include investment in infrastructure, capability, and data management approaches that enable iwi, hapū and Māori to adapt, thrive and lead in the face of climate change.

By undertaking these next steps, we aim to strengthen our understanding of the socio-economic circumstances and resilience of Māori communities. Through robust research, inclusive engagement, and strategic collaboration, our intent is to enable this data to empower hapori Māori to adapt, thrive, and lead in the face of climate change.

Recommendations and implications for policy makers

The findings of our research provide valuable insights into the challenges faced by Māori households and communities in the context of climate change. Based on these key findings, we present the following recommendations to policymakers, incorporating the specific needs and vulnerabilities identified. These implications are intended to encourage thoughtful discussions, though they are not exhaustive.

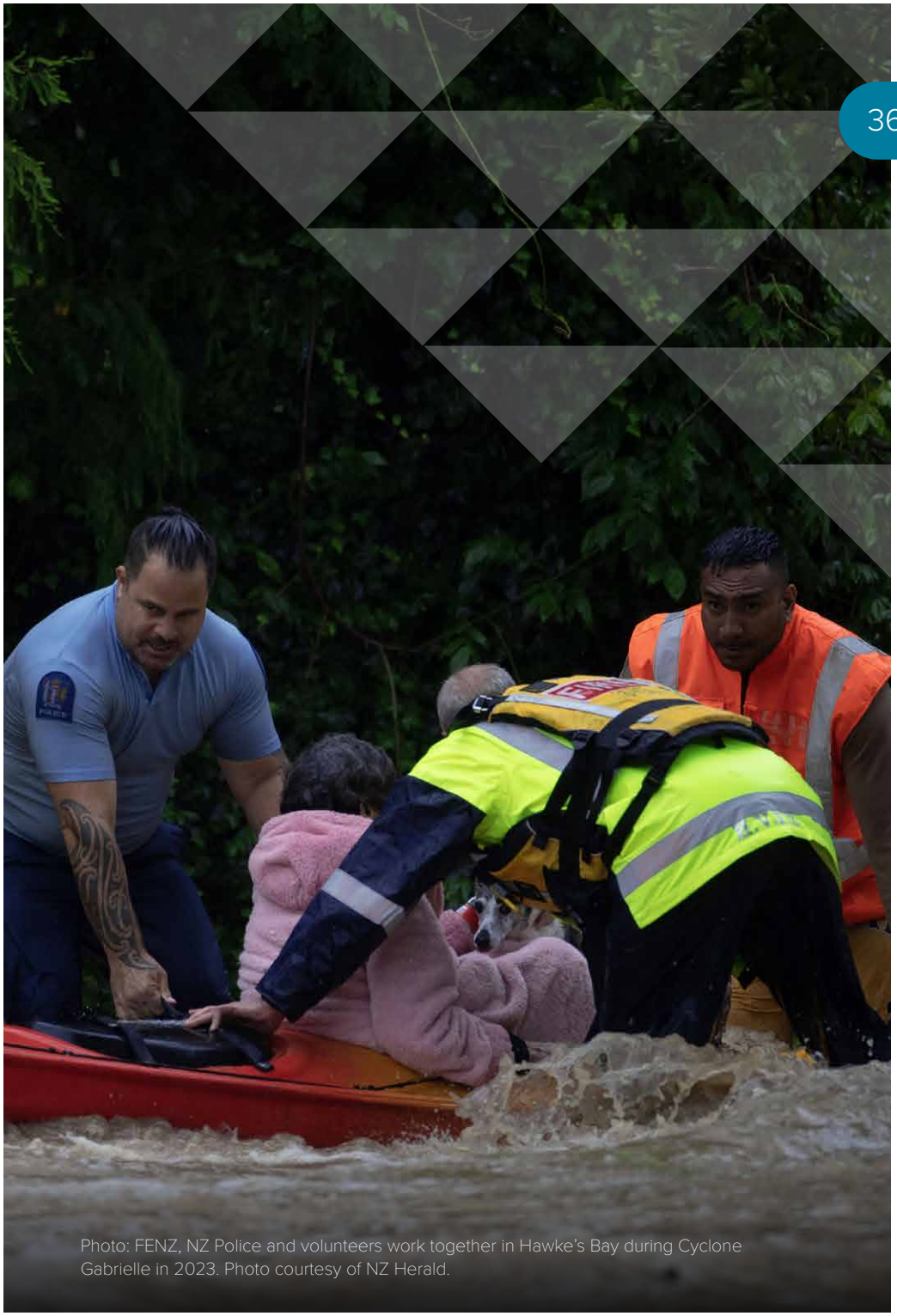


Photo: FENZ, NZ Police and volunteers work together in Hawke's Bay during Cyclone Gabrielle in 2023. Photo courtesy of NZ Herald.

Recommendations

1. Targeted support for climate-exposed communities

Policymakers should prioritise targeted support for Māori households and communities exposed to climate hazards, particularly those identified in the research as most exposed to the climate hazards we explored (sea level rise, wet spell days, extreme rainfall, flooding, extra hot days, heatwaves, and drought). This support should address the socio-economic risks specific to these communities, including poverty, health disparities, and adaptive capability. For instance, the research found that the many of the SA2s exposed to flooding have heightened risks associated with health, poverty, and justice, suggesting that communities facing higher socio-economic challenges may be more vulnerable to the impacts of flooding. Additionally, areas projected to be most impacted by sea level rise have a relatively higher proportion of older Māori households, potentially affecting their adaptive capacity. Adopting targeted approaches that consider these needs and challenges and align with te ao Māori perspectives, will safeguard and improve the ability of these groups to respond and recover when facing adverse climate hazards.

2. Community engagement and co-design

Policymakers should actively engage with hapori Māori and groups representative of Māori rights and interests to foster collaborative and inclusive decision-making processes, ensuring the challenges identified in this report are thoroughly considered. For instance, the research indicates that adaptability risk was found to be low for Māori households in cities and higher in rural areas. By actively involving hapori Māori from both rural and urban centres in decision-making, policymakers can tap into their wealth of knowledge and expertise, leading to more effective and culturally relevant solutions. This inclusive approach should involve fostering partnerships and collaborations and taking care to ensure those representative of various rights and interests are engaged at the right time in the right way.

3. Strengthening adaptive capacity

Policymakers should prioritise initiatives that enhance the adaptive capacity of Māori households and communities, considering the specific challenges identified in this research. This may for example involve providing tailored resources, training, and support to older households in coastal areas and fostering social networks, community cohesion, and cultural practices that contribute to resilience-building.

4. Acknowledge and uphold Māori rights and interests

Policy measures need to acknowledge and uphold Māori rights and interests, valuing and incorporating mātauranga-a-iwi and mātauranga-a-hapū into addressing climate-related risks. By integrating Māori perspectives and principles, policies can be more effective and culturally relevant, aligning with the specific needs and aspirations of hapori Māori.

5. Prioritise equity and inclusivity

Policies and interventions should prioritise equity and inclusivity, recognising the unique socio-economic circumstances and cultural considerations of hapori Māori, as explored in this analysis. Meaningful engagement with iwi, hapū, and hapori Māori is essential to foster inclusive decision-making processes. This ensures that policies avoid maladaptation and genuinely reflect the needs and aspirations of hapori Māori, promoting a more equitable and inclusive approach to climate resilience.

6. Monitoring and evaluation

Policymakers should establish robust monitoring and evaluation frameworks to assess the effectiveness of climate change policies and interventions. Regular monitoring allows for adaptive management and ensures that policies remain responsive to the evolving needs and challenges faced by hapori Māori, as highlighted in the research.

7. Enhance understanding through data and research

Continued investment in data collection and research is necessary to deepen our understanding of the exposure, vulnerability, and resilience of hapori Māori to climate change. Policymakers should support comprehensive data collection, including qualitative insights, to capture the lived experiences and perspectives of Māori households. Identifying data limitations and research gaps can guide future efforts to ensure policies are well-informed and responsive. For example, it is essential to consider that Māori may face climate hazards beyond those explored in this first-step analysis, in locations such as workplaces, schools, hospitals, and other settings. Additionally, the impact of climate hazards on infrastructure, including wāhi tapu (sites of cultural significance), and the subsequent impact on community resilience, was not explored. Taking these factors into account, Māori may experience a disproportionate level of exposure to climate hazards compared to the overall population. Therefore, advancing data and research efforts in these areas will contribute to a more comprehensive and nuanced understanding of the challenges faced by hapori Māori, ultimately informing more effective and inclusive policies.

8. Integrate both mitigation and adaptation strategies

It is crucial to adopt a comprehensive approach that combines mitigation efforts to reduce greenhouse gas emissions with adaptation strategies that enhance the resilience of Māori communities. This may involve supporting sustainable livelihoods, improving access to essential services like healthcare and education, and preserving cultural heritage. Additionally, incorporating nature-based solutions, such as ecosystem restoration and conservation, can contribute to climate change mitigation and adaptation while providing co-benefits for biodiversity and community wellbeing.

By integrating these recommendations into policymaking processes, policymakers can take concrete steps towards enhancing the resilience of Māori households and communities. It is essential to prioritise the wellbeing, empowerment, and representation of iwi, hapū and hapori Māori in climate change decision-making. Through targeted policies, inclusive approaches, and collaborative efforts, we can work towards a climate-resilient future that supports the unique needs and aspirations of hapori Māori.

Additional Resources for Policy Makers

In addition to the findings and recommendations presented in this report, policy makers can benefit from accessing additional resources and frameworks to support their decision-making processes and enhance their understanding of climate change impacts on Māori households and communities. The following resources are recommended:

1. Rauora Framework[11]

Developed by Ihirangi, the operational arm of Te Pou Take Āhuarangi (Climate Lead) for the National Iwi Chairs Forum, the Rauora Framework outlines a set of cohesive cultural values and principles from which to approach climate action. It promotes transformative action as a means through which resilience can be strengthened. The principles of balance, interconnectedness, working together and inter-generational equity are outlined and complemented by a set of Māori values.

2. Ngā Kōrero Āhuarangi me te Ōhanga: Climate Economic and Fiscal Assessment 2023 (CEFA)[12]

Seeks to bring together what we know about the potential economic and fiscal implications of climate change for New Zealanders. It provides a framework for understanding potential climate change impacts, as well as new analysis on the potential costs of overseas emissions reductions to meet New Zealand's Paris Agreement commitments.

3. Me Tū ā-Uru[13]

Is an action plan created to address the inter-related crises we all face, such as climate change, biodiversity decline, poverty and homelessness. Recommendations within the report specifically target the governance of te taiao, but many can also be applied to other aspects of life. They are grouped under four themes: whanaungatanga (relationships); utu (balance and reciprocity); mātauranga (knowledge and ways of seeing); and mana and rangatiratanga (authority with care).

These additional resources provide valuable tools, frameworks, and perspectives to inform policy making and enhance the understanding of the challenges faced by hapori Māori in the context of climate change. By utilising these resources and engaging with relevant stakeholders, policy makers can enhance their approaches to creating inclusive, resilient, and sustainable policies that benefit all communities in Aotearoa.

11 Ihirangi 'Rauora – A Climate Change Framework' chapter 2 pg. 30 Aotearoa New Zealand's first national adaptation plan [April 2022] at www.environment.govt.nz.

12 The Treasury and Ministry for the Environment 'Ngā Kōrero Āhuarangi me te Ōhanga: Climate Economic and Fiscal Assessment 2023' [April 2023] at www.treasury.govt.nz.

13 New Zealand's Biological Heritage National Science Challenge Ngā Koiora Tuku Iho, Adaptive Governance and Policy Working Group 'Me Tū ā-Uru' [2023] at www.metuauru.co.nz.

Conclusion

This analysis has provided valuable insights into the challenges and vulnerabilities faced by Māori households and communities in the context of climate change.

The findings underscore the importance of targeted policies and interventions that address the socio-economic risks and enhance the resilience of hapori Māori. Upholding Māori rights and interests, integrating Māori perspectives and principles, and adopting a comprehensive approach that combines mitigation and adaptation strategies are key considerations for policy makers. By leveraging resources such as the Rauora Framework, Me Tū ā-Ūru, and CEFA, policy makers can access valuable tools and frameworks to inform their decision-making and effectively address the unique challenges posed by climate change.

Looking ahead, continued research, community engagement, and collaboration among government agencies, iwi, hapū, and hapori Māori will be essential for fostering a climate-resilient future that supports the wellbeing and thriving of Māori communities in Aotearoa. By integrating these findings and recommendations into policy design and implementation, we can work towards equitable and sustainable solutions that empower hapori Māori and contribute to a more resilient and inclusive society.

Photo: The Whenua Māori Fund enabled Ōmaio Kiwifruit Development Project partners to examine nine land blocks for potential conversion from maize to kiwifruit production.

Appendices

Note:

The number of marae sourced in our analysis comes from Te Puni Kōkiri source data (https://hub.arcgis.com/maps/TPK::map-marae/explore). It includes ancestral and tribal marae, as well as non-tribal marae, such as those that belong to Urban Māori Authorities, adhere to educational and other institutions, or otherwise do not have a specific link to iwi, hapū or whānau.

We collated data at Statistical Area 2 (SA2) level. An SA2 area often has a larger area than the town/city boundary by which it is named. This means marae numbers may seem conflated (see pg. 9 for further information on SA2 areas).

All counts of households have been randomly rounded to satisfy Statistics NZ confidentiality requirements. SA2s with 30 or less Māori households were excluded from the analysis.

Appendix A: Overall socio-economic risk

Top 30 SA2s that were rated highest in overall socio-economic risk.

Rank	Name of SA2	Regional council	Overall socio-economic risk index	Number of Māori households	Number of marae in the SA2
1	Otangarei	Northland	1.000	498	1
2	Camberley	Hawke's Bay	0.999	393	0
3	Māngere Mascot	Auckland	0.998	210	0
4	Favona West	Auckland	0.991	168	1
5	Wesley East	Auckland	0.990	102	0
6	Ōtara South	Auckland	0.988	282	0
7	Rongomai West	Auckland	0.984	183	0
8	Māngere West	Auckland	0.982	294	0
9	Harania South	Auckland	0.980	204	1
9	Flaxmere South	Hawke's Bay	0.980	498	0
11	Omahuta Forest-Horeke	Northland	0.977	243	9
12	Highbury East	Manawatū-Whanganui	0.976	465	1
13	Point England	Auckland	0.975	465	0
14	Gonville West	Manawatū-Whanganui	0.975	321	0
15	Clendon Park East	Auckland	0.974	216	0
16	Massey Road West	Auckland	0.971	237	0
17	Sutton Park	Auckland	0.968	204	0
18	Favona North	Auckland	0.966	186	0
19	Tauranga Hospital	Bay of Plenty	0.963	249	0
20	Māngere South	Auckland	0.962	171	0
21	Tikipunga North	Northland	0.957	480	0
22	Glenholme North	Bay of Plenty	0.956	480	0
23	Enderley North	Waikato	0.954	411	0
24	Elgin	Gisborne	0.954	582	0
25	Ōtara West	Auckland	0.953	282	2
26	Enderley South	Waikato	0.951	444	0
27	Taitoko	Manawatū-Whanganui	0.948	297	0
28	Marewa East	Hawke's Bay	0.947	576	1
29	Massey Road South	Auckland	0.946	120	0
30	Kaitaia West	Northland	0.945	780	0

Appendix B: Overall socio-economic risk by region

Regional ranking based on overall socio-economic risk.

Regional council	Number of SA2s	Overall socio-economic risk index	Number of Māori households	Number of marae in the region
Northland	97	0.681	26,562	197
Gisborne	27	0.652	9,255	72
Bay of Plenty	133	0.628	38,079	179
Manawatū-Whanganui	132	0.623	26,742	126
Hawke's Bay	83	0.612	18,618	84
Waikato	224	0.589	49,701	178
West Coast	28	0.585	2,403	3
Taranaki	58	0.584	12,117	43
Nelson	22	0.564	3,102	2
Chatham Islands	1	0.562	123	2
Marlborough	22	0.539	3,708	6
Auckland	538	0.518	89,583	68
Southland	55	0.506	8,607	10
Tasman	29	0.490	2,946	2
Canterbury	266	0.470	34,626	17
Otago	117	0.414	12,531	5
Wellington	205	0.400	37,902	56

Appendix C: Sea level rise

Top 30 SA2s identified as at risk of sea level rise.[14]

Rank	Name of SA2	Regional council	Projected inundated area (sqkm)	Number of Māori households	Number of marae in the SA2
1	Hauraki Plains South	Waikato	99.9	153	1
2	Hauraki Plains North	Waikato	93.9	117	1
3	Ruawai-Matakohe	Northland	89.2	342	9
4	Hauraki Plains East	Waikato	88.1	129	0
5	Kaipara Coastal	Northland	87.4	540	10
6	Aka Aka	Waikato	81.9	213	0
7	Maungaru	Northland	65.4	201	3
8	Momona	Otago	61.1	126	0
9	Paeroa Rural	Waikato	58.0	207	3
10	South Head	Auckland	49.4	222	1
11	Matatā-Otakiri	Bay of Plenty	48.5	267	3
12	Motukarara	Canterbury	46.4	36	0
13	Thornton-Awakeri	Bay of Plenty	43.7	339	4
14	Kaitangata-Matau	Otago	42.0	120	0
15	Lower Wairau	Marlborough	41.3	93	2
16	Matatoki-Puriri	Waikato	37.0	111	1
17	Bruce	Otago	36.6	120	0
18	Kahutara	Wellington	36.5	90	0
19	Woodend-Greenhills	Southland	33.1	66	0
20	Banks Peninsula South	Canterbury	32.5	78	1
21	Clutha Valley	Otago	32.4	63	0
22	Rangaunu Harbour	Northland	31.1	501	5
23	Golden Bay/Mohua	Tasman	30.2	126	0
24	Wyndham-Catlins	Southland	28.2	171	0
25	North Cape	Northland	27.7	372	3
26	Kaipara Hills	Auckland	27.6	162	3
27	Rangiuru	Bay of Plenty	25.2	333	6
28	Awarua Plains	Southland	25.1	63	0
29	West Plains-Makarewa	Southland	23.6	123	0
30	Pongakawa	Bay of Plenty	22.8	354	2

14 As the SA2 is population based reflecting communities that interact together socially and economically, some SA2 areas will be large in size and encompass both coastal and rural geography.

Appendix D: Flooding

Top 30 SA2s identified as at risk of flood.

Rank	Name of SA2	Regional council	% of SA2 exposed to flooding	Number of Māori households	Number of marae in the SA2
1	Huntington	Waikato	100.0	114	0
1	Cambridge North	Waikato	100.0	93	0
1	Oaklands-St Kilda	Waikato	100.0	57	0
1	Bush Road	Otago	100.0	117	0
1	Mosgiel East	Otago	100.0	114	0
1	Mosgiel Central	Otago	100.0	120	0
1	Seddon Park	Otago	100.0	165	0
1	Bathgate Park	Otago	100.0	210	0
9	Hautapu Rural	Waikato	99.9	36	0
10	Motukarara	Canterbury	99.9	36	0
11	Tamahere North	Waikato	99.8	162	0
12	Riverdale	Gisborne	99.8	210	0
13	Gore South	Southland	99.8	60	1
14	Cambridge Park-River Garden	Waikato	99.8	57	1
15	Parakai	Auckland	99.7	132	0
16	Hutt Central South	Wellington	99.2	108	1
17	Woburn	Wellington	99.2	99	0
18	Campus South	Otago	98.9	123	0
19	Petone East	Wellington	98.6	315	0
20	Rototuna South	Waikato	97.8	237	0
21	Motueka North	Tasman	97.8	216	0
22	McJorrow Park	Wellington	97.8	303	2
23	Ōpōtiki	Bay of Plenty	97.5	912	1
24	Tamahere South	Waikato	96.6	93	0
25	Park West	Manawatū-Whanganui	96.5	180	0
26	Thames Central	Waikato	96.3	135	0
27	Hutt Central North	Wellington	96.3	84	0
28	Kaiapoi Central	Canterbury	96.1	177	0
29	Poraiti Flat	Hawke's Bay	95.9	51	0
30	Fairlie	Canterbury	95.3	45	0

Appendix E: Wet spells

Top 30 SA2s identified as at risk of wet spells.

Rank	Name of SA2	Regional council	Projected number of wet spell days	Number of Māori households	Number of marae in the SA2
1	Westland Glaciers-Bruce Bay	West Coast	317.2	54	1
2	Whataroa-Harihari	West Coast	296.5	45	0
3	Waitaha	West Coast	264.0	39	0
4	Hokitika Valley-Otira	West Coast	261.5	39	0
5	Lake Brunner	West Coast	240.6	30	0
6	Arahura-Kumara	West Coast	211.7	111	1
7	Hokitika Rural	West Coast	173.5	111	0
8	Karamea	West Coast	167.0	54	0
9	Nelson Creek	West Coast	166.7	42	0
10	Greymouth Rural	West Coast	159.5	54	0
11	Dobson	West Coast	156.8	72	0
12	Barrytown	West Coast	151.3	72	0
13	Murchison-Nelson Lakes	Tasman	150.6	75	0
14	National Park	Manawatū-Whanganui	149.8	126	3
15	Stewart Island	Southland	149.8	54	0
16	Hokitika	West Coast	148.6	333	0
17	Charleston (Buller District)	West Coast	147.5	39	0
18	Inangahua	West Coast	147.1	60	0
19	Tangiwai	Manawatū-Whanganui	146.3	207	11
20	Mount Holdsworth	Wellington	145.9	105	0
21	Golden Bay/Mohua	Tasman	144.1	126	0
22	Longwood Forest	Southland	140.3	171	2
23	Kopuaranga	Wellington	139.1	69	0
24	Buller Coalfields	West Coast	138.6	78	0
25	Mokai Patea	Manawatū-Whanganui	135.6	207	8
26	Taungatara	Taranaki	133.4	126	4
27	Tauherenikau	Wellington	132.8	84	1
28	Pembroke	Taranaki	132.4	96	0
29	Cape Egmont	Taranaki	129.8	291	5
30	Kaponga-Mangatoki	Taranaki	129.1	111	0

Appendix F: Extreme rainfall

Top 30 SA2s identified as at risk of extreme rainfall.

Rank	Name of SA2	Regional council	Projected number of extreme rainfall days	Number of Māori households	Number of marae in the SA2
1	Westland Glaciers-Bruce Bay	West Coast	106.9	54	1
2	Whataroa-Harihari	West Coast	102.5	45	0
3	Hokitika Valley-Otira	West Coast	95.6	39	0
4	Waitaha	West Coast	90.6	39	0
5	Charleston (Buller District)	West Coast	82.3	39	0
6	Inangahua	West Coast	82.0	60	0
7	Barrytown	West Coast	81.5	72	0
8	Buller Coalfields	West Coast	78.5	78	0
9	Karamea	West Coast	78.2	54	0
10	Mararoa	Southland	76.9	54	0
11	Golden Bay/Mohua	Tasman	74.8	126	0
12	Kopuaranga	Wellington	70.1	69	0
12	Mount Holdsworth	Wellington	70.1	105	0
14	Taungatara	Taranaki	69.2	126	4
15	Pembroke	Taranaki	69.1	96	0
16	Kaitake	Taranaki	69.1	150	0
16	Cape Egmont	Taranaki	69.1	291	5
18	Tauherenikau	Wellington	68.9	84	1
19	Everett Park	Taranaki	68.8	147	0
20	Mangorei	Taranaki	68.4	105	0
21	Kaponga-Mangatoki	Taranaki	68.0	111	0
22	Murchison-Nelson Lakes	Tasman	67.5	75	0
23	Golden Downs	Tasman	65.1	126	0
24	Akatarawa	Wellington	64.1	42	0
25	Arahura-Kumara	West Coast	60.5	111	1
26	Makahika	Manawatū-Whanganui	59.6	78	0
27	Lake Brunner	West Coast	59.5	30	0
28	Nireaha-Eketahuna	Manawatū-Whanganui	59.1	162	0
29	National Park	Manawatū-Whanganui	50.9	126	3
30	Tangiwai	Manawatū-Whanganui	50.9	207	11

Appendix G: Heatwave days

Top 31 SA2 identified as at risk of heatwaves. Note that there are 31 SA2s listed rather than 30 SA2s as per other tables due to similar values for heatwave days.

Rank	Name of SA2	Regional council	Projected number of heatwave days	Number of Māori households	Number of marae in the SA2
1	Westland Glaciers-Bruce Bay	West Coast	64.8	54	1
2	Onepu Spring	Bay of Plenty	57.6	192	2
2	Te Teko Lakes	Bay of Plenty	57.6	411	6
2	Monika Reserve	Bay of Plenty	57.6	654	0
2	Tarawera Park	Bay of Plenty	57.6	879	2
6	Cromwell West	Otago	55.1	195	0
7	Lindis-Nevis Valleys	Otago	55.1	108	0
7	Cromwell East	Otago	55.1	126	0
9	Manawahe	Bay of Plenty	54.0	144	1
10	Earnscleugh	Otago	53.4	30	0
10	Dunstan-Galloway	Otago	53.4	72	0
10	Clyde	Otago	53.4	51	0
13	Alexandra North	Otago	51.8	204	0
14	Galatea	Bay of Plenty	51.0	300	17
15	Alexandra South	Otago	48.9	138	0
16	Pongakawa	Bay of Plenty	47.0	354	2
17	Murupara	Bay of Plenty	46.7	525	3
18	Twizel	Canterbury	46.6	90	1
19	Waingarara-Waimana	Bay of Plenty	46.4	549	24
20	Matatā-Otakiri	Bay of Plenty	46.3	267	3
21	Thornton-Awakeri	Bay of Plenty	46.1	339	4
22	Upper Clutha Valley	Otago	45.7	75	0
23	Manuherikia-Ida Valleys	Otago	45.3	51	0
24	Te Kawa	Waikato	44.9	99	2
24	Puniu	Waikato	44.9	93	3
26	Wharekaka	Gisborne	44.8	444	6
26	Hexton	Gisborne	44.8	336	2
26	Lytton	Gisborne	44.8	93	0
26	Makaraka-Awapuni	Gisborne	44.8	186	1
26	Riverdale	Gisborne	44.8	210	0
26	Te Hapara North	Gisborne	44.8	312	0

Appendix H: Hot days

Top 30 SA2s identified as at risk of extra hot days.

Rank	Name of SA2	Regional council	Projected number of extra hot days	Number of Māori households	Number of marae in the SA2
1	Westland Glaciers-Bruce Bay	West Coast	24.2	54	1
2	Earnscleugh	Otago	19.7	30	0
2	Dunstan-Galloway	Otago	19.7	72	0
2	Clyde	Otago	19.7	51	0
5	Cromwell West	Otago	19.1	195	0
6	Lindis-Nevis Valleys	Otago	19.0	108	0
7	Cromwell East	Otago	19.0	126	0
8	Alexandra North	Otago	18.7	204	0
9	Alexandra South	Otago	17.4	138	0
10	Twizel	Canterbury	15.2	90	1
11	Manuherikia-Ida Valleys	Otago	15.2	51	0
12	Upper Clutha Valley	Otago	15.1	75	0
13	Teviot Valley	Otago	13.9	108	0
14	Mossburn	Southland	11.9	57	0
15	Wanaka Central	Otago	11.6	48	0
16	Wanaka North	Otago	11.2	123	0
16	Albert Town	Otago	11.2	99	0
18	Wanaka West	Otago	10.8	54	0
19	Wanaka Waterfront	Otago	10.7	75	0
20	Jacks Point	Otago	10.5	66	0
21	Glentunnel	Canterbury	10.5	57	0
22	Torlesse	Canterbury	10.4	72	0
23	Southbridge	Canterbury	10.2	126	1
24	Bankside	Canterbury	10.1	63	0
25	Irwell	Canterbury	9.8	66	0
26	Lake Hawea	Otago	9.8	96	0
27	Eiffelton	Canterbury	9.7	69	0
28	Winchmore-Wakanui	Canterbury	9.7	54	1
29	Leeston	Canterbury	9.7	141	0
30	Chertsey	Canterbury	9.6	66	0

Appendix I: Drought

Top 45 SA2s identified as at risk of drought. Note that there are 45 SA2s listed rather than 30 SA2s as per other tables due to similar values for projected probability of PED>200mm.

Rank	Name of SA2	Regional council	Projected probability of PED > 200mm	Number of Māori households	Number of marae in the SA2
1	Lindis-Nevis Valleys	Otago	100.0	108	0
1	Cromwell West	Otago	100.0	195	0
1	Cromwell East	Otago	100.0	126	0
1	Manuherikia-Ida Valleys	Otago	100.0	51	0
1	Earnscleugh	Otago	100.0	30	0
1	Dunstan-Galloway	Otago	100.0	72	0
1	Clyde	Otago	100.0	51	0
1	Alexandra North	Otago	100.0	204	0
1	Alexandra South	Otago	100.0	138	0
1	Maniototo	Otago	100.0	90	0
1	Teviot Valley	Otago	100.0	108	0
1	Wanaka Waterfront	Otago	100.0	75	0
1	Wanaka North	Otago	100.0	123	0
1	Wanaka West	Otago	100.0	54	0
1	Albert Town	Otago	100.0	99	0
1	Wanaka Central	Otago	100.0	48	0
1	Lake Hawea	Otago	100.0	96	0
1	Upper Clutha Valley	Otago	100.0	75	0
1	Jacks Point	Otago	100.0	66	0
1	Twizel	Canterbury	100.0	90	1
1	Opua (Mackenzie District)	Canterbury	100.0	57	0
1	Danseys Pass	Canterbury	100.0	60	0
1	Upper Wairau	Marlborough	100.0	78	0
1	Awatere	Marlborough	100.0	132	0
1	Mossburn	Southland	100.0	57	0
1	Riversdale-Piano Flat	Southland	100.0	81	0
27	Lower Wairau	Marlborough	99.2	93	2
27	Woodbourne	Marlborough	99.2	165	1

Appendix I: Drought continued

Rank	Name of SA2	Regional council	Projected probability of PED > 200mm	Number of Māori households	Number of marae in the SA2
27	Spring Creek-Grovetown	Marlborough	99.2	84	1
27	Springlands	Marlborough	99.2	225	0
27	Yelverton	Marlborough	99.2	171	0
27	Mayfield	Marlborough	99.2	192	0
27	Whitney West	Marlborough	99.2	210	0
27	Blenheim Central	Marlborough	99.2	141	0
27	Riversdale-Islington	Marlborough	99.2	240	0
27	Whitney East	Marlborough	99.2	189	0
27	Redwoodtown West	Marlborough	99.2	228	0
27	Witherlea West	Marlborough	99.2	162	0
27	Redwoodtown East	Marlborough	99.2	228	0
27	Witherlea East	Marlborough	99.2	183	0
27	Wakatipu Basin	Otago	99.2	45	0
27	Lake Hayes Estate	Otago	99.2	102	0
27	Strath Taieri	Otago	99.2	33	0
27	Maraekakaho	Hawke's Bay	99.2	87	0
27	Kaikōura Ranges	Canterbury	99.2	159	1

Appendix J: Overall socio-economic risk and overall climate risk index

SA2s in the top 20 per cent quantile for overall socio-economic risk and overall climate risk.

Name of SA2	Regional council	Overall socio-economic risk index	Overall climate risk index	Number of Māori households	Number of marae in the SA2
Allandale	Bay of Plenty	0.761	0.801	453	1
Aongatete	Bay of Plenty	0.771	0.737	219	1
Baypark-Kairua	Bay of Plenty	0.896	0.715	120	1
Bethlehem North	Bay of Plenty	0.779	0.700	198	2
Cape Runaway	Bay of Plenty	0.938	0.775	459	14
Galatea	Bay of Plenty	0.816	0.691	300	17
Greerton North	Bay of Plenty	0.812	0.624	369	0
Greerton South	Bay of Plenty	0.762	0.640	75	0
Kaingaroa-Whakarewarewa	Bay of Plenty	0.774	0.620	264	1
Maketu	Bay of Plenty	0.767	0.780	324	2
Matakana Island	Bay of Plenty	0.799	0.648	48	5
Matapihi	Bay of Plenty	0.794	0.660	159	2
Murupara	Bay of Plenty	0.850	0.614	525	3
Oponae	Bay of Plenty	0.777	0.626	63	2
Ōpōtiki	Bay of Plenty	0.903	0.813	912	1
Pyes Pa East	Bay of Plenty	0.945	0.686	45	1
Rangiuru	Bay of Plenty	0.853	0.957	333	6
Rotoiti-Rotoehu	Bay of Plenty	0.778	0.612	378	13
Tauranga Hospital	Bay of Plenty	0.963	0.698	249	0
Tauranga South	Bay of Plenty	0.790	0.650	453	1
Te Puke West	Bay of Plenty	0.834	0.620	405	2
Te Teko Lakes	Bay of Plenty	0.928	0.659	411	6
Trident	Bay of Plenty	0.927	0.818	567	2
Waingarara-Waimana	Bay of Plenty	0.928	0.696	549	24
Wainui	Bay of Plenty	0.914	0.732	291	1
Welcome Bay East	Bay of Plenty	0.792	0.637	258	1
Whakatāne Central	Bay of Plenty	0.757	0.842	585	2

Appendix J: Overall socio-economic risk and overall climate risk index continued

Name of SA2	Regional council	Overall socio-economic risk index	Overall climate risk index	Number of Māori households	Number of marae in the SA2
Whakatāne West	Bay of Plenty	0.870	0.840	597	0
Dargaville	Northland	0.825	0.842	768	1
Herekino-Takahue	Northland	0.852	0.752	204	6
Hokianga North	Northland	0.847	0.725	246	9
Hokianga South	Northland	0.831	0.721	285	4
Kaeo	Northland	0.899	0.767	225	4
Kaipara Coastal	Northland	0.778	0.886	540	10
Kaitaia East	Northland	0.881	0.651	600	1
Kaitaia West	Northland	0.945	0.635	780	0
Kawakawa	Northland	0.810	0.639	354	1
Kohukohu-Broadwood	Northland	0.744	0.679	162	6
Mangakahia-Hūkerenui	Northland	0.926	0.741	288	6
Matawaia-Taumarere	Northland	0.764	0.785	312	11
Morningside (Whangarei District)	Northland	0.763	0.617	429	0
Omahuta Forest-Horeke	Northland	0.977	0.729	243	9
Onerahi	Northland	0.880	0.658	315	0
Oruru-Parapara	Northland	0.824	0.730	141	3
Ruawai-Matakohe	Northland	0.850	0.863	342	9
Sherwood Rise	Northland	0.843	0.598	351	0
Taemaro-Oruaiti	Northland	0.778	0.713	150	5
Waimā Forest	Northland	0.899	0.694	264	7
Whakarara	Northland	0.876	0.837	240	6
Whangaruru	Northland	0.854	0.775	375	7
Whangārei Central	Northland	0.776	0.734	174	1
Woodhill-Vinetown	Northland	0.834	0.646	426	0
Centennial Crescent	Gisborne	0.857	0.743	342	0
East Cape	Gisborne	0.790	0.865	435	21

Appendix J: Overall socio-economic risk and overall climate risk index continued

Name of SA2	Regional council	Overall socio-economic risk index	Overall climate risk index	Number of Māori households	Number of marae in the SA2
Kaiti South	Gisborne	0.905	0.785	711	1
Mangapapa South	Gisborne	0.824	0.833	369	0
Outer Kaiti	Gisborne	0.900	0.647	633	0
Ruatoria-Raukumara	Gisborne	0.818	0.853	402	14
Tamarau	Gisborne	0.896	0.660	573	0
Te Hapara South	Gisborne	0.803	0.678	435	0
Wharekaka	Gisborne	0.751	0.881	444	6
Colville	Waikato	0.780	0.739	222	3
Mangaiti	Waikato	0.780	0.817	105	2
Maramarua	Waikato	0.827	0.776	204	0
Pirongia Forest	Waikato	0.832	0.648	189	8
Richmond Downs-Wardville	Waikato	0.769	0.653	90	1
Te Aroha East	Waikato	0.779	0.606	282	0
Thames Central	Waikato	0.825	0.879	135	0
Thames South	Waikato	0.911	0.776	375	0
Karamu	Hawke's Bay	0.894	0.678	177	1
Maraenui	Hawke's Bay	0.912	0.638	660	0
Marewa East	Hawke's Bay	0.947	0.700	576	1
Omahu-Pakowhai	Hawke's Bay	0.834	0.746	189	3
Onekawa South	Hawke's Bay	0.844	0.707	495	1
Tamatea West	Hawke's Bay	0.867	0.635	219	0
Wairoa	Hawke's Bay	0.863	0.875	1,131	2
Aranui	Canterbury	0.927	0.624	561	0
Avonside	Canterbury	0.922	0.601	198	0
Bromley South	Canterbury	0.814	0.605	306	0
Dallington	Canterbury	0.765	0.607	183	0
Woolston East	Canterbury	0.793	0.631	273	0

Appendix J: Overall socio-economic risk and overall climate risk index continued

Name of SA2	Regional council	Overall socio-economic risk index	Overall climate risk index	Number of Māori households	Number of marae in the SA2
Woolston North	Canterbury	0.797	0.613	327	0
Taumarunui Central	Manawatū-Whanganui	0.779	0.612	342	6
Taumarunui East	Manawatū-Whanganui	0.849	0.632	357	0
Upper Aramoho	Manawatū-Whanganui	0.780	0.601	306	1
Upper Whanganui	Manawatū-Whanganui	0.765	0.735	171	20
Henderson North	Auckland	0.817	0.597	285	1
Kaipara Hills	Auckland	0.820	0.763	162	3
Mayfield	Marlborough	0.758	0.644	192	0
Motueka North	Tasman	0.868	0.708	216	0
Moera	Wellington	0.907	0.603	246	1