Climate change risks and adaptation tools for Aotearoa New Zealand's cultural heritage

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Climate change risks and adaptation tools for Aotearoa New Zealand's cultural heritage

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In 2020 the Ministry for the Environment (MfE) published Aotearoa New Zealand's first National Climate Change Risk Assessment (NCCRA) to provide an overview of how the country might be affected by climate change-related hazards, and to identify the most significant climate change risks and opportunities. However, knowledge about the relationship between social vulnerabilities, cultural heritage, and climate change, and impacts on Māori social, cultural, spiritual, and economic well-being, was identified as a significant gap in managing climate change risks and opportunities (MfE 2020). The NCCRA called for further research on the location of cultural heritage sites and how they could be affected, due to the very limited research done on the sensitivity of cultural heritage sites to climate change. Aotearoa New Zealand's first National Adaptation Plan (NAP) sets out objectives related to the risks and issues identified in the NCCRA.

Manatū Taonga – The Ministry for Culture and Heritage, as the Government's principal adviser on the cultural system in Aotearoa New Zealand, has an important role in advising the Government on climate risks to Aotearoa New Zealand's culture and heritage, and in supporting the cultural system to respond and adapt so that culture can continue to thrive sustainably. As part of its responsibilities, Manatū Taonga and cultural sector entities (Museum of New Zealand Te Papa Tongarewa and Heritage New Zealand Pouhere Taonga) work closely with Māori communities to protect and conserve cultural heritage (e.g. by providing support to iwi- and hapū-led taonga tūturu[1] recovery and conservation projects, and by helping iwi and hapū to develop their long-term plans for care and management of found taonga).

Consequently, Manatū Taonga is mandated to address Actions 5.8, 3.26, 3.27, and 7.2 as outlined in the NAP. These NAP actions require foundational work to be undertaken in 2023 to meet the first expected milestones in early to mid-2024. In response, Manatū Taonga contracted Manaaki Whenua – Landcare Research (MWLR) to undertake a review and gap analysis of the literature on culture and heritage with regard to climate change risks, vulnerabilities, and adaptation. This research was primarily to provide guidance for Action 5.8 'Support kaitiaki communities to adapt and conserve taonga/cultural assets' but will also contribute to Action 3.26 'Produce guidance for disaster risk management for cultural heritage' and Action 3.27 'Develop a framework for assessing exposure and vulnerability of cultural assets/taonga to climate change'. Recent extreme weather events, including Cyclone Gabrielle, have demonstrated the importance of accelerating these actions to support communities.

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[1] Taonga tūturu - protected objects that whakapapa to te ao Māori and embody mana, tapu, and mauri.

Objectives

The objectives of this work are to:

- increase understanding within Manatū Taonga of the current information, resources, and guidance available in the public domain (the status quo) on the climate risks and vulnerabilities of culture and heritage in Aotearoa New Zealand and who is producing this information
- understand the gaps in knowledge and information publicly available
- use the information gathered to identify possible priority areas for next steps to progress the NAP actions.

Methods

MWLR has been extensively involved with climate change adaptation, risk, and uncertainty research over the last decade, which provides the initial knowledge base for this review. Key to this knowledge base is the advancement of te ao Māori (Māori world view) perspectives on adaptation, risk and uncertainty, and cultural heritage (Awatere et al. 2021).

We used two approaches for the literature review. First, we carried out a document search using Google, Google Scholar, and ISI Web of Science. This search used a quasi-systematic process, whereby key search terms, determined in consultation with Manatū Taonga officials, were used. Second, we used reference lists from recommended reports, articles, and websites to identify additional documents (including digital web-based tools) and any peer-reviewed articles. Discussions were held with MWLR colleagues and kairangahau (Māori researchers) to further inform the review.

The document search using ISI Web of Science and the Google databases included the following criteria:

- peer-reviewed articles published between 2010 and April 2023. (Note some documents prior to 2010 were identified in the reference lists of these documents and were included because of their relevance).
- related to Aotearoa New Zealand
- fits the cultural heritage definition in the National Adaptation Plan (MfE 2022): 'Those aspects of the environment that contribute to an understanding and appreciation of Aotearoa New Zealand's history and cultures. It includes historic sites, structures, places, areas, archaeological sites, sites of significance to Māori (including wāhi tapu) and cultural landscapes' (MfE 2022, p. 181)
- only peer-reviewed journal articles, literature, and websites
- only material that was easily accessible by the general public (e.g. not archived, privately owned or specific to one or two hapū)
- documents written primarily in English.

Results

We grouped the resulting resources into five categories:

- historic sites, structures, places, areas, and archaeological sites (section 3.1)
- places of significance to Māori (section 3.2)
- cultural landscapes (section 3.3)
- adaptation, vulnerability, and risk (section 3.4)
- models, tools, and frameworks (section 3.5).

In each section the resources are summarised and listed in tables. Links are provided for each resource. Further detailed tables listing the title, URL link (where available), author(s), publication date, article type, scale, disaster type or impact, place of significance (if mentioned), organisation involved in actions or guidelines, purpose of the tool/framework used, and any gaps or recommendations identified are found in Appendix 3.

Our overall findings were as follows.

- Most of the literature focuses on Māori cultural heritage, and in particular marae and urupā.
- There is a paucity of Aotearoa New Zealand-specific literature looking at the impacts of climate change on the cultural heritage values of the wider communities.
- This review has revealed an emphasis in the literature on how to address the future impacts of climate change, such as sea-level rise and the resultant coastal inundation and flooding. There are also numerous instances of research that specifically address the impacts of a disaster on those areas (e.g. Christchurch earthquakes, Manawatū floods). We anticipate there will be similar research carried out on the impacts of Cyclone Gabrielle.
- More recently, methodologies such as the Dynamic Adaptive Policy Pathway (DAPP) future scenario mapping and risk assessments are being used to develop strategies and action plans that can help communities prepare for future climate change impacts in places such as marae.
- The documents indicate that, for Māori communities, a holistic approach is taken, which is underpinned by Māori cultural values.
- Rangatiratanga, or the value of strong leaders, is important for educating and transferring intergenerational knowledge to rangatahi (young people). The challenge for Māori is how to increase the capability and capacity of rangatahi to ensure that iwi and hapū can adapt to future climate change impacts.

Gaps in tools and resources available

- Cultural heritage and taonga (treasured items) are rarely a significant component of climate change policies, strategies, action plans, and risk assessments. While the direction of the Zero Carbon legislation has set a positive road map for change in Aotearoa New Zealand, the effects on and response for cultural heritage are not well understood (MfE 2020).

- There are gaps in knowledge about where cultural heritage sites are located and how they could be affected, due to very limited research carried out on the sensitivity of cultural heritage sites to climate change.

- Limitations of the ArchSite system were identified in most of the peer-reviewed geospatial studies and relate to the quality of data points representing sites. ArchSite is the national database of recorded archaeological sites in Aotearoa New Zealand, and it is essential to the management and protection of those sites. It contains information on over 73,600 recorded archaeological sites, but there are many more that are unrecorded. Thus, at the local or site level, we recommend that more detailed assessments be undertaken to identify their locations and the climate-related risks. It is also important to note that geospatial analyses are looking at the risk to physical cultural heritage sites, but not the cultural values those sites hold.

- According to Carter and Bennett (2020), Aotearoa New Zealand has a diverse range of underwater cultural heritage sites. However, climate change impacts on them were only mentioned in this one article.

- There is a paucity of Aotearoa New Zealand-specific literature looking at the impacts of climate change on the values of cultural heritage for the wider community. Recognising the diversity of Aotearoa New Zealand's cultural heritage and the value of these sites to tangata whenua as well as the wider community is important to all New Zealanders.

- No resources focusing specifically on cultural landscapes were found, although they are an important type of cultural heritage. This may be due to the current focus on coastal cultural heritage sites at risk rather than on inland sites. Also, cultural landscapes are poorly protected by the current legislative framework.

Limitations of the review

- The scope of the literature review was restricted to Aotearoa New Zealand studies due to the limited resources available to Manatū Taonga to commission this report. While there is a growing body of international climate change adaptation literature relating to indigenous, local, and traditional knowledge on culture and heritage, this review does not cover such literature.

- The review focused on documents primarily written in English, not te reo Māori.

- This study used the Google search engine and so the resulting resources may be biased due to previous search histories. Further consideration should be given to running the searches multiple times with different search engines.

Conclusions

The purpose of this review was to increase our understanding of what climate change information, resources, and guidance for Aotearoa New Zealand's cultural heritage are available in the public domain. The review sought to find the gaps in the tools and resources available to help people adapt to climate change risk. Publicly available documents were reviewed to assist Manatū Taonga prioritise its NAP actions.

The review found that geographical scale is an important consideration. Overall, the vulnerability and resilience of Māori and other communities and their ability to adapt

under a changing climate is not uniform: one size does not fit all. Decision-making needs to be at the local level.

The majority of the resources are focused on Māori communities and marae responding to the climate change impacts of sea-level rise, coastal inundation, and flooding. This reflects the location of most marae in coastal margins, where the impacts of climate change will affect certain whānau, hapū, and iwi and their interests, values, practices, and well-being more than others (MfE 2022). Ongoing analysis of climate change risks faced by different iwi and hapū are needed to ground-truth diverse exposures, sensitivities, and adaptive capacities to help avoid generalisation (King, Dalton, Bind, et al. 2012; King, Dalton, Home, et al. 2012; King et al. 2013). The Māori Climate Platform will be important in helping with adaptation planning, especially for the most vulnerable groups within communities.

Aotearoa New Zealand's adaptation responses must provide for its unique and diverse cultural heritage, and supply mechanisms to capture current and changing societal and wider community values. A diverse range of tools, models, and frameworks are available and have been utilised to develop climate change strategies and action plans for Māori communities, hapū, iwi, and rūnanga. King, Dalton, Bind, et al. (2012), King, Dalton, Home, et al. (2012), and King et al. (2013) emphasised that available climate change projections and associated guidance on sea-level rise are sufficient to raise awareness about potential impacts and risks. These projections can also be used to develop strategies to address vulnerability and adaptability, as most of the influencing factors are related to the existing socio-ecological issues faced by whānau, hapū, and iwi.

There are enough tools to encourage planning for the protection of cultural heritage against the impacts of climate change, what appears lacking is co-ordination and investment in the people to create and implement the plans. While there are a number of organisations (both local and central government) associated with caring for and protecting Aotearoa New Zealand's cultural heritage, there is a need for better co-ordination across these organisations and for more clarity on each of their roles. This review also shows that more investment is needed to build capacity and capability to carry out climate change risk assessments for cultural heritage and the relocation of taonga.

It should be noted that the gaps found through this review do not necessarily mean there are gaps in knowledge for climate change adaptation. We acknowledge this 'western style' literature review is limited to written documents, and much mātauranga and knowledge relevant to culture and heritage may be documented in other ways. Communities, iwi and hapū may be developing protocols and guidance themselves, and sharing these protocols more publicly may not be a priority for them.

Recommended next steps for Government agencies

The next steps Manatū Taonga and/or appropriate government leads could consider in progressing the Manantū Taonga NAP actions are to:

- support Te Tiriti o Waitangi (Treaty of Waitangi) arrangements such as the Māori Climate Platform, by developing supporting information and guidelines for assessing the risk to taonga and implementing adaptation strategies for partner agencies

- acknowledge the decision-making rights of Māori by providing funding and opportunities for the early involvement of hapū and iwi in partnership approaches for implementing climate change adaptation processes
- facilitate better coordination across those agencies that are associated with or have responsibility for caring and protecting Aotearoa New Zealand's cultural heritage, and provide more clarity on each of their roles (including central government, Crown agencies, local government, NGOs, and iwi organisations)
- ensure a multi-agency, coordinated approach is taken to support communities, hapū, and iwi to undertake risk assessments and develop and implement adaptation plans
- develop a plan and/or guidance on financial mechanisms for iwi and hapū to mitigate impacts
- support the option to relocate cultural taonga/assets, if this is desired and/or required
- ensure there is support for key people in communities to carry out risk assessments on taonga and provide guidance on community plans – relationships are key, and people who have connections and networks with local communities and government are needed to translate political-speak to outcomes for whānau
- support the building of capability and capacity for intergenerational knowledge transfer about taonga
- invest in relationships to places, and taonga under new climate conditions. However, the maintenance to place may not be possible if climate change impacts are severe enough to destroy or limit access to place
- provide flexibility in the system, as each situation is unique, which would involve:
  - working at the local scale
  - communities forming their own solutions using the NCCRA framework
  - supporting and encouraging the implementation of a system-wide framework for risk assessments that goes beyond geotechnical assessments
- utilise frameworks such as DAPP future scenario mapping to develop scenarios and actions that recognise the cultural diversity of Aotearoa New Zealand's heritage, and the value of archaeological sites held by the wider community.

Recommended next steps for future research

This research was tightly scoped so recommendations for possible next steps for future research are to:

- examine a broader body of peer-reviewed international literature on the importance or role of indigenous, traditional, and local knowledge in relation to adaptation that is not captured in this review; which focused only on Aotearoa New Zealand literature
- fund research to include intangible and non-documented evidence of how people are adapting to climate risks and the effects on their cultural heritage
- broaden the search terms and definitions to include legislation, policy and strategies at national and local government levels relating to cultural heritage and cultural landscapes
- more research focused on climate change risks faced by inland communities would help to identify and assess the impacts on cultural landscapes.

1   Introduction

1.1   Context

Climate change projections developed by the National Institute of Water and Atmospheric Research (NIWA) suggest that New Zealand's climate is warming, sea levels are rising, and extreme weather events are becoming more frequent and severe (MfE 2020). Climate impacts, and the resulting vulnerability, present challenges and risks to Aotearoa New Zealand's cultural heritage. However, there are few studies that specifically address how to adapt to these risks and vulnerabilities, making decisions about how to prioritise action difficult.

Historically, people have settled along the coastal and inland waterways of Aotearoa New Zealand. As a result, many cultural heritage sites (particularly archaeological sites) are found in these localities (Bickler et al. 2013; Bailey-Winiata 2021; Ramsay 2021; Jones & Bickler 2022; MfE 2022). Sea-level rise and associated coastal inundation and erosion, as well as increased frequency of extreme weather events, pose a significant threat to the protection of these sites (Jones & Bickler 2022; Ramsay 2021; Awatere et al. 2021; Bailey-Winiata 2021; McCoy 2018). The threat of sea-level rise on cultural heritage sites is not unique to Aotearoa New Zealand. According to Carmichael et al. (2018), hundreds of thousands of significant cultural heritage sites along coasts around the world face similar threats.

In 2020 the Ministry for the Environment (MfE) undertook Aotearoa New Zealand's first National Climate Change Risk Assessment (NCCRA) to provide an overview of how Aotearoa New Zealand might be affected by climate change-related hazards, and to identify the most significant climate change risks and opportunities. The NCCRA was based on Arotakenga Huringa Āhuarangi: A Framework for the National Climate Change Risk Assessment for Aotearoa New Zealand (the NCCRA framework), which used five value domains[2] (human, natural environment, economy, built environment, and governance) to identify sectors, systems, taonga and assets ('elements') at risk (MfE 2019). The human domain includes both social and cultural elements, and includes:

> *community wellbeing, social cohesion and social welfare (urban, rural and coastal communities); health, education, sports, recreation, cultural heritage (archaeological sites, museums, arts, theatre), ahurea Māori, tikanga Māori – Māori culture, values and principles, cultural taonga.* (MfE 2019)

The NCCRA framework recognised that all the value domains are highly interconnected and interdependent, which reflects the te ao Māori world view of all living and non-living things.

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[2] See Table 6 (p. 29) in the NCCRA for a description of all the value domains: https://environment.govt.nz/assets/Publications/Files/national-climate-change-risk-assessment-main-report.pdf

The NCCRA identified and focused on the 10 most significant risks and 43 priority risks across the five value domains. Although the NCCRA identified risks that are highly relevant to Māori, it also recognised that all the risks identified are relevant to Māori as kaitiaki (guardians) of their ancestral and cultural landscapes. Of the 10 most significant risks, none directly addressed risks to cultural heritage. Of the 43 priority risks, the following three were identified as being in the human value domain and directly address risks to cultural heritage:

- H5 – Risks to Māori social, cultural, spiritual and economic wellbeing from loss and degradation of lands and waters, as well as cultural assets such as marae, due to ongoing sea-level rise, changes in rainfall and drought
- H6 – Risks to Māori social, cultural, spiritual and economic wellbeing from loss of species and biodiversity due to greater climate variability and ongoing sea-level rise
- H8[3] – Risks to Māori and European cultural heritage sites due to ongoing sea-level rise, extreme weather events and increasing fire weather.

Knowledge about the relationship between social vulnerabilities, cultural heritage, and climate change, and their impacts on Māori social, cultural, spiritual, and economic well-being, was identified as a significant gap in managing climate change risks and opportunities. The NCCRA called for further research to understand where cultural heritage sites are and how they could be affected, due to the very limited research carried out on the sensitivity of cultural heritage sites to climate change.

MfE responded to the risks identified in the NCCRA with Aotearoa New Zealand's first National Adaptation Plan (NAP), the Government's long-term adaptation strategy to build resilience and adapt to a changing climate (MfE 2022). Adaptation actions are driven by four priorities:

- enabling better risk-informed decisions
- driving climate-resilient development in the right places
- laying the foundations for a range of adaption options, including managed retreat
- embedding climate resilience across government policy.

A series of objectives related to system-wide issues, and objectives specific to five 'outcome areas', drive the actions. The five outcome areas are:

- natural environment
- homes, buildings, and places
- infrastructure
- communities
- the economy and financial system.

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[3] H8 is the highest research priority in Figure 8 Risk statements and urgency scores in the NCCRA

Actions related to cultural heritage are mainly driven by the 'enabling better risk-informed decisions' priority and the objectives under 'homes, buildings and places' outcome area (HBP3 – Māori connections to whenua and places of cultural value are strengthened through partnerships; HBP4 – Threats to cultural heritage arising from climate change are understood and impacts minimised).

The NAP recognised that, as Treaty partners, tangata whenua (indigenous people) and kaitiaki communities play a unique role in adaptation, and mātauranga Māori (Māori knowledge) will be critical to informing adaptation responses. The NAP also called for action to establish a platform for Māori climate action (Action 3.3).

It is in this context that Manatū Taonga – Ministry for Culture and Heritage is mandated to address four actions outlined in MfE (2022). Manatū Taonga has responsibility for actions 5.8, 3.26, 3.27, and 7.2, which all require foundational work to be undertaken in 2023 to meet the first expected milestones in early-mid 2024. Manaaki Whenua – Landcare Research (MWLR) was contracted to undertake a review and gap analysis of the literature on culture and heritage with regard to climate change risks, vulnerabilities, and adaptation. This research was to primarily provide guidance for action 5.8 'Support kaitiaki communities to adapt and conserve taonga/cultural assets' but will also contribute to action 3.26 'Produce guidance for disaster risk management for cultural heritage' and action 3.27 'Develop a framework for assessing exposure and vulnerability of cultural assets/taonga to climate change'.

1.2   Definition of terms

For the purposes of this review, we use the following definition of cultural heritage from MfE (2022):

> *Those aspects of the environment that contribute to an understanding and appreciation of Aotearoa New Zealand's history and cultures. It includes historic sites, structures, places, areas, archaeological sites, sites of significance to Māori (including wāhi tapu) and cultural landscapes.* (p. 181)

Definitions of other key terms used in the search were taken directly from the glossary in MfE (2022) and are listed at the end of this document in Appendix 1. Appendix 2 provides a glossary of te reo Māori terms used throughout this document.

All cultures have value systems developed through time that are maintained in the present for future generations. In Aotearoa New Zealand this cultural heritage manifests as archaeological sites such as beach middens, terraced maunga (mountains), old buildings and graveyards, or language, arts, crafts, religious ideas, written records, photographs or historical artefacts. Cultural heritage is both tangible and intangible. This review mainly focuses on the tangible, place-based aspects.

1.3 Objectives

The objectives of this review are to:

- increase understanding within Manatū Taonga of the current information, resources, and guidance available in the public domain (the status quo) on the climate risks and vulnerabilities of culture and heritage in Aotearoa New Zealand and who is producing this information
- understand the gaps in knowledge and information publicly available
- use the information gathered to identify possible priority areas for next steps to progress the NAP actions.

2 Methods

2.1 Scope

This literature review identified and collated peer-reviewed papers as well as documents publicly available (including websites with videos). The scope was limited to Aotearoa New Zealand resources published between 2010 and 2023, however some documents prior to 2010 were identified in the reference lists of these documents and were included because of their relevance. The documents were primarily written in English, and included information, guidance, resources, frameworks, and tools to assess climate change risks and adaptation for culture and heritage. The review focuses on climate change impacts, although it was anticipated that most tools would relate to risks and vulnerabilities generally. Approaches to risk, adaptation, and vulnerability were sourced, where possible, and the different scales (community, local, regional, and catchment, national) were listed. Te ao Māori frameworks for risk and uncertainty currently being developed through the National Science Challenges were a first point of reference.

2.2 Approach

MWLR has been extensively involved with climate change adaptation, risk, and uncertainty research over the last decade, which provides the initial knowledge base for this review. Key to this knowledge base is the advancement of te ao Māori perspectives on adaptation, risk and uncertainty, and cultural heritage (Awatere et al. 2021).

An initial search of online databases while preparing the proposal for this research showed that it would be difficult to find all the relevant peer-reviewed and documents using only online search databases. Therefore, two approaches were used for the literature review. First, a document search was carried out using Google, Google Scholar, and ISI Web of Science. This search used a quasi-systematic process, whereby key search terms, determined in consultation with Manatū Taonga officials, were used (see Table 1 for a list of search terms). Second, we used reference lists from recommended reports, articles, and websites to identify additional documents (including digital web-based tools) and any peer-reviewed articles. Discussions were held with MWLR colleagues and kairangahau (Māori researchers) to further inform the review.

The literature search included the following criteria:

- peer-reviewed articles published between 2010 and April 2023
- related to Aotearoa New Zealand
- fits the cultural heritage definition in the National Adaptation Plan (MfE 2022): 'Those aspects of the environment that contribute to an understanding and appreciation of Aotearoa New Zealand's history and cultures. It includes historic sites, structures, places, areas, archaeological sites, sites of significance to Māori (including wāhi tapu) and cultural landscapes' (MfE 2022, p. 181)
- only grey and peer-reviewed journal articles, documents, and websites
- only material that is easily accessible by the general public (e.g. not archived, privately owned or specific to one or two hapū)
- documents written in English.

2.3 Search methods

The ISI Web of Science and Google databases were searched using different combinations of the search terms given in Table 1. The total number of resulting publications ranged from less than 10 to over 300 for each search. However, after reading the titles and abstracts, only 11 peer-reviewed publications fitted the criteria. Our second approach was to use the snowballing method. We started reviewing relevant publications and recommendations from Manatū Taonga officers, MWLR colleagues and kairangahau, and then used the references from these recommended resources to source further relevant peer-reviewed and other documents, including websites, fact sheets, and reports.

Table 1. Search strategies and terms used in ISI Web of Science and Google Scholar

Category	Examples	Search terms
Culture and heritage	New Zealand culture and heritage	"Climate* change*" OR "global warming" OR "change* in climate" OR "greenhouse effect*" AND "New Zealand" AND Culture* AND Heritage* AND "Historic Heritage*"
Places of significance to Māori	• Urupā – Māori burial grounds • Middens • Marae	AND urupā, midden*, marae, pā, "whare taonga", site* of significance, papakāinga, "wāhi tapu", "wāhi tūpuna"
Historically important places, areas and sites including archaeological sites	• Heritage buildings • Archaeological sites • Heritage areas	"AND "heritage building*", "archaeolog* site*, "historic area", "historic site", "historic place"
Cultural landscapes	• Takiwā • Mahinga kai • Cultural events/activities	AND "mahinga kai", mātauranga, rohe, takiwā, iwi, hapū, tikanga, kaitiaki*, landscape*
Adaptation pathways, vulnerability and risk	• Climate change risks • Vulnerability • Adaptation pathways	AND "climat* change* risk*", vulnerab*, "adapt* pathway*", "disaster risk*" "management plan*"

We documented sources, context, reviews (where available), and future plans for these tools/resources if these were noted publicly. A desktop analysis that collected and analysed information from available published sources was undertaken to determine what gaps existed for assessing the impacts of climate change on cultural heritage in Aotearoa New Zealand. The review endeavoured to frame this analysis through a te ao Māori lens, recognising the Government's commitment to building a climate response partnership with Māori, including the elevation of te ao Māori within the adaptation process.

3   Results

We grouped the resultant resources into five categories:

- historic sites, structures, places, areas, and archaeological sites (section 3.1)
- places of significance to Māori (section 3.2)
- cultural landscapes (section 3.3)
- adaptation, vulnerability, and risk (section 3.4)
- models, tools, and frameworks (section 3.5).

In each section the resources are summarised and listed in tables. Links are provided for each resource. Further detailed tables listing the title, URL link (where available), author(s), publication date, article type, scale, disaster type or impact, place of significance (if mentioned), organisation involved in actions or guidelines, purpose of the tool/framework used, and any gaps or recommendations that were identified are provided in Appendix 3. Some resources could have been placed in several sections, so we have used our judgement as to the best section to place the resource.

3.1   Historic sites, structures, places, areas, archaeological sites

This section includes resources that provide guidance on caring for significant historic sites, structures, places, areas, and archaeological sites. Table 2 lists the resources available online from national agencies to conserve, care for, and protect Aotearoa New Zealand's historic places. (See Appendix 3, Table 8, for more information on all the resources in this section.)

Heritage New Zealand Pouhere Taonga is the lead organisation for the identification, protection, preservation, and conservation of Aotearoa New Zealand's historical and cultural heritage. We identified four information sheets from the Sustainable Management of Historic Heritage Guidance Series, which were published in November 2016 in response to the Christchurch earthquakes.

The information sheets provide guidelines on how to repair historic brickwork, stonework, and chimneys, and how to replace high-risk elements with lightweight materials. All the information sheets include advice on safety, support for determining and designing structural repairs, consent requirements, and funding options. Replacing high-risk elements with lightweight materials is sometimes necessary where a structure (e.g. gables, parapet, façade) may be a threat to public safety.

A more recent guide published in this series in March 2022 provides guidance on preparing Heritage Risk Management Plans for disaster and emergency events caused by nature or humans. They follow an internationally recognised methodology for risk management planning based on reduction, readiness, response, and recovery (the 4 Rs). There are eight steps in the process in preparation for implementing action plans over different time periods – short, medium, and long term.

Table 2. Resources from national agencies that care for and protect Aotearoa New Zealand's historic places

Organisation/author	Resources	Link
Heritage NZ Pouhere Taonga	Sustainable Management of Historic Heritage Guidance series Nov 2016:	- Repairing historic brickwork - Repairing historic stonework - Repairing and building historic chimneys - Replacement of high-risk elements
Heritage NZ Pouhere Taonga	Sustainable Management of Historic Heritage Guidance series Mar 2022:	Guidance preparing heritage risk mgt plans
Heritage NZ Pouhere Taonga	Archaeological Guidelines Series, 25 Aug 2014	Koiwi tangata human remains guidelines
Museum of New Zealand Te Papa Tongarewa	Te Papa National Resource Guides: Issues 5, 6, and 7	- Issue no. 5 Collection care: Preventative conservation - Issue no. 6 Governance, management & planning: Minimising disaster. - Issue no. 7 Governance management & planning: Emergency procedures
Museum of New Zealand Te Papa Tongarewa	YouTube videos on how to care for piupiu, kete, and hei kete in te reo Māori and English	- Watch: How to care for your piupiu | Te Papa - Watch: How to care for your kete | Te Papa - Watch: How to care for your hei tiki | Te Papa
New Zealand Archaeological Association	New Zealand Archaeological Association Climate Change and Cultural Heritage Portfolio: Strategic Plan 2021-2026 June 2021	No link available but the report is available on request from the New Zealand Archaeological Association Contact NZ Archaeological Association
Carter & Bennett 2020	'Underwater cultural heritage in Aotearoa New Zealand: challenges and opportunities'	Underwater cultural heritage in Aotearoa New Zealand: challenges and opportunities | Carter & Bennett 2020

Heritage New Zealand has also produced an Archaeological Guideline Series, and one guideline that is relevant to this review is *Kōiwi Tangata Human Remains Guidelines* (Table 2). This resource provides a process for the management of kōiwi tangata (human remains) that have been uncovered accidentally or deliberately excavated/exhumed in emergency response situations, by development, or as a result of a natural process. The guidelines ensure that compliance with New Zealand legislation is met. Iwi and hapū may have their own tikanga (protocols) and kawa (ceremonies), and this is acknowledged in the guideline.

Issues 5, 6, and 7 in the Museum of New Zealand Te Papa Tongarewa's National Resource Guides provide guidance on 'Collection care: preventative conservation', 'Governance, management and planning', and 'Emergency procedures', respectively, for small museums (and marae) that don't have specialist conservators to safeguard/conserve items in their care and to minimise disaster in an emergency. These guides are available on their website and use the SWOT analysis as a planning tool for determining strengths, weaknesses, opportunities and threats.

The Museum of New Zealand guides provide a framework for setting priorities and actions to take when faced with an emergency. These frameworks include topics such as location, insurance, maintenance, finance, where to find outside support, emergency materials, and equipment that might be necessary. These guides highly recommend developing a contingency plan that clearly sets out the procedures in the event of an emergency, and an emergency manual that includes an emergency equipment locker. These guidelines would be useful for marae to enhance their readiness in preparation for an emergency. The Museum of New Zealand documents (Issues 5, 6, and 7) should be read in conjunction with each other.

The Museum of New Zealand has also produced three YouTube videos that show how to care for and store piupiu (flax garments), kete (flax baskets), and hei tiki (carved pendants). The videos show the materials that should be used and recommend taking photos of taonga for future reference.

The National Library of New Zealand website provides information on how to plan for and respond to a disaster. The website includes information on planning ahead, responding to a disaster in a timely way to stabilise damaged items and collections, and disaster recovery checklists and resources. There are links to the New Zealand Conservators of Cultural Materials – Pū Manaaki Kahurangi – a professional association of conservators of cultural property in Aotearoa New Zealand.

The New Zealand Archaeological Association (NZAA) has published a strategic plan entitled *Climate Change and Cultural Heritage Portfolio: Strategic Plan 2021*. This document sets out the plan and objectives of the NZAA to help the coordination and focus on climate action, and to create wider awareness and appreciation of cultural heritage.

The final resource in this section reviews Aotearoa New Zealand's underwater cultural heritage sites (Carter & Bennett 2020). This review is published in the ICOMOS *Heritage Special Edition: Heritage under water at risk: Challenges, threats and solutions*.[4] The article highlights the challenges involved in applying terrestrial heritage legislation to maritime archaeological sites that do not incorporate international best practice in the management of underwater cultural heritage. They recommend employing suitably qualified maritime archaeologists to oversee underwater cultural heritage (e.g. investigating shipwrecks).

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[4] http://openarchive.icomos.org/id/eprint/2488/

3.2 Places of significance to Māori

Section 3.2 is divided into three sections (see Appendix 3, Table 9, for more information on all the resources in this section). Section 3.2.1 provides some context by reviewing media articles relevant to the impacts of climate change on marae and urupā (burial grounds). Section 3.2.2 reviews and gives examples of climate change strategies, plans and information sheets, and section 3.2.3 outlines some research on the role of Māori communities during crises and disasters.

The focus of these resources is on places such as marae and urupā that are of significance to Māori. There is increasing concern for these places, which are often located in low-lying coastal areas or close to waterways. Landslides and slips also present a risk to urupā, maunga (mountains) and puke (hills), which are often associated with significant cultural heritage sites (e.g. recent flooding events in Auckland during which midden sites on Maungakiekie / One tree Hill were exposed). However, these risks were not highlighted in the resources we reviewed.

3.2.1 Context setting: media articles on risks to marae and urupā

Five media articles were identified during the searches that specifically highlight concerns by hapū and iwi for their marae and urupā. These articles are included in section 3.2 to provide context and examples of places of significance to Māori that are being affected by climatic changes.

At Mirumiru Marae, on the west coast of the North Island, the hapū are on a quest to save their marae from flooding and erosion due to rising river levels (Day 2018). Access to the marae is by barge across the Marokopa River, and changes to the river flow are putting not only their urupā but also a century-old cultural tradition called poukai[5] at risk, a cultural practice that connects the Kīngitanga with marae throughout New Zealand.

This hapū is having ongoing kōrero (discussions) with whānau about how to save their marae, along with gathering information about their situation and the hazards they are facing. However, they say that getting a consensus on what to do will be difficult. Media articles written by Angeloni (2018, 2021) and Davis (2018) highlight the issues of urupā sites being eroded and kōiwi being uncovered. On the Nūhaka River, where the flow and dynamics of the river have changed and eroded the riverbanks, kōiwi from Ngāti Rakaipaaka were reburied on higher ground (Angeloni 2021).

Reinterring kōiwi needs to be carried out with sensitivity and respect for the iwi and whānau involved. Unmarked and private burial sites located on silent files may be difficult to locate and protect if they are affected by forestry slash, flooding, and erosion (Angeloni 2018). Urupā on Waiheke Island and Ponui Island / Chamberlins Island in the Hauraki Gulf have kōiwi being unearthed on beach fronts more frequently following storms (Davis 2018). A Ngāti Paoa representative asked the Waiheke Local Board to create two new

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[5] A hui or gathering of the Kīngitanga (King Movement).

urupā on different parts of Waiheke Island to reinter remains because some private landowners do not want to reinter remains on their land.

The fifth media article, by Paewai ([2022](#)), also focuses on the exposure of kōiwi from urupā on the cliff top at Okurei Point, which came down onto the beach below. As a result, Bay of Plenty iwi have put in place a climate change strategy for Maketū, He Toka Tū Moana Mō Maketū. This strategy has a focus on education and teaching their rangatahi about science and mātauranga Māori. They have developed māra kai (food gardens), an emergency response plan, and a land-use-change project. Future kōrero will focus on houses in vulnerable areas that may need to be moved.

3.2.2   Strategies, plans, and information sheets

Table 3 lists and summarises climate change strategies, an environmental management plan, a kaitiakitanga (guardianship) plan, and information sheets that relate to places of significance to Māori.

Table 3. Resources on places and taonga of significance to Māori

Organisation/Author(s)	Resource	Link
Te Rūnanga o Ngāi Tahu	Te Tāhū o Te Whāriki Anchoring the foundation: He Rautaki Mō Te Huringa o te Āhuarangi – Climate Change Strategy, August 2018	Te Rūnanga o Ngāi Tahu Climate Change Strategy
Te Arawa; developed by Te Arawa Climate Change Working Group in partnership with Te Arawa Lakes Trust and Scion	Te Ara ki Kōpū: Te Arawa Climate Change Strategy. Te Arawa ahu Hawaiki: Past, present and future generations of Te Arawa - secure and well. Nā Ruihana Te Nahu & Ngahuia Hona-Paku 2021	Te Arawa Climate Change Strategy
Te Rūnanga o te Rarawa	Te Rūnanga o te Rarawa Strategic Plan 2020–2025	Strategic plan Te Runanga o Te Rarawa
Patuharakeke Hapū, Juliane Chetham, and Patuharakeke Te Iwi Trust Board working Party	Environmental Management Plan 2014: Section 8: Waahi tapu me waahi taonga.	Patuharakeke hapu environmental management plan 2014
Te Ātiawa ki Whakarongotai (TAKW) Charitable Trust	Whakarongotai o te Moana Whakarongotai o te wā Kaitiakitanga Plan: A Plan for Te Ātiawa Ki Whakarongotai. 2019	TAKW Kaitiakitanga Plan
Joint Climate Change Adaptation Committee and Climate Adaptation Te Tai Tokerau working group	Te Tai Tokerau Climate Adaptation Strategy: - Chapter 2: Impacts on Māori - Chapter 3: Coastal communities 1 April 2022	Te Tai Tokerau Climate Adaptation Strategy
Nelson City Council	Taonga Tuku Iho, Heritage Strategy 2022–2032.	Taonga Tuku Iho 2022-2032
Heritage New Zealand Pouhere Taonga	Information sheets (Feb 2023): - Caring for Marae Taonga after Floods - Caring for Urupā after Cyclone Gabrielle.	- Caring for Marae after Floods - Caring for Urupā after Floods

In response to the already existing and imminent climate change-induced risks to cultural heritage, iwi and hapū are developing climate change adaptation strategies to outline how they will work to better adapt to the impacts of climate change and protect cultural infrastructure and communities (MfE 2022; Climate Adaptation Te Tai Tokerau 2022).

Seven examples from across Aotearoa New Zealand are outlined below. Two of these examples (Te Tai Tokerau and Te Tauihu o Te Waka a Māui) work in partnership with regional and local government agencies, respectively, to enable an integrated, holistic, and considered approach to adaptation at the local scale with communities, iwi and hāpu, and stakeholders.

Te Rūnanga o Ngāi Tahu

Te Tahū o Te Whariki – Anchoring the Foundation is Te Rūnanga o Ngāi Tahu's Climate Change Strategy (2018) and addresses climate change at multiple scales (individual, whānau, hapū, papatipu rūnanga [ancestral council], and iwi) because each place and tribal activity is unique and requires its own solution. The strategy focuses on the impact of sea-level rise on marae, urupā, and other areas of cultural significance, and highlights the importance of taking a holistic approach to climate change and an intergenerational vision so that their people adapt and their cultural practices and taonga species can flourish. The concepts of 'shelter' (building and strengthening enduring systems to protect and care for what is important) and 'weaving' (acknowledging the interconnectedness of the strands in Te Rūnanga o Ngāi Tahu's strategy) are important.

Te Rūnanga o Ngāi Tahu outline nine pou (pillars) in their strategy. Of these, numbers 2, 3, and 6 specifically address cultural places, taonga, and tribal resources or taonga tuku iho (cultural heritage) such as mahinga kai and wāhi tapu (sacred places).

1. TE KAITIAKITANGA ME TE TĀHUHU: to adapt all areas of tribal interests and activity to withstand the compounding effects of changing climate under extreme scenarios.

2. TŌ TĀTOU NGĀI TAHUTANGA: Ngāi Tahutanga and tikanga guide innovative, effective climate change responses for all Te Rūnanga o Ngāi Tahu; intergenerational knowledge of taonga and resources that have been diminished or lost. Maintain relationships to places, resources and taonga under new climate conditions.

3. TE AU TŪROA: to manage tribal resources wisely to protect wāhi tapu, mahinga kai and other taonga tuku iho using strategic restoration activities. Investing in places and species of likely future abundance.

4. KO NGĀ WHAKĀPĀTANGA: Whānui are well informed about all aspects of climate change relevant to their interests and well-being within whānau and hapū.

5. TE WHAKAARIKI: Te Rūnanga o Ngāi Tahu is embedded within key climate change response structures and programmes, working with central and local government.

6.TE WHAKATIPU: Resources and information for marae and community-centred climate change response strategies for whānau and hapū and aligned with tribal

direction e.g., upgrade of technologies and systems for all marae facilities to ensure long term resilience, plans to relocate if sea level rise threatens marae and Rūnanga facilities.

7. WHĀNAU: Whānau needs and aspirations central to tribal climate change response. Tribal resources targeted towards addressing challenges to kainga with the takiwā.

8. MĀTAURANGA: Future-focused education and training supports to generate and take up opportunities related to climate change response. Development of leaders.

9. TE PŪTEA: Economic base of Te Rūnanga o Ngāi Tahu is built on leading climate responsible, innovative and adaptive businesses and partnerships; meeting needs and aspirations of whānau, applying values to address business risks, challenges and opportunities associated with climate change.

The Te Rūnanga o Ngāi Tahu strategy focuses on the need for long-term resilience plans, future-focused education, and leaders who can address the challenges and opportunities associated with climate change impacts.

Te Arawa

Te Ara ki Kōpū: Te Arawa Climate Change Strategy[6] addresses climate change at the local, regional, national, and international scales. The strategy provides a pathway for whānau, hapū, and iwi to work proactively, 'empowering our way of knowing and seeking new ways of living to ensure our tribe's collective survival'. Te Arawa has an intergenerational vision, which includes the concept to "weave a basket of knowledge for the future - raraungia he kete mātauranga mō anamata".

Te Arawa highlights economic poverty as a challenge in mitigating and adapting to climate change. For example, during natural disasters and large-scale emergencies their marae have opened up to cater for displaced whānau and communities. Their patterns of settlement are along the coastlines and close to lakes and rivers, which is why their strategy encourages their whānau, hapū, and iwi to proactively empower new ways of knowing and ways of living to ensure their survival.

The strategy highlights six priority actions over a 10-year period:
- action planning: to enable kaupapa-focused action
- research and monitoring: to gather and collate robust information to guide planning, decision-making and action
- awareness: to build tamariki (children), rangatahi, whānau, hapū, and iwi awareness and understanding about climate change
- social mobilisation: to inspire and empower whānau, hapū, and iwi to be involved in leading on-the-ground action

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[6] https://tearawa.io/wp-content/uploads/2021/09/RS03642-Ta-Arawa-Climate-Change-Strategy.pdf

- strategic alliances: to build and maintain effective and mutually beneficial relationships
- advocacy: to represent Te Arawa locally, regionally, national and globally in relation to climate change.

Te Rūnanga o Te Rarawa

Te Rūnanga o Te Rarawa Strategic Plan 2020–2025 (2019) focuses on their rūnanga at the whānau, hapū, and marae scale in the Far North District of Northland. Their vision is to uphold the mana and mauri of their haukāinga (true home) so that 'every Te Rarawa marae is a vibrant and healthy space for whānau and hapū to develop culturally, socially and economically'.

In their plan there are three initiatives that relate to culture and heritage:

- 1.1 Direct resources to support hapū and marae development.
- 1.3 Utilise and preserve traditional knowledge. Form and utilise a kaumātua advisory body to inform education and advocacy on tikanga-related matters. Utilise traditional methods (waiata, pūrerehua, pūkāea) to transmit Te Rarawa history and stories to our people. Support whānau to access and store traditional knowledge and resources.
- 3.3 Recognise and realise the cultural, social and economic value of te taiao. Proactively mitigate the impacts of and respond to events relating to climate change including planning for future food and water requirements.

Strong leadership, along with structures, knowledge, and tools to support their growth and development, are foundational in this plan. A strong sense of Te Rarawatanga guides and nurtures their whānau and the wider community. The well-being of their people is at the centre of Rarawatanga.

The Patuharakeke Hapū

The 'Patuharakeke Hapū Environmental Management Plan' (2014) was developed

> to ensure appropriate engagement and participation of Patuharakeke in the planning and decision-making process of councils, agencies and developers; to assert tino rangatiratanga and kaitiakitanga over their natural environmental and all ancestral taonga; to empower legislative provisions and to clearly identify management kaupapa of Patuharakeke (pg.12).

Section 8, 'Wāhi tapu me wāhi taonga', covers cultural heritage sites, resources, traditions, knowledge, and landscapes of significance to Patuharakeke, including wāhi tapu and mahinga kai. Wāhi tapu are known as historical 'footprints', important and sacred, and passed down over generations through kōrero. Land-use changes and colonisation have affected these sites, and many sites have been destroyed.

Various issues and challenges are outlined in the plan. They would like their wāhi tapu to have the same status as 'natural' or 'built' heritage status in the planning regime, and to use kaitiaki and tangata whenua (holding ahi kaa – title to land through occupation) as

experts rather than archaeologists or landscape architects. They believe that utilising their knowledge would capture the whole cultural landscape setting and context.

Another issue identified in *Patuharakeke Hapū Environmental Management Plan* is the naming of sites. Many of the original names given by Māori have been 'wrongly recorded, abbreviated, changed or omitted completely'; for example, Poupouwhenua is now known as Marsden Point. Section 8.3 of the Environment Plan outlines the policies to be enacted, and section 8.4 outlines the methods for mapping sites of significance, and cultural impact assessments or cultural values assessments for wāhi tapu.

Te Ātiawa ki Whakarongotai

The '*Whakarongotai o te Moana Whakarongotai o te Wā: Kaitiakitanga Plan*' (2019) for Ātiawa ki Whakarongotai was developed within a kaupapa Māori planning framework and is made up of three conceptual components:

- hunanga – outcomes and objectives,
- tikanga – best practices, actions, policies, rules and programme
- kaupapa – the platform of values on how the world is viewed.

The Hua Parakore framework is used in this plan and has six kaupapa (themes): whakapapa (genealogy), wairua (spirit), mana (prestige, authority), māramatanga (understanding), te ao tūroa (the enduring world), and mauri (life force). These values are recurring themes in other strategies and plans reviewed in this report.

Each of these kaupapa has objectives, outputs, and 5-year priorities to address the impacts of climate change and extreme weather events, and to set out tikanga to limit impacts on the community – including a vulnerability assessment to understand areas of greatest risk. For each Kaupapa, information is provided on the nature of the relationship of Ātiawa ki Whakarongotai and their culture and traditions with their ancestral land, water, sites, wāhi tapu, and other taonga. Tikanga are important for protecting wāhi tapu and other taonga, including mapping wāhi tapu sites, determining measures for providing necessary protection for wāhi tapu, wāhi tūpuna and archaeological sites, and abiding by the Accidental Discovery Protocols (Appendix A) if evidence of archaeological sites is discovered.

Te Tai Tokerau

'Te Tai Tokerau Climate Adaptation Strategy' (2022) is a holistic, collective response to climate change risks for Northland coastal communities. Whangārei District Council, Far North District Council, Kaipara District Council, Northland Regional Council (NRC), tangata whenua representatives from the Far North District, NRC Tai Tokerau Māori and Council, Whangārei District, and Kaipara District were involved in developing the actions and guidelines.

The purpose of this strategy is to develop a toolkit and resources to enable hapū-led adaption at the local scale so that the people and the environment of Te Tai Tokerau 'thrive and are resilient in a changing climate'. There is an emphasis on working together

across iwi and hāpu partners, communities, and stakeholders using a framework of mātauranga, tikanga, and pūrākau (storytelling). The Dynamic Adaptive Policy Pathways (DAPP) approach was used to ensure best-practice engagement and decision-making were used.

Their strategy is founded on the following key principles:

- the Treaty of Waitangi
- whanaungatanga (kinship)
- Western science and mātauranga Māori knowledge to help understand and inform decisions
- equitable – empowering communities
- considered – research-led, evidence-based, values-driven policy and decision making
- ka mua ka muri (walking backwards into the future):
    - transformative: innovation to build a better future
    - transition: address and reduce risks
    - holistic: strengthen the four well-beings.

Hazards identified for these communities include flooding, coastal erosion, storm surge, and regular tidal inundation, which are likely to have an impact on cultural infrastructure such as marae and urupā, places for food gathering (e.g. mahinga mataitai), and places of cultural significance such as wāhi tapu and archaeological sites.

Tauihu o Te Waka a Māui

'Taonga Tuku Iho Heritage Strategy (2022–2032)' (2022) is a collective response across agencies, organisations, and groups – both Māori and non-Māori – with an interest in Nelson's heritage. Their approach is holistic and sits within a te ao Māori framework encompassing built heritage as well as natural and metaphysical heritage (e.g. language, stories, and the arts). The purpose of the strategy is to work together to ensure that taonga tuku iho is 'respected, protected and valued by our community and passed to future generations'.

There are eight iwi that have tribal interests within Nelson. As with the Te Tai Tokerau strategy, the Treaty of Waitangi is the foundational basis of the relationship between ahikā (home people, people of the land) and the Crown. The strategy honours tino rangatiratanga (self-determination) of ahikā and their authority as kaitiaki (guardians) of their lands and taonga. The taonga tuku iho framework includes:

- tohu whenua: sites of cultural significance (e.g. wāhi tapu, wāhi tūpuna and archaeological sites)
- taonga: physical (built heritage) and metaphysical heritage
- te taiao: the environment and natural heritage
- kōrero tuku iho: histories and stories
- tikanga/kawa: cultural practices, customs and traditions

- te reo: the Māori language.

The 2022 strategy emphasises a shift in approach from the previous strategy *'Whakatū Nelson Heritage Strategy'* (2006) to a woven history, diverse narratives, relationships-based heritage, a living view, and dynamic stories.

A dynamic action plan will be developed, reviewed annually, to achieve the aspirations of the strategy. The strategy is guided by five pou:

- kaitiakitanga: high-level advocacy and responsibility as kaitiaki to advance the protection and care of our taonga
- te taiao: protect and improve the natural and built environment, as well as culture and traditions associated with ancestral lands, water, wāhi tapu, and other taonga
- mana motuhake: celebrate our unique heritage, tikanga, and reo
- whanaungatanga: a community approach to actively preserving and respecting taonga
- rangatiratanga: collective duty of care to uphold the mana of communities through learning and critiquing policy and practices related to taonga tuku iho.

Other information sheets

Finally, in this section two information sheets are highlighted that have been published by Heritage New Zealand Pouhere Taonga to support marae to care for their taonga urupā through the Māori Built Heritage Programme. The first information sheet, *Caring for Marae Taonga after Floods* (published in February 2023) gives advice on re-entering a marae after flooding and the process of drying and cleaning up. The second, *Caring for Urupā after Cyclone Gabrielle*, is a guide on how to care for urupā or burial grounds that are disturbed by natural disasters such as flooding. There are four sections, which outline safety, tikanga (best practice methods), record & store, and return & rebury.

3.2.3 Research on the role of Māori communities during crises and disasters

The role of Māori communities and marae in crises and disasters is the subject of two research projects outlined in this section (Table 4).

Table 4. Resources on the role of Māori communities and marae during crises and disasters

Organisation/Author(s)	Resource	Link
Massey University, Hudson & Hughes 2007	The role of marae and Māori communities in post-disaster recovery: A case study. Research Report for GNS Science, Report 2007/15:	Role of marae & Māori communities in post disaster recovery
The Deep South National Science Challenge project team: Koroi, Carlson, & Burgess	Kai ora: Restoring local Māori food systems by restoring power to marae, 2022/2023	Kai ora restoring local Māori food systems by restoring power to marae

A case study of the role of marae and Māori communities in post-disaster recovery (Hudson & Hughes 2007) is included in this review, even though the year is outside the criteria outlined in section 2.3, because it has relevance to the recent Cyclone Gabrielle disaster. This research investigated the role of the Poupatatē Marae and the Māori community in the Manawatu District following the floods of 2004 in the Manawatū-Whanganui Region. The case study was conducted to improve emergency policy development, planning, and management, particularly in relation to the involvement and role of marae and Māori communities in disasters.

This extensive study carried out focus group discussions and face-to-face interviews with key contacts from the Poupatatē Marae, district councils, and the flood review team. A key finding was the importance of Māori communities and their marae as a focal point in an emergency. The report identified gaps in the emergency management systems. It recommended that communication and information exchange during an emergency or disaster could be improved through greater cooperation and creating more opportunities for transferring knowledge and skills between civil defence groups, councils and Māori communities. A more effective approach suggested that Māori be present at all the decision-making levels within civil defence and council. The importance of developing relationships and building partnerships between the groups was emphasised.

The Deep South National Science Challenge website outlines a research project, 'Kai ora: Restoring local Māori food systems by restoring power to marae' which is designed to support marae to envisage a future beyond crisis and lead to a more resilient marae. The research acknowledges the role that three Kaipara marae played during the Covid pandemic. The project team from Massey University and Te Kupenga Hauora Māori are taking an intergenerational approach to the research to increase the capacity and capability of future leaders to climate change. The research hopes to support marae to envisage a future that is more resilient and prepared for collective action in response to crises.

3.3   Cultural landscapes

This section summarises the resource *Tapuwae: Nā te Kaunihera Māori mō te Pouhere Taonga Māori: The Māori Heritage Council Statement on Māori Heritage.* [7]

The Māori Heritage Council is a statutory body responsible for the identification, protection, preservation, and conservation of Māori heritage places. The Council assists Heritage New Zealand Pouhere Taonga in "developing and reflecting a bicultural view in the exercise of its powers and functions". Tapuwae is a term that means 'sacred footprint' and is used by the Māori Heritage Council to symbolise Māori heritage in the landscape. It also encompasses ka mua ka muri (to look back to where we have been as we move forward):

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[7] https://culturalheritage.org.au/storage/2022/08/Tapuwae-2017.pdf

> *Māori heritage places give meaning and mana to the history, traditions, culture and identity of whānau, hapū and iwi and includes sacred and historic sites, ancestral places, tribal landmarks, cultural landscapes and built heritage features e.g. marae, church buildings, structures and monuments.* ([Cultural Heritage | Tapuwae: A Vision for Places of Māori Heritage](#))

The Māori Heritage Council has published a statement on Māori heritage entitled '[Tapuwae](#): Nā te Kaunihera Māori mō te Pouhere Taonga Māori: The Māori Heritage Council Statement on Māori Heritage'. The purpose of the statement is to:

- safeguard Māori heritage places for their own intrinsic worth and mana, and for the cultural benefit and well-being of today's and future generations of Māori
- acknowledge traditional and customary associations of whānau, hapū, and iwi with their heritage places and exercise of kaitiakitanga
- recognise and value Māori heritage places.

The statement is bilingual, using te reo Māori and English. It starts with a description of 'What Māori heritage is' and a statement about Māori heritage from Sir Apriana Ngata:

> *He taonga tuku iho, he taonga pūmau.*
> *Ko ngā tikanga whai hua o tō tātou Māoritanga.*
> *Ko ngā mea nō konei, nō tēnei whenua kura,*
> *he taonga tuku iho ki ā tātou tamariki.*
> *An heirloom, a treasure of true value.*
> *These are the significant aspects of our Māoritanga.*
> *They are the treasures from here, of this treasured land,*
> *an ancestral treasure to pass on to our children.*

The statement outlines the statutory framework for Māori heritage, which includes Heritage New Zealand, the Māori Heritage Council (The Council), and giving effect to the Treaty of Waitangi. Section 4 promotes the identification, protection, and conservation of Māori heritage, and section 5 outlines the work of the Council, which includes identifying Māori heritage, places and the New Zealand Heritage List (the List). The List includes wāhi tūpuna, wāhi tapu, wāhi tapu areas, historic places of interest to Māori, and historic areas of interest to Māori.

The Council works to build and enhance the capacity and capability of iwi, hapū, and whānau as kaitiaki of their taonga and heritage places. Places of outstanding national heritage can be included on the List of National Historic Landmarks / Ngā Manawhenua o Aotearoa me ōna Kōrero Tūturu. Māori built heritage is also an important part of Aotearoa New Zealand's heritage and includes wharenui (large meeting houses), wharekai (dining halls), wharekarakia (churches), pātaka (storehouses), pou haki (flag poles), tohu whakamaumaharatanga (memorials), and waka (canoes).

The Council recognises the uniqueness of the relationship between Māori built heritage and the cultural values it encompasses. The value of Māori heritage to Māori communities and to Aotearoa New Zealand is emphasised in section 6, and all New Zealanders are

encouraged to treasure these places. Kaitiakitanga (a way of caring for Māori heritage using traditional perspectives) and mātauranga Māori (distinctive indigenous and traditional knowledge) are recognised as important for the conservation and management of Māori heritage.

The Council's aspirations for Māori heritage (section 7) include:

- building the capacity and capability of whānau, hapū, and iwi to be kaitiaki of their heritage places,
- increasing the value that New Zealanders ascribe to Māori heritage places
- protecting and enhancing places of Māori heritage
- developing an understanding of the potential contribution of places of Māori heritage to health and well-being.

These aspirations are a platform for "honouring the mana of the past and enriching the lives of current and future generations through active treasuring of heritage places, buildings and structures that are important to Māori".

3.4 Adaptation, vulnerability, and risk

Table 5 lists the findings from the literature related to identifying and assessing climate-induced risks and hazards on cultural heritage places, and factors affecting vulnerability and adaptive capacity. (See Appendix 3, Table 10 for more information on these resources.) Varying methods were used in these publications, ranging from qualitative, quantitative, and mixed methods.

Studies using qualitative methods and a mixture of qualitative and quantitative methods have focused on identifying risks to cultural heritage places and factors that affect the vulnerability and adaptive capacity of whānau, hapū, iwi (King, Dalton, Bind, et al. 2012; King, Dalton, Home, et al. 2012; King et al. 2013; Proctor 2010; Awatere et al. 2021; McLachlan & Waitoki 2022).

Using the NCCRA framework and a kaupapa Māori analytical approach, Awatere et al. (2021) explored how climate change will affect the physical, social, and spiritual connection that Māori have with the natural environment. Twenty-five risks were identified and assessed across the four domains of interest:

- he kura taiao – living treasures
- whakatipu rawa – Māori enterprise
- he oranga tāngata – healthy people
- ahurea Māori, tikanga Māori – Māori culture, Māori values and principles

Table 5. Resources on adaptation pathways, vulnerability and risk

Organisation/author(s)	Resource	Link
King et al. 2012	Māori community adaptation to climate variability and change: examining risk, vulnerability and adaptive strategies with Ngāti Huirapa at Arowhenua Pā, Te Umu Kaha (Temuka), New Zealand. NIWA client report AKL 2011-015	[Māori community adaptation to climate variability and change: Temuka](#)
King, Dalton, Bind, et al. 2012	Coastal adaptation to climate variability and change: examining community risk, vulnerability and endurance at Manaia Settlement, Hauraki-Waikato, Aotearoa-New Zealand. NIWA client report AKL 2012-029	[Coastal adaptation to climate variability and change: Manaia](#)
King et al. 2013	Coastal adaptation to climate variability and change: examining community risk, vulnerability and endurance at Mitimiti, Hokianga, Aotearoa-New Zealand. NIWA client report AKL 2013-022	[Coastal adaptation to climate variability and change: Mitimiti](#)
McCoy 2018	The race to document archaeological sites ahead of rising sea levels: recent applications of geospatial technologies in the archaeology of Polynesia. Sustainability 10(1): 185	[The race to document archaeological sites ahead of rising sea levels](#)
Awatere et al. 2021	He huringa āhuarangi, he huringa ao: a changing climate, a changing world. Report prepared for Nga Pae o te Māramatanga. Manaaki Whenua – Landcare Research Contract report LC3948	[Report: He huringa āhuarangi, he huringa ao: a changing climate, a changing world](#)
Jones & Bickler 2022	Calculating heritage risks for the climate emergency in Aotearoa (New Zealand). Archaeology 52	[Calculating Heritage Risks for the Climate Emergency in Aotearoa New Zealand](#)
Department of Conservation. Bickler et al. 2013	The impact of climate change on the archaeology of New Zealand's coastline: a case study from the Whangarei District. Science for Conservation (322).	[The impact of climate change on the archaeology of New Zealand's coastline: a case study from the Whangarei District](#)
Department of Conservation Tait 2019	Risk-exposure assessment of Department of Conservation (DOC) coastal locations to flooding from the sea. Science for Conservation 332.	[Risk-exposure assessment of DOC coastal locations to flooding from the sea.](#)
Hill 2020	Better management through measurement: integrating archaeological site features into a GIS-based erosion and sea level rise impact assessment: Blueskin Bay, New Zealand. The Journal of Island and Coastal Archaeology 15(1)	[Better management through measurement: integrating archaeological site features into a GIS-based erosion and sea level rise impact assessment – Blueskin Bay, New Zealand](#)
University of Waikato Bailey-Winiata 2021	Understanding the potential exposure of coastal marae and urupā in Aotearoa New Zealand to sea level rise. MSc thesis	[Understanding the potential exposure of coastal marae and urupā in Aotearoa New Zealand to sea level rise](#)

Organisation/author(s)	Resource	Link
University of Waikato Proctor 2010	Toi tu te whenua, toi tu te tangata: A holistic Māori approach to flood management in Pawarenga. MSocSci Thesis	Toi tu te whenua, toi tu te tangata: A holistic Māori approach to flood management in Pawarenga
University of Waikato McLachlan & Waitoki 2020	Collective action by Māori in response to flooding in the southern Rangitīkei region. International Journal of Health Promotion and Education	Collective action by Māori in response to flooding in the southern Rangitīkei region
Smith et al. 2016	Local volunteers respond to the Rena oil spill in Maketū, New Zealand. New Zealand Journal of Social Sciences Online 11: 1	Local volunteers respond to the Rena oil spill in Maketū, New Zealand
Victoria University: Project Team Lead: Catherine Iorns	Sea level rise, housing and insurance: Liability and compensation. Deep South Challenge Research website	Sea level rise housing and insurance liability and compensation
Massey University: Project Team Lead: Huhana Smith	Risk management for Māori coastal assets. Deep South Challenge Research website	Risk-management-for-Māori-coastal-assets
Bailey-Winiata et al. 2022	The role of coastal marae in natural hazard response and climate change adaptation. Chapter 3. In *Coastal Adaptation: Adapting to Coastal Change and Hazard Risk in Aotearoa New Zealand* (pp. 41–44)	The role of coastal marae in natural hazard response and climate change adaptation

The risk of potential climate change impacts on ahurea Māori and tikanga Māori was assessed, with a particular emphasis on language and customs, sports, festivals, mourning ceremonies, and cultural infrastructure. Adaptation strategies were identified and listed. Future proofing of existing cultural infrastructure, relocating cultural infrastructure and taonga away from floodplains and low-lying coastal areas, restricting the building of infrastructure on flood-prone sites, and investing in insurance coverage were some of the adaptation strategies suggested in this report.

In a series of place-based studies with Māori communities undertaken by NIWA, King, Dalton, Bind, et al. (2012), King, Dalton, Home et al. (2012), and King et al. (2013) identified climate change risks and the determinants of adaptive capacity and vulnerability of iwi and hapū. Proctor (2010) and McLachlan and Waitoki (2022) conducted studies to explore the resilience and vulnerability of the community to flood risk. At the time of the research, these iwi and hapū were already at risk of flooding and coastal hazards and were concerned about the impacts on their marae, pā, and mahinga kai sites.

It was found that genealogical relationships to people and land (whakapapa) and tribal canoe (waka) bring people together in crises. It was also found that the capacity to adapt was rooted in cultural principles defined by whakapapa, tikanga, kawa, rangatiratanga, and kaitiakitanga, and actioned through practical values of whanaungatanga (kinship), manaakitanga (hospitality), kotahitanga (unity), and aroha (love, concern).

The following factors were identified as determinants of resilience and vulnerably of whānau, hapū, and iwi:

- infrastructure and resourcing
- social-cultural networks, community changes, and conventions
- knowledge, skills, expertise, information and education
- planning, governance, community-based structures and decision-making, and competing values.

Smith et al. (2016) looked at the quick response of the iwi and hapū of Maketū to the oil spill disaster from *MV Rena* (a container ship) and found the importance of Māori cultural principles and practical values of rangatiratanga, kaitiakitanga, and manaakitanga in adaptive capacity. Further, support from whānau, well-established connections and roles in the community, spiritual connection to Tangaroa (God of the Sea), resourcefulness, innovation, local knowledge, skills and expertise, and the ability to combine scientific knowledge with mātauranga Māori were identified as determinants of the Maketū community's ability to respond to disasters.

A few quantitative studies have identified the location of archaeological and cultural heritage sites and assessed climate change-induced risks using geospatial analysis at the local (Bickler et al. 2013; Hill 2020) or national scale (Tait 2019; McCoy 2018; Jones & Bickler 2022; Bailey-Winiata 2021). Findings from these studies suggested that the majority of sites are located near the coast and are, or will be, severely affected by climate change-induced risks, especially from sea-level rise and coastal inundation. These studies also highlighted the importance of (and ways to improve) the reliability of site location data, especially at a local level. Use of field surveys, higher-resolution topographic and geospatial data, and feature-based representations of archaeological sites (instead of point–based representation) were recommended to increase the accuracy of site-specific assessments.

3.5 Models, tools, and frameworks

In this section on models, tools, and frameworks for adapting to climate change, four peer-reviewed papers were identified, along with one NIWA client report that specifically relates to culture and heritage (Table 6). (See Appendix 3, Table 11, for more information on all the resources in this section.)

All of these resources were either developed with Māori marae communities or are specifically for Māori to carry out risk assessments associated with marae. They are diverse in their approaches to climate change adaptation and decision-making and include both qualitative (adaptation decision-making models, kaupapa Māori, community-based participatory methods such as Marae-opoly, pūrākau – storytelling) and quantitative (hydrological modelling) methodologies.

Table 6. Resources that focus on models, tools, and frameworks for adapting and addressing climate change

Organisation/Author(s)	Resource	Link
NIWA Colliar & Blackett 2018	Tangoio climate change adaptation decision model: a process for exploring adaptation pathways for Tangoio Marae. NIWA client report 2018-242HN	Tangoio NIWA client report .
Kenney & Phibbs 2015	A Māori love story: community-led disaster management in response to the Ōtautahi (Christchurch) earthquakes as a framework for action. International Journal of Disaster Risk Reduction 14: 46-55	A Māori love story: Community-led disaster management in response to the Ōtautahi (Christchurch) earthquakes
Morgan Te Kipa Kepa 2006	Decision-support tools and the indigenous paradigm. Proceeding of the Institute of Civil Engineers: Engineering Sustainability 159(4): 169–177	Decision-support tools and the indigenous paradigm
Blackett et al. 2021.	Marae-opoly: supporting localised Māori climate adaptation decisions with serious games in Aotearoa New Zealand. Sustainability Science pp.1–17	Marae-opoly | Deep South Challenge
Lee 2009	Decolonising Māori narratives: Pūrākau as a method. Mai Review 2: Article 3	Pūrākau as a decolonising method for Māori narratives

For Māori communities, decision-making is underpinned by a range of cultural values, which begin with whanaungatanga and kotahitanga as starting points, and include aroha nui ki te tangata (extending love to all people) when faced with the impact of a disaster (Kenney & Phibbs 2015). While there are only five articles in this section, there are a number of articles in sections 3.2 and 3.4 that outline other methods not included here, and they emphasise the importance of climate change strategies that provide direction at a place, or for an activity, because each is unique and requires its own solutions.

Other methods described include geomorphology data modelling and mapping for sea-level rise risk assessments, DAPP strategies for future planning and climate change scenarios, complex systems theory, and a grounded theory approach. Whichever methods are chosen, there is a focus on the outcome, enabling priority actions to be determined for a specified period of time.

There is much international literature on adaptation decision models and adaptation pathways, but we only found a NIWA client report (Colliar & Blackett 2018) that was relevant to Aotearoa New Zealand's culture and heritage. This Deep South National Science Challenge research was carried out with the Tangoio Marae community. In this research they used a climate change adaptation decision model process to explore adaptation pathways for the Tangoio Marae. They developed an eight-step adaptation decision model, Te Huringa ki te Rangi, which brings together mātauranga Māori community experience and hydrological modelling. Information was shared and presented using a range of formats, including flooding history timelines, videos, and visualisations of hydrological modelling outputs. Using a variety of communication methods helped the wider community to better understand the potential impacts of extreme flooding in

different future climate change scenarios over a range of timeframes. From this process, the marae community have developed adaptation pathway maps for their marae, which has helped them to consider proposed options for adapting to large storm events (e.g. building stop banks, lifting building floor levels).

Kenney and Phibbs (2015) give an overview of Māori risk management in response to the Christchurch earthquakes. The research outlines how kaupapa-based technologies were used to operationalise cultural technologies that could be used in an emergency context. The Hyogo Framework of Action supports the integration of Māori technologies into national civil defence emergency management policies. Tikanga, mātauranga, and kaupapa are used to achieve whakaoranga iwi whānui – community recovery, restoration and resilience. The principle of aroha nui ki te tangata (extending love to all people) is the principal value. Cultural values such as kotahitanga, manaakitanga, whanaungatanga, and rangatiratanga guided action in the Christchurch earthquakes.

Included in this review is a peer-reviewed article by Te Kipa Kepa Morgan (2006) that outlines a decision support tool and indigenous paradigm called the Mauri Model, because this has been developed specifically by Māori for Māori. The Mauri Model is an expert-weighted decision matrix that provides a culturally based template within which indigenous values are explicitly empowered alongside 'Western' thinking. It provides the basis for consistent prioritisation of well-being. Four dimensions – community (social), whānau or family unit (economic), ecosystem (environmental), and hapū group (cultural) – are used to evaluate mauri.

A different approach, which supports decision-making, is Marae-opoly, a serious game which has been developed as a platform for assembling cross-cultural climate change knowledge (Blackett et al. 2021). The game provides a safe place to learn, experiment, and inform adaptation decisions and strategies. This game was used to aid the Tangoio Marae community in their climate change adaptation decision model process to explore adaptation pathways for the marae (Colliar & Blackett 2018).

Lee (2009) writes about how pūrākau (a traditional form of Māori narrative) was used as a method to describe engagement with decolonising methodologies and kaupapa Māori. Pūrākau bricoleur is the weaving together of sets of practices as possible solutions to a specific problem. Lee (2009) suggests that there is a need to have a broad knowledge of a range of methods that may adapt and evolve during the process of finding a solution to the problem.

3.6   Summary of findings

In Tables 2–6 we have listed and summarised the peer-reviewed papers, climate change strategies and plans, geospatial assessments, risk assessments, models, tools, frameworks, and resources for caring for, protecting and conserving Aotearoa New Zealand's taonga and cultural heritage. These are in a variety of forms, which include peer-reviewed articles, research reports and plans, media articles, videos, information sheets, websites and guidelines (Table 7). However, this review took a Western science approach to sourcing and analysing the resources, and we acknowledge that there may be iwi-led cultural

knowledge and mātauranga Māori resources available that have not been published and so are not captured by this research.

Table 7. Summary of resource types

Resource type	No.
Peer-reviewed articles	11
Information factsheets or guides	11
Research reports (NIWA, MWLR, DOC)	9
Climate change strategies, environment plans, statements or kaitiakitanga plans	8
Websites with relevant research projects (Deep South Science Challenge) but no papers identified	3
YouTube videos	3
Master's theses	2

Our overall findings were as follows.

- Most of the literature focused on Māori cultural heritage, and in particular marae and urupā.

- There is a paucity of Aotearoa New Zealand-specific literature looking at the impacts of climate change on the cultural heritage values of wider communities.

- This review shows an emphasis in the literature on how to address future impacts of climate change such as sea-level rise and the resultant coastal inundation and flooding. There are also numerous instances of research that specifically address the impacts following a disaster (e.g. Christchurch earthquakes, Manawatū floods). We anticipate there will be similar research carried out on the impacts of Cyclone Gabrielle.

- More recently, methodologies such as DAPP future scenario mapping and risk assessments are being used to develop strategies and action plans that can help communities prepare for future climate change impacts in places such as marae.

- The literature indicates that, for Māori communities, a holistic approach is taken, which is underpinned by Māori cultural values.

- Rangatiratanga, or the value of strong leaders, is important for educating and transferring intergenerational knowledge to rangatahi. The challenge for Māori is how to increase the capability and capacity of rangatahi to ensure that iwi/hapū can adapt to future climate change impacts.

3.7   Gaps in tools and resources

- Cultural heritage and taonga (treasured items) are rarely a significant component of climate change policies, strategies, action plans, and risk assessments. While the direction of the Zero Carbon legislation has set a positive road map for change in Aotearoa New Zealand, the effects on and response for cultural heritage are not well understood (MfE 2020).

- There are gaps in knowledge about where cultural heritage sites are located and how they could be affected, due to very limited research carried out on the sensitivity of cultural heritage sites to climate change.

- Limitations of the ArchSite system were identified in most of the peer-reviewed geospatial studies and relate to the quality of data points representing sites. ArchSite is the national database of recorded archaeological sites in Aotearoa New Zealand, and it is essential to the management and protection of those sites. It contains information on over 73,600 recorded archaeological sites, but there are many more that are unrecorded. Thus, at the local or site level, we recommend that more detailed assessments be undertaken to identify their locations and the climate-related risks. It is also important to note that geospatial analyses are looking at the risk to physical cultural heritage sites, but not the cultural values those sites hold.

- According to Carter and Bennett (2020), Aotearoa New Zealand has a diverse range of underwater cultural heritage sites. However, climate change impacts on them were only mentioned in this one article.

- There is a paucity of Aotearoa New Zealand-specific literature looking at the impacts of climate change on the values of cultural heritage for the wider community. Recognising the diversity of Aotearoa New Zealand's cultural heritage and the value of these sites to tangata whenua as well as the wider community is important to all New Zealanders.

- No resources focusing specifically on cultural landscapes were found, although they are an important type of cultural heritage. This may be due to the current focus on coastal cultural heritage sites at risk rather than on inland sites. Also, cultural landscapes are poorly protected by the current legislative framework.

Limitations of the review

- The scope of the literature review was restricted to Aotearoa New Zealand studies due to the limited resources available to Manatū Taonga to commission this report. While there is a growing body of international climate change adaptation literature relating to indigenous, local, and traditional knowledge on culture and heritage, this review does not cover such literature.

- The review focused on documents primarily written in English, not te reo Māori.

- This study used the Google search engine and so the resulting resources may be biased due to previous search histories. Further consideration should be given to running the searches multiple times with different search engines.

4   Conclusions

The purpose of this review was to increase our understanding of what climate change information, resources, and guidance for Aotearoa New Zealand's cultural heritage are available in the public domain. The review sought to find the gaps in the tools and resources available to help people adapt to climate change risk. Publicly available documents were reviewed to assist Manatū Taonga prioritise its NAP actions.

The review found that geographical scale is an important consideration. Overall, the vulnerability and resilience of Māori and other communities and their ability to adapt under a changing climate is not uniform: one size does not fit all. Decision-making needs to be at the local level.

The majority of the resources are focused on Māori communities and marae responding to the climate change impacts of sea-level rise, coastal inundation, and flooding. This reflects the location of most marae in coastal margins, where the impacts of climate change will affect certain whānau, hapū, and iwi and their interests, values, practices, and well-being more than others (MfE 2022). Ongoing analysis of climate change risks faced by different iwi and hapū are needed to ground-truth diverse exposures, sensitivities, and adaptive capacities to help avoid generalisation (King, Dalton, Bind, et al. 2012; King, Dalton, Home, et al. 2012; King et al. 2013). The Māori Climate Platform will be important in helping with adaptation planning, especially for the most vulnerable groups within communities.

Aotearoa New Zealand's adaptation responses must provide for its unique and diverse cultural heritage, and supply mechanisms to capture current and changing societal and wider community values. A diverse range of tools, models, and frameworks are available and have been utilised to develop climate change strategies and action plans for Māori communities, hapū, iwi, and rūnanga. King, Dalton, Bind, et al. (2012), King, Dalton, Home, et al. (2012), and King et al. (2013) emphasised that available climate change projections and associated guidance on sea-level rise are sufficient to raise awareness about potential impacts and risks. These projections can also be used to develop strategies to address vulnerability and adaptability, as most of the influencing factors are related to the existing socio-ecological issues faced by whānau, hapū, and iwi.

There are enough tools to encourage planning for the protection of cultural heritage against the impacts of climate change, what appears lacking is co-ordination and investment in the people to create and implement the plans. While there are a number of organisations (both local and central government) associated with caring for and protecting Aotearoa New Zealand's cultural heritage, there is a need for better co-ordination across these organisations and for more clarity on each of their roles. This review also shows that more investment is needed to build capacity and capability to carry out climate change risk assessments for cultural heritage and the relocation of taonga.

It should be noted that the gaps found through this review do not necessarily mean there are gaps in knowledge for climate change adaptation. We acknowledge this 'western-style' literature review is limited to written documents, and much mātauranga and knowledge relevant to culture and heritage may be documented in other ways. Communities, iwi and hapū may be developing protocols and guidance themselves, and sharing these protocols more publicly may not be a priority for them.

5 Recommended next steps

5.1 Recommended next steps for Government agencies

The next steps Manatū Taonga and/or appropriate government leads could consider in progressing the Manantū Taonga NAP actions are to:

- support Te Tiriti o Waitangi (Treaty of Waitangi) arrangements such as the Māori Climate Platform, by developing supporting information and guidelines for assessing the risk to taonga and implementing adaptation strategies for partner agencies
- acknowledge the decision-making rights of Māori by providing funding and opportunities for the early involvement of hapū and iwi in partnership approaches for implementing climate change adaptation processes
- facilitate better coordination across those agencies that are associated with or have responsibility for caring and protecting Aotearoa New Zealand's cultural heritage, and provide more clarity on each of their roles (including central government, Crown agencies, local government, NGOs, and iwi organisations)
- ensure a multi-agency, coordinated approach is taken to support communities, hapū, and iwi to undertake risk assessments and develop and implement adaptation plans
- develop a plan and/or guidance on financial mechanisms for iwi and hapū to mitigate impacts
- support the option to relocate cultural taonga/assets, if this is desired and/or required
- ensure there is support for key people in communities to carry out risk assessments on taonga and provide guidance on community plans – relationships are key, and people who have connections and networks with local communities and government are needed to translate political-speak to outcomes for whānau
- support the building of capability and capacity for intergenerational knowledge transfer about taonga
- invest in relationships to places, and taonga under new climate conditions. However, the maintenance to place may not be possible if climate change impacts are severe enough to destroy or limit access to place
- provide flexibility in the system, as each situation is unique, which would involve:
  - working at the local scale
  - communities forming their own solutions using the NCCRA framework
  - supporting and encouraging the implementation of a system-wide framework for risk assessments that goes beyond geotechnical assessments
- utilise frameworks such as DAPP future scenario mapping to develop scenarios and actions that recognise the cultural diversity of Aotearoa New Zealand's heritage, and the value of archaeological sites held by the wider community.

5.2 Recommended next steps for future research

This research was tightly scoped so recommendations for possible next steps for future research are to:

- examine a broader body of peer-reviewed international literature on the importance or role of indigenous, traditional, and local knowledge in relation to adaptation that is not captured in this review; which focused only on Aotearoa New Zealand literature
- fund research to include intangible and non-documented evidence of how people are adapting to climate risks and the effects on their cultural heritage
- broaden the search terms and definitions to include legislation, policy and strategies at national and local government levels relating to cultural heritage and cultural landscapes
- more research focused on climate change risks faced by inland communities would help to identify and assess the impacts on cultural landscapes.

6   Acknowledgements

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Appendix 1 – Glossary of definitions from the National Adaptation Plan

The following definitions are taken from the glossary in the National Adaptation Plan (Ministry for the Environment 2022).

Adaptation: In human systems, the process of adjusting to actual or expected climate and its effects, to moderate harm or take advantage of beneficial opportunities. In natural systems, the process of adjusting to actual climate and its effects. Human intervention may help these systems to adjust to expected climate and its effects.

Adaptive capacity: The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences.

Climate change: A change in the state of the climate that can be identified (eg, by using statistical tests) by changes or trends in the mean and/or the variability of its properties, and that persists for an extended period, typically decades to centuries. Includes natural internal climate processes and external climate forcings such as variations in solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use.

Cultural heritage: Those aspects of the environment that contribute to an understanding and appreciation of Aotearoa New Zealand's history and cultures. It includes historic sites, structures, places, areas, archaeological sites, sites of significance to Māori (including wāhi tapu) and cultural landscapes.

Disaster: A serious disruption of the functioning of a community or a society, at any scale, that occurs because hazardous events interact with conditions of exposure, vulnerability and capacity, leading to human, material, economic and/or environmental losses and impacts.

Disaster risk management: Processes for designing, implementing and evaluating strategies, policies and measures to improve understanding of current and future disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in 182 Aotearoa New Zealand's first national adaptation plan Key term Definition disaster preparedness, prevention and protection, response and recovery practices. The aim is to increase human security, wellbeing, quality of life and sustainable development.

Indigenous knowledge: The understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings. For many indigenous peoples, indigenous knowledge informs decision-making about fundamental aspects of life, from day-to-day activities to longer-term actions. This knowledge is integral to cultural complexes, which also include language, systems of classification, resource-use practices, social interactions, values, ritual and spirituality. These distinctive ways of knowing are important facets of the world's cultural diversity.

Māori values and principles: Values and principles that come from Māori views of the world and that Māori use to make sense of, experience and interpret the world. They form the basis for Māori ethics and principles.

Place/places: Urban or rural areas, ranging from neighbourhoods to towns and regions. Adaptation must address both the physical elements of a place (e.g., homes, buildings, infrastructure and spaces around them) and the social elements (e.g., the identity of people and communities, cultural value).

Resilience/resilient: The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, by responding or reorganising in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it allows systems to maintain their capacity to adapt, learn and/or transform.

Risk: The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. Adverse consequences may affect human lives, livelihoods, health and wellbeing; economic, social and cultural assets and investments; infrastructure; services (including ecosystem services); and ecosystems and species.

Risk assessment: The scientific estimation of risks, which may be either quantitative or qualitative.

Vulnerability/vulnerable: Being predisposed or more likely to be adversely affected. Elements that contribute to this concept include sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Appendix 2 – Glossary of te reo Māori terms

Ahi kā	Continued connection and occupation to place (keeping the home fires burning)
Ahurea Māori, Tikanga Māori	Māori culture, Māori values and principles
Ako	Culturally preferred reciprocal interactions. Teaching and learning
Aroha	Love, care, mutual respect
Aroha nui kit te tangata	Extending love to all people
Hapū	Pregnant, subtribe
Huanga	Objectives
Iwi	Tribal kin group, bones
Kaupapa	Cultural values and principles
Kaitiakitanga	Care and responsibility toward taonga tuku iho, guardianship
Ka mua ka muri	Walking backwards into the future
Kawa	Protocols, customs, etiquette
Kōiwi	Ancestral bones
Kōrero	Discussion, account, narrative, to speak
Kotahitanga	Unity, solidarity, collective action
Mana	Dignity, authority, control, prestige, power
Mana whenua	Territorial rights, power and authority from the land
Marae	Social and cultural centres for traditional and modern iwi/hapū/whānau Māori society
Mauri	An energy or a sustaining life force or spirit, a soul, in all living and non-living things
Mahinga kai	A food gathering area, cultivation
Manaakitanga	Reciprocal and unqualified acts of giving, caring and hospitality, care for whanau and manuhiri
Mana motuhake	Self-rule, independent power and authority, uniqueness
Mātauranga	Cultural knowledge
Piupiu	waist-to-knees garment made of flax
Pūrakau	Māori narrative, story telling
Rāhui	Prohibition, the setting aside of a place or thing for a specified time
Rangatahi	Youth, younger generation

Rangatiratanga	Self-determination, independence, leadership
Rūnanga	Tribal or public assembly, conference or council
Taonga	Treasure
Taonga tuku iho	Treasured possessions passed down from ancestors, heirloom
Taonga tūturu	Protected objects that whakapapa to Te Ao Māori and embody mana, tapu, and mauri
Tapu	Sacred, prohibited, restricted - a supernatural condition
Tauiwi	Non-Māori people of Aotearoa New Zealand
Tikanga	Cultural practices, protocols, values and traditions
Tūpuna	Ancestor
Urupā	Burial ground
Whakapapa	Ancestral lineage, ancestral connections, genealogical relationships
Wāhi tapu	Sacred place/area
Wāhi Tūpuna	Ancestral lands
Whanaungatanga	Family connections and family relationship, kinship
Whakatipu Rawa	Māori Enterprise
Whānau	Family, extended family
Whakaoranga iwi whānui	Community recovery, restoration and resilience

Appendix 3 – Tables summarising publication information, scale, hazard type or impact, organisations, purpose, tool/framework used, recommendations and gaps identified for sections 3.1, 3.2, 3.4 and 3.5

Table 8. Published resources on historic sites, structures, places, areas, and archaeological sites to support section 3.1

Title, author & link	Date published & article type	Scale	Hazard type or impact	Cultural Heritage	Organisations involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
Repairing historic brickwork after an earthquake. Heritage NZ Pouhere Taonga [Repairing historic brickwork](#)	Nov 2016 Sustainable Management of historic heritage guidance series: Information sheet	National	Earthquake	Heritage buildings	Heritage NZ Pouhere Taonga	To provide information about repairing historic brickwork after an earthquake. Includes advice on safety, support for determining and designing structural repairs, consent requirements and funding options.
Repairing historic stonework after an earthquake. Heritage NZ Pouhere Taonga [Repairing historic stonework](#)	Nov 2016 Sustainable Management of historic heritage guidance series: Information sheet	National	Earthquake	Heritage buildings	Heritage NZ Pouhere Taonga	To provide information about repairing historic stonework after an earthquake. Includes advice on safety, support for determining and designing structural repairs, consent requirements and funding options.
Repairing and rebuilding historic chimneys after an earthquake. Heritage NZ Pouhere Taonga [Repairing and building historic chimneys](#)	Nov 2016 Sustainable Management of historic heritage guidance series: Information sheet	National	Earthquake	Heritage buildings	Heritage NZ Pouhere Taonga	To provide information about repairing historic chimneys. Includes advice on ensuring the building is safe, support for determining and designing structural repairs, consent requirements, materials to use, and funding options.

Title, author & link	Date published & article type	Scale	Hazard type or impact	Cultural Heritage	Organisations involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
Replacement of high-risk elements with lightweight materials. Heritage NZ Pouhere Taonga [Replacement of high-risk elements](#)	Nov 2016 Sustainable Management of historic heritage guidance series: Information sheet	National	Earthquake	Heritage buildings	Heritage NZ Pouhere Taonga	To provide guidance on exterior fabrics that may be a threat to public safety – such as gables, parapets and façades. Recommendation: to use lightweight composite materials if repair and strengthening of original material is not possible.
Guidance for Preparing Heritage Risk Management Plans. Heritage NZ Pouhere Taonga [Guidance preparing heritage risk management plans](#)	Sustainable management guides. March 2022	National	Disasters and emergency events, both natural and human-induced	Cultural heritage places	Heritage NZ Pouhere Taonga	Guidance to assist owners and managers to prepare risk management plans to aid the conservation and protection of any place of cultural heritage significance in New Zealand or held to be taonga by Māori. Follows an internationally recognised methodology for risk management planning based on reduction, readiness, response and recovery (the 4 Rs). Sets out the 8 steps in the process leading to the preparation and implementation of action plans that can be used to prioritise, plan and resource actions to treat or manage the risk over the short, medium and long term.
Koiwi Tangata Human Remains Guidelines. Heritage NZ Pouhere Taonga [Koiwi tangata human remains guidelines](#)	25 Aug 2014 Archaeological Guidelines Series	National	Coastal erosion	Urupā – kōiwi tangata	Heritage NZ Pouhere Taonga	To provide a process for the management of kōiwi tangata /human remains that have been uncovered accidentally or deliberately excavated/ exhumed in emergency response situations, as a result of development or as a result of natural processes that ensure compliance and NZ legislation are met.

Title, author & link	Date published & article type	Scale	Hazard type or impact	Cultural Heritage	Organisations involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
Collection Care: Preventative Conservation. Te Papa National Services Te Paerangi Preventative conservation	June 2001 Te Papa National Resource Guides: Issue No. 5	National	Earthquake, fire, flooding	Museums	Te Papa Tongarewa Museum of NZ	A guide for small museums without specialist conservators to safeguard/conserve items in their care. It highlights the importance of identifying risks and preventive actions e.g. temperature control, air cleanliness, relative humidity etc. This document should be read in conjunction with Te Papa's *Minimising disaster* and *Emergency procedures* guidance.
Governance, management & planning: Minimising disaster. Te Papa National Services Te Paerangi Minimising disaster.	June 2001 Te Papa National Resource Guides: Issue No. 6	National	Earthquake, fire, flooding	Museums	Te Papa Tongarewa Museum of NZ	To provide guidance for museums on preparing for disaster. Uses a SWOT analysis as a planning tool to determine strengths, weaknesses, opportunities and threats. A framework is provided for setting priorities and actions to take e.g. location, insurance, maintenance, finance, outside support, emergency materials, equipment & support. This resource recommends developing a contingency plan that clearly sets out what to do in the event of emergencies - including people and organisations who can provide assistance. There should be an Emergency Manual which includes an emergency equipment locker. In the Further reading section are guidelines from Australia, Canada and the US for disaster/emergency preparedness plans for small museums and cultural institutions.

Title, author & link	Date published & article type	Scale	Hazard type or impact	Cultural Heritage	Organisations involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
Governance, management & planning: Emergency Procedures. Te Papa National Services Te Paerangi Emergency procedures	June 2001 Te Papa National Resource Guides: Issue No. 7	National	Earthquake, fire, flooding	Museums	Te Papa Tongarewa Museum of NZ	A guide to the initial response to an emergency that paid staff and volunteers should follow i.e. stage 1 of the Emergency Recovery Plan. Sets out how to create 'The emergency procedures flipchart'. This document should be read in conjunction with Te Papa's *Minimising Disaster and Preventative Conservation* guidance.
New Zealand Archaeological Association Climate Change and Cultural Heritage Portfolio: Strategic Plan 2021-2026. New Zealand Archaeological Association (NZAA) No link available but the report is available on request from NZAA. Contact NZ Archaeological Association	Strategic Plan June 2021	National	Climate change impacts on cultural heritage	Cultural heritage places	New Zealand Archaeological Association	Sets out the plan and objectives of NZAA to aid the coordination and focus of climate action and response and to improve wider awareness and appreciation of cultural heritage. Sets out the goals and targets to achieve the NZAA strategic plan objectives.
How to care for your piupiu Te Tieki i tō piupiu. Te Papa Tongarewa Museum of NZ Watch: How to care for your piupiu | Te Papa	YouTube video	National		Taonga - piupiu	Te Papa Tongarewa Museum of NZ	To show how to care for and store piupiu. Resources available.

Title, author & link	Date published & article type	Scale	Hazard type or impact	Cultural Heritage	Organisations involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
How to care for your kete Te Tieki i tō kete. Te Papa Tongarewa Museum of NZ [Watch: How to care for your kete | Te Papa](#)	YouTube video	National		Taonga - kete	Te Papa Tongarewa Museum of NZ	To show how to care for and store kete. Resources available. Links to NZ Conservators of Cultural Materials - Pū Manaaki Kahurangi who are a professional association of conservators of cultural property in NZ https://www.nzccm.org.nz/
How to care for your hei tiki Te Tieki i tō hei tiki. Te Papa Tongarewa Museum of NZ [Watch: How to care for your hei tiki | Te Papa](#)	YouTube video	National		Taonga – hei tiki	Te Papa Tongarewa Museum of NZ	To show how to care for and store hei tiki. Resources available.
Underwater Cultural Heritage in Aotearoa New Zealand: Challenges and Opportunities. Carter and Bennett [Underwater Cultural Heritage in Aotearoa New Zealand Challenges and Opportunities](#)	2020 ICOMOS Heritage at risk Special Edition- Heritage Under Water at Risk: Challenges, Threats and Solutions	National	Not discussed however very relevant to impacts of Sea Level rise	Maritime archaeological sites		Review of NZ underwater cultural heritage sites. Challenges: discrepancies between the way in which heritage legislation is applied to terrestrial vs maritime archaeological sites, failure to incorporate international best practice in management of underwater cultural heritage. Recommendations: Heritage NZ to employ one or more suitably qualified maritime archaeologists to oversee the management of underwater cultural heritage sites, establishment of a tertiary level maritime archaeology programme, collaboration with technical divers to investigate shipwrecks.

Table 9. Resources on places of significance to Māori to support section 3.2

Title, Author & link	Date published & article Type	Scale	Hazard type or risk	Place of significance	Organisations Involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
Te Tāhū o Te Whāriki Anchoring the foundation: He Rautaki Mō Te Huringa O Te Āhuarangi - Climate Change Strategy. Te Rūnanga o Ngāi Tahu [Te Rūnanga o Ngāi Tahu Climate Change Strategy](#)	1 August 2018	Multiple scales – individual, whānau, hapū, Papatipu Rūnanga and iwi. Intergenerational	Climate related hazards in general including sea level rise	Marae	Te Rūnanga o Ngāi Tahu with support from NIWA on projected Climate Change impacts in the takiwā.	Strategy provides direction for Te Rūnanga o Ngāi Tahu across all their interests, assets and activities. Each place and tribal activity is unique and will require their own solutions. Highlights the importance of intergenerational perspective, regular communications and wānanga to build knowledge and understanding and culturally centred innovations and actions. Holistic view is important. Founding principles are SHELTER - building and strengthening enduring systems to protect and care for what is important to us all and WEAVING - acknowledging the interconnectedness of the various strands and aspects of the strategy. The strategy is framed around 9 pou and heke of Te Rūnanga o Ngāi Tahu 2025 the tribal map guiding their work.
Te Ara ki Kōpū: Te Arawa Climate Change Strategy. Te Arawa ahu Hawaiki: Past, present and future generations of Te Arawa - secure and well. Nā Ruihana Te Nahu & Ngahuia Hona-Paku [Te Arawa Climate Change Strategy](#)	Report – 2021	All scales – local, regional, national and international	Sea level rise	Coastal marae, urupā, and other areas of cultural significance.	Te Urunga o Kea: Te Arawa Climate change Working Group, Te Arawa Lakes Trust and Scion	The strategy provides a pathway for whānau, hapū and iwi to work proactively – "empowering our way of knowing and seeking new ways of living – to ensure our tribe's collective survival." It highlights 6 priority actions over the next 10 years. It has an intergenerational vision. Mission: "Navigating Te Arawa whānau, hapū and iwi through climate change by empowering our way of knowing to ensure continuity and wellbeing of Te Arawa whakapapa and taonga". (See page 11 for priority kaupapa). Challenges: Patterns of settlement are along the coastlines and close to lakes and rivers. During natural disasters and large-scale emergencies their marae have opened up to cater for displaced whānau and communities. Economic poverty is a challenge so mitigation and adaptation to climate change is difficult.

Title, Author & link	Date published & article Type	Scale	Hazard type or risk	Place of significance	Organisations Involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
Te Rūnanga o Te Rarawa Strategic Plan 2020-2025. Te Rūnanga o Te Rarawa [Strategic plan Te Runanga o Te Rarawa](#)	Report – October 2019	Rūnanga – Far North of Northland	Climate-related risks in general	Te Rarawa marae	Te Rūnanga o Te Rarawa	Strategic goals: Cultural well-being includes the proactive development of Te Rarawa whānau, hapū and marae. Vision: The mana and mauri of our haukāinga are upheld. Every Te Rarawa marae is a vibrant& healthy space for whānau and hapū to develop culturally, socially and economically. Te Rarawa whānau are supported and nurtured to learn, practice and express themselves. Te Rarawatanga continues to guide and nurture Te Rarawa whānau and the wider community. Foundational Support - Structures knowledge and tools to support growth and development. Strong leadership; unwavering commitment to achieving outcomes for whānau, hapū and marae. Capable governors mentored to transition into leadership roles. Progressive management initiatives to advance the well-being of the people. Political influence at local, regional, national levels; strong tikanga-based relationships.
Patuharakeke Hapū Environmental Management Plan 2014: Chapter 8 Waahi Tapu me Waahi Taonga. Juliane Chetham and Patuharakeke Te Iwi Trust Board working Party. [Patuharakeke Hapu Environmental Management Plan 2014](#)	2014 Environment Plan	Hapū/iwi from Ruakaka, Waipu and Marsden point also known as Patuharakeke	Environmental impact	Waahi Tapu me waahi Taonga	Hapū working party led the review of plan, which included workshops, hui-a-hapū and wananga.	Purpose: - To ensure the appropriate engagement and participation of Patuharakeke in the planning and decision-making processes of councils, agencies, and developers with respect to their rohe. - To assert their tino rangatiratanga and kaitiakitanga over their natural environment and all ancestral taonga; and • - To empower legislative provisions • - To clearly identify the environmental management kaupapa of Patuharakeke.

Title, Author & link	Date published & article Type	Scale	Hazard type or risk	Place of significance	Organisations Involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
						Holistic world view - desire to protect key cultural values and practices such as mauri, tikanga, rahui, and wāhi tapu are central to their identity, sense of place and culture well-being.
						Key principles, values and practices are whakapapa, kaitiakitanga, whanaungatanga, manaakitanga, mātauranga, mana whenua, mauri and tikanga. "I ngā rā e hī ika, he kupenga tatai awhai nuku" "If you wish to catch fish, first you need to ensure your net is in good order". The "net" was a recurring theme, symbolising concepts such as whakapapa, whānau, mātauranga etc.
						Methods: Cultural impact assessments, Cultural values assessments, Cultural health monitoring and sites of significance mapping.
						(See Section 8.3 for more details on policies and methods).
Whakarongotai o te moana Whakarongotai o te wā: Kaitiakitanga Plan for Te Ātiawa Ki Whakarongotai. Te Ātiawa ki Whakarongotai (TAKW) Charitable Trust TAKW Kaitiakitanga Plan	2019 Kaitiakitanga Plan	Iwi - TAKW	Climate - related risks in general	Wāhi tapu, and mahinga kai sites	TAKW iwi, TAKW Charitable Trust	Identify the key kaupapa, huanga and tikanga (values, objectives and policies) of TAKW that guide their kaitiakitanga as mana whenua. Provide information on the nature of the relationship of TAKW and their culture and traditions with their ancestral land, water, sites, wāhi tapu and other taonga. Based on a kaupapa Māori approach, and the guidance of the Hua Parakore Framework. The protection of wāhi tapu, and mahinga kai sites are important for maintaining the well-being of wairua. Sets tikanga that are important for the protection of wāhi tapu and other taonga.
Te Tai Tokerau Climate Adaptation Strategy: Chapter 2 Impacts on Māori	1 April 2022 Strategy report	Regional - Northland	Sea level rise, coastal erosion, flooding, storm	Cultural infrastructure such as marae and urupā, places for	Whangārei District Council, Far North District Council,	To develop a tool kit and resources to enable hapū-led adaptation at the local scale. Vision: The people and the environment of Te Tai Tokerau thrive and are resilient in a changing climate.

Title, Author & link	Date published & article Type	Scale	Hazard type or risk	Place of significance	Organisations Involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
Chapter 3 Coastal communities. Joint Climate Change Adaptation Committee and Climate Adaptation Te Tai Tokerau working group [Te Tai Tokerau Climate Adaptation Strategy](#)			surge and regular tidal inundation.	gathering food e.g. mahinga mātaitai and places of cultural significance such as wāhi tapu and archaeological sites.	Kaipara District Council, Northland Regional Council (NRC), Tangata whenua representatives from Far North District, NRC Tai Tokerau Māori and Council, Whangārei District, and Kaipara District.	Mission: "Across Te Tai Tokerau, we work together with iwi/hapū partners, communities and stakeholders to proactively understand, plan for, and respond to the impacts and opportunities of climate change". Framework of reference are mātauranga, tikanga and pūrākau (storytelling). Coastal adaptation programme is addressing the climate change risks to coastal communities and using best-practice engagement and decision-making approach dynamic adaptive pathways planning (DAPP). (See page 26 *Sensitivity & vulnerability*). Priority actions are to work with tangata whenua to develop a programme to facilitate hapū or iwi-led holistic climate change adaptation plans on well-being. Key principles: **Te Tiriti o Waitangi, whanaungatanga** (kinship), **Western science and mātauranga Māori** knowledge to help understand and inform decisions, **Equitable - empowering communities; Considered**: research-led , evidence-based, values-driven policy and decision-making**; ka mua ka muri**: walking backwards into the future; **Transformative**: innovation to build a better future; **Transition**: address and reduce risks; **Holistic**: strengthen the four well-beings; **Integrated**: embed climate change lens across all council activities and align adaption with emissions reduction.
Taonga Tuku Iho, Heritage Strategy 2022-2032. [Taonga Tuku Iho 2022-2032](#)	Strategy report. September 2022	Local - Nelson City Council		Wāhi tapu, wāhi tūpuna and archaeological sites	Nelson City Council, The eight iwi of Te Tauihu o Te Waka a Māui	Provides a clear heritage vision, allowing communities to work in partnership to celebrate and explore Whakatū Nelson's history and heritage and how that contributes to collective identity. It is framed around the maintenance and protection of taonga tuku iho for diverse ethnic groups of Whakatū Nelson and aims to enhance the cultural wellbeing of

Title, Author & link	Date published & article Type	Scale	Hazard type or risk	Place of significance	Organisations Involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
						community as a whole. The Strategy offers a holistic approach to understanding heritage within a te ao Māori framework. It is guided by five pou kōrero or principles: Kaitiakitanga | Guardianship, Mana Motuhake | Uniqueness, Te Taiao | The Natural World, Whanaungatanga | Community Relationships, Rangatiratanga | Leadership.
						Includes physical/built heritage (e.g. sites of cultural significance such as wāhi tapu, wāhi tūpuna and archaeological sites) and natural and metaphysical taonga (e.g. oral traditions, performing arts, music and sounds, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the skills to produce traditional crafts). Story telling is recognised as an important basis of the strategy.
Kai ora: Restoring local Māori food systems by restoring power to marae. Project team Koroi H, Carlson T, & Burgess H, Kai ora restoring local Māori food systems by restoring power to marae	Website for Deep South Challenge	National, Three marae of the southern Kaipara	Climate related hazards or Risks in general	Mātauranga Māori	Massey University, Toi Tangata (Te Hotu Manawa Māori) and Te Kupenga Hauora Māori	To support marae to envision a future beyond crisis that leads to marae resilience. Intergenerational knowledge around local food systems, well-evidenced local leadership and expertise. Kaipara marae response to COVID-19 demonstrated the significant role marae play in times of crises and their ability to act as a centre to collect, organise and care for their whānau. The research focus is on how whānau can be supported now and in the future in the face of climate change. Collective action requires climate leadership, resources, investment of time into whanaungatanga and a focus on future generations to build intergenerational leadership capacity and capability.
The role of marae and Māori communities in post-disaster recovery: A case study. Hudson J & Hughes E (Massey University)	2007 Research Report for GNS Science Report 2007/15	Regional Manawatu-Wanganui Region	Flood	The Poupatatē Marae as a focal point for emergency response and recovery efforts	Te Puni Kōkiri, Civil Defence, District and City Councils.	To report on findings from research into the role of the Poupatatē Marae and the Māori community in the Manawatū District during the February 2004 flood. To contribute to improving emergency policy development, planning and management in particular the role of marae and Māori communities. A case study approach is used with focus group discussions and face to face interviews with key contacts who

Title, Author & link	Date published & article Type	Scale	Hazard type or risk	Place of significance	Organisations Involved in action/ guidelines	Purpose of resource, tool/framework used, recommendations/ gaps identified
[Role of marae & Māori communities in post disaster recovery](#)						interacted with the Poupatatē Marae or Māori communities e.g. District councils, Flood Review team.
						Future approaches: Māori communities and their marae as a focal point in future emergency management responses. Need to differentiate the needs of a marae in an emergency situation from the needs of whānau.
						Gaps: the provision and exchange of information during the emergency could be improved by increasing opportunities for knowledge transfer and greater cooperation between civil defence groups and councils. Māori need representation at all the decision-making levels including within civil defence groups and councils.
Caring for Marae Taonga after Floods. Heritage NZ Pouhere Taonga [Caring For Marae after Floods](#)	16 Feb 2023 Information Sheet	National	Floods	Marae taonga	Heritage NZ Pouhere Taonga	To support marae to care for their heritage taonga through the Māori Built Heritage Programme. Advice is given on re-entering a marae after flooding and the process of drying and cleaning up (including equipment needed).
Caring for Urupā after Cyclone Gabrielle. Heritage NZ Pouhere Taonga [Caring for Urupā after floods](#)	17 Feb 2023 Information sheet	National	Cyclone Gabrielle and flooding	Disturbed urupā and kōiwi tangata (human skeletal remains)	Heritage NZ Pouhere Taonga	A guide for caring for urupā, or burial grounds that are disturbed by natural disasters such as flooding. 4 sections: safety, tikanga, record & store, and return & rebury. Recommendation: to notify the police if kōiwi is found. If bone fragments are found outside an urupā, the local marae/iwi authority should be contacted to provide guidance.

Table 10. Resources on adaptation pathways, vulnerability, and risk to support section 3.4

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
Māori community adaptation to climate variability and change: Examining risk, vulnerability and adaptive strategies with Ngāti Huirapa at Arowhenua Pā, Te Umu Kaha (Temuka), New Zealand. King D et al. Māori community adaptation to climate variability and change	March 2012 NIWA Client Report # AKL2011-015	Hapū – Ngāti Huirapa at Arowhenua Pā, Te Umu Kaha Temuka	Flooding in the Temuka River and inundation of the coastal zone surrounding the Opihi River mouth due to sea level rise.	Theoretical frameworks: Complex systems theory, grounded theory and community-based participatory research. Mixed method approach. Qualitative methods: group & individual interviews, on-land walks and observations. Quantitative methods: Climate change scenarios, modelling and mapping.	Te Rūnanga o Arowhenua Society Incorporated and NIWA's Māori Environmental Research and National Climate Centre.	Explores the complexities around climate impacts, vulnerability and the capacity to respond and adapt. The research explored current and past climate conditions and risks that the community at Arowhenua Pā contend with. Vulnerability and adaptation to climate change are inseparable from issues linked to natural hazards management and sustainable development. Focus on whānau, historical changes in river course, flows and mahinga kai; causes and amplification of flood risks due to human modification of the environment. Findings: environmental, economic, social, political and cultural aspects of community life are interdependent, and all contribute to the sensitivity-adaptive capacity of the community. The capacity to adapt is rooted in cultural values and approaches such as tikanga and kawa, and actioned through whanaungatanga, manaakitanga, & kotahitanga. Also important are social networks & conventions (internal & external), knowledge of place and closer human-environmental risks. See the report for further findings on constraints & strengths and strategies and policies to tackle vulnerability and enhance adaptability under future climate risk.

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
Coastal Adaptation to Climate Variability and Change: Examining community risk, vulnerability and endurance at Manaia Settlement, Hauraki-Waikato, Aotearoa-New Zealand. King D et al. [NIWA Client report 2012-029](NIWA%20Client%20report%202012-029)	December 2012 NIWA Client report # AKL2012-029	Iwi - Ngaati Whanaunga at Manaia settlement	Coastal inundation at the Manaia River mouth and river flooding of the Manaia River valley due to sea level rise and extreme flooding.	Theoretical frameworks: Complex systems theory, grounded theory and community-based participatory research. Quantitative methods: Climate change scenarios, modelling and mapping of sea level rise and flooding. Qualitative methods: group & individual interviews, on-land walks and observations	Ngaati Whanaunga Incorporated Society, and NIWA's Māori Environmental Research and National Climate Centres	Explores the community's climate conditions, risk, vulnerability, resilience and adaptation to climate-induced coastal change at Manaia settlement. Identify options to eliminate and/or minimise vulnerabilities and to enhance the different skills and capacities to cope with (and adapt to) future climate conditions and challenges. Climate is only one of several factors that influence the vulnerability and adaptability of the 'community' at Manaia to cope and deal with climate threats and stresses. Identified four key determinants that influence the sensitivity and adaptive capacity. (i) Infrastructure and resourcing, (ii) Social-cultural networks and conventions, (iii) Knowledge, information and education and (iv) Planning, governance and competing values. Dominant determinants were concerns about unreliable infrastructure and housing and insufficient finance and resourcing to reduce exposures to climate hazards and stresses. Cultural values and approaches centred on tikanga, whanaungatanga, kotahitanga, and aroha were referred to as the Māori way of dealing with hazards, risks. These behaviours are dependent on the relationship between people and the environment supported through principles of rangatiratanga, and kaitiakitanga.
Coastal adaptation to climate variability and change: Examining community risk, vulnerability and endurance at Mitimiti, Hokianga, Aotearoa-New Zealand.	September 2013 NIWA Client report # AKL2013-022	Hapū- Te Tao Mauī at Mitimiti settlement	Coastal inundation along the greater Mitimiti coastline and coastal-river	Theoretical frameworks: Complex systems theory, grounded theory and community-based participatory	Hapū of Te Tao Mauī from Mitimiti settlement, and NIWA's Māori	Explored future projections of climate change-induced coastal hazards and risks for the community at Mitimiti and the contextual conditions that influence the vulnerability and endurance of the community to effectively respond to those hazards and risks.

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
King D et al. [NIWA Client Report 2013-022](#)			reach flooding around Mātihetihe Marae due to sea level rise	research. Quantitative methods: Climate change scenarios, modelling and mapping of sea level rise and flooding. Qualitative methods: group & individual interviews, on-land walks and observations	Environmental Research and National Climate Centres.	Identified four key determinants that influence the sensitivity and adaptive capacity of the community to deal with climatic risks (i) social-cultural networks and community change, (ii) resourcing, self-reliance and innovation, (iii) knowledge, skills and expertise, (iv) community-based structures and decision-making. The capacity to adapt is rooted in the collective strength of whānau and hapū relationships, cultural values and principles such as whakapapa and tikanga, actioned through whanaungatanga, manākitanga, kotahitanga and aroha. Identified deep concerns about the enduring use and maintenance of Mātihetihe Marae for future generations. Major changes in the composition of the community, low levels of economic development and employment opportunities were identified as constraints to adequately reduce those risks and exposure to potential impacts.
The Race to Document Archaeological Sites Ahead of Rising Sea Levels: Recent Applications of Geospatial Technologies in the Archaeology of Polynesia. Mark D. McCoy [The Race to Document Archaeological Sites Ahead of Rising Sea Levels](#)	2018 Peer-reviewed article. Sustainability 10(1), 185	National	Impact of Sea Level Rise on Archaeological sites in different coastal and marine environment	Risk analysis using Geospatial analysis. Review applications of different geospatial technologies.		Review recent efforts to document archaeological sites using geospatial technology (remote sensing, high-resolution documentation, and archaeological site geodatabases) in assessing impacts of sea level rise across the islands of Polynesia. Using elevation models estimated more than 12% of all known archaeological sites in New Zealand will be affected by sea level rise. Recommended a greater use of geospatial technology for identifying and monitoring sites, more and better data sharing, and better investigation of coastal archaeological sites due to varying quality of geodatabase records. Also discussed the limitations of site locations represented as points in Archsite.

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He huringa āhuarangi, he huringa ao: a changing climate, a changing world. Awatere et al. 2021 [He huringa āhuarangi, he huringa ao: a changing climate, a changing world](#)	Manaaki Whenua - Landcare Research Contract report. 2021	National	Climate change impacts on whānau/hapū/ iwi and Māori business	Consequence (risk) assessment framework and methods used in the first NCCRA. Kaupapa Māori analytical approach.	National Science Challenges, Ngā Pae o te Māramatanga (NPM)	Summarise the latest research and guidance on observed and projected climate change impacts on whānau/hapū/iwi and Māori business. Provide commentary about risk and uncertainty, knowledge gaps, and options for mitigation and adaptation. Compiled risk scores based on a consensus-based expert judgement approach for four domains of interest: He Kura Taiao – Living Treasures, Whakatipu Rawa – Māori Enterprise, He Oranga Tāngata – Healthy People, Ahurea Māori, Tikanga Māori – Māori Culture and Practice. Use a Kaupapa Māori approach, to explore how climate change will impact the physical, social, and spiritual connection that Māori have with the natural environment. Identified a total of 25 risks across the four domains. 'Ahurea Māori, Tikanga Māori – Māori Culture and Practices' domain explores and assesses the risk of potential climate change impacts on Māori culture and practices, with particular emphasis on language and customs, sports, festivals, mourning ceremonies, and cultural infrastructure. Detailed work is required to understand how cross-domain relationships might influence the development of effective mitigation and/or adaptation actions in the future. Urgent work is also needed to better understand the social, cultural, and fiscal implications of sea-level rise, including what duties local and central governments have with respect to actively upholding Māori interests under the Treaty of Waitangi.

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
Calculating Heritage Risks for the Climate Emergency in Aotearoa (New Zealand). Jones and Bickler Calculating Heritage Risks for the Climate Emergency in Aotearoa New Zealand	2022 Peer-reviewed article. Archaeology 52	Local and National	Coastal erosion and inundation from Sea Level Rise	Risk analysis using Geospatial analysis. Sources of Archaeological and environmental information for risk assessments.		Explore some of the technical issues surrounding the identification of risks to heritage in NZ. Presented and discussed primary archaeological and environmental sources of information with quantitative and qualitative information associated for evaluating heritage risk. Discussed how most of the archaeological data sources provide detailed qualitative information but little systematic quantitative information. Included a discussion on the reliability of ArchSite database and how to improve the precision of analysis at local level.
The impact of climate change on the archaeology of New Zealand's coastline A case study from the Whangarei District. Simon Bickler, Rod Clough and Sarah Macready The impact of climate change on the archaeology of New Zealand's coastline: a case study from the Whangarei District	2013 DOC report Science for Conservation 322	Local - Whangarei District	Coastal erosion, flooding and land instability from sea level rise	Risk assessment using Geospatial analysis. Risk assessment framework to prioritise the protection or investigation of archaeological sites in coastal areas.	The Department of Conservation (DOC)	A Geographic Information System (GIS)-based case study to examine the distribution of archaeological sites in the Whangārei District and assess the risk to the archaeological resource primarily from sea level rise associated with future climate change. GIS analysis of more than 2400 archaeological sites in the Whangārei District, revealed that the primarily coastal distribution of the sites makes them particularly vulnerable to coastal erosion, flooding and land instability. Approximately 35% of all archaeological sites on the mainland are vulnerable to some form of currently identified hazards. Suggested a risk assessment framework (adapted from MfE's Coastal Hazards and Climate Change: Guidance for Local Government) to prioritise the protection or investigation of archaeological sites in coastal areas. Emphasised that action is needed now to protect or retrieve the information from significant sites under threat before they disappear completely.

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
Risk-exposure assessment of Department of Conservation (DOC) coastal locations to flooding from the sea. Andrew Tait [Risk-exposure assessment of DOC coastal locations to flooding from the sea.](#)	2019 DOC report Science for Conservation 332	National	Coastal inundation caused by high seas	Risk assessment using Geospatial analysis.	The Department of Conservation (DOC)	Describe a national-level risk-exposure screening assessment that identifies archaeological sites located in a potential coastal inundation risk zone. Identified a total of 4149 archaeological sites in the potential coastal inundation risk zone, representing 6% of all the known sites in the country (based on Archsite database). 420 of those sites are on Public Conservation Land. Recommended more detailed risk assessment of specific locations involving analysis of historical records, local knowledge and site visits followed by detailed mapping.
Better Management Through Measurement: Integrating Archaeological Site Features into a GIS-based Erosion and Sea Level Rise Impact Assessment—Blueskin Bay, New Zealand. Greg Hill [Better Management Through Measurement: Integrating Archaeological Site Features into a GIS-Based Erosion and Sea Level Rise Impact Assessment—Blueskin Bay, New Zealand](#)	2020 Peer-reviewed article. The Journal of Island and Coastal Archaeology 15(1)	Local- Blueskin Bay, Otago	Coastal erosion and Sea Level Rise	Field surveys and risk analysis using Geospatial analysis.		Sets out a methodology that combines field survey with GIS-based spatial analysis to track erosion and inundation's impact on coastal sites in Blueskin Bay, New Zealand. Found that numerous sections of the Blueskin Bay shoreline may be severely affected by inundation by 2100. Discussed the unsuitability of ArchSite data for site-specific assessments due to the uncertainty of its site locations. Recommended the use of feature-based representations of archaeological sites to improve the ability of computer-based assessments to consider the impact of changing landscapes on site specific scales.

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
Understanding the potential exposure of coastal marae and urupā in Aotearoa New Zealand to sea level rise. Bailey-Winiata, A. P. S [Understanding the potential exposure of coastal marae and urupā in Aotearoa New Zealand to sea level rise](#)	2021 MSc Thesis	National and Regional- Bay of Plenty	Sea level rise, coastal flooding and erosion impacts on coastal marae and urupā	Quantitative: Geospatial analysis to identify and map locations of marae and urupā, modelling and mapping of sea level rise and inundation, classification of coastal geomorphology of	University of Waikato	Understand the potential exposure of coastal (within 1 kilometre of the coastline) marae to sea level rise nationally and to urupā in the Bay of Plenty. Assess local coastal geomorphology around coastal marae and urupā in the Bay of Plenty. Identified 191 (out of 774) marae around NZ and 41 urupā in the Bay of Plenty were located within 1 km of the coast, making clear that they are nationally at risk to sea level rise. The potential response to seal level rise was highly dependent on the type of coastal geomorphology. Discussed the use of dynamic adaptive policy pathways (DAPP) in creating management and adaptation solutions. Any management strategies for marae, hapū and iwi will need to be aware of the tapu and mana of these places - no one size fits all approach.
Toi tū te whenua, toi tū te tangata: A holistic Māori approach to flood management in Pawarenga. Proctor, E.-M. [Toi tu te whenua, toi tu te tangata: A holistic Māori approach to flood management in Pawarenga](#)	2010 MSocSc Thesis	Whānau and hapū - Te Uri O Tai	Flooding	Qualitative analysis: Focus groups and individual interviews, Theoretical Frameworks: Grounded theory approach, Kaupapa Māori theory	Hapū of Te Uri O Tai, University of Waikato	Investigate and document Te Uri O Tai Hapū preferred strategies for reducing flood risk in Pawarenga and to identify the use of tikanga Māori principles and values in emergency response. Identify the factors that affect the resilience and vulnerability of the Pawarenga community. Resilience and strength that enabled the Hapū to respond to crises such as flooding events come from learning from elderly people, self-reliance, talent and skills, resourcefulness and tenacity. Tikanga offers a system of action that enables the Hapū to demonstrate both resilience and adaptive capacity in the face of hazard events. Tikanga useful in flood management were identified as tika-pono-aroha, whanaungatanga, manaakitanga, and kaitiakitanga.

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
						Proposed a tikanga framework which could be used for preparing a flood management plan. Also identified factors that affect cultural, social, physical, economic and political vulnerabilities. Political factors, physical isolation and low-income levels were identified as the major contributors to the vulnerability. Political marginalisation has prevented tangata whenua from exercising their kaitiakitanga. Recommendations: facilitate full participation of Te Uri O Tai Hapū in decision-making in emergency management, recognise and support the value of tikanga in flood emergency management.
Collective action by Māori in response to flooding in the southern Rangitīkei region. McLachlan, AD, Waitoki, W. [Collective action by Māori in response to flooding in the southern Rangitīkei region](#)	2020 Peer-reviewed paper International Journal of Health Promotion and Education	Hapū - Ngā Wairiki – Ngāti Apa	Flooding	Qualitative: Kaupapa Māori qualitative case study design, individual and focus groups interviews.	Ngā Wairiki – Ngāti Apa hapū (whānau support group), Waikato Institute of Technology, University of Waikato	Examine Ngā Wairiki – Ngāti Apa hapū collective actions and community efforts to provide support for those affected by flooding in the Southern Rangitīkei area. Identified the following four key themes: 1. Collective aspirations mobilise in traumatic events - community had particular skills and attitudes due to the long history of significant flooding within the Rangitīkei, Māori responsiveness during flooding was quicker than local governments' ability to respond. 2. Genealogical relationships bring people together - genealogical relationships to people and land (whakapapa), and tribal canoe (waka) were identified as a key for successful collaboration. 3. Collective leadership drives the vision - Māori taking leadership provided opportunity for Māori collective skill and action to be in the forefront and

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
						identify and activate resources from within or across Iwi. 4. Indigenous values inform responses to traumatic events – Whānau relationship bonds helped to identify and reach out to the most vulnerable members of their communities.
Local volunteers respond to the Rena oil spill in Maketū, New Zealand. K Smith, H Hamerton, S Hunt & RJ Sargisson Local volunteers respond to the Rena oil spill in Maketū, New Zealand	2016 Peer-reviewed article. New Zealand Journal of Social Sciences Online, 11:1	Local - Māori community of Maketū	MV Rena oil spill	Qualitative: focus group interviews	Maketū/Te Arawa Rena Clean-Up Group, University of Waikato, Bay of Plenty Polytechnic	Identify how the oil spill affected people in the Maketū community and identify the factors that ensured the success of their clean-up efforts. Maketū is historically and culturally significant as the landing place of the Te Arawa waka and also as a mahinga kai site. Maketū clean-up organisers expressed their rangatiratanga through the practice of kaitiakitanga and manaakitanga. Support from whānau, well established connections and roles in the community, spiritual connection to Tangaroa, resourcefulness, innovation, local knowledge, skills and expertise, ability to combine scientific knowledge with mātauranga Māori were identified as determinants of Maketū community's ability to respond to disasters. Recommended the full inclusion and acknowledgment of the rangatiratanga of mana whenua, in planning and decision-making processes, and the use of participatory processes that engage local communities for effective disaster response.
Sea level rise, housing and insurance: Liability and compensation. Catherine Iorns Project Lead – Victoria University	Deep South Challenge Research website	Local, regional and national scale.	Sea level rise and insurance		Deep South Challenge and Victoria University	Investigating tipping points at which insurance companies might decide to refuse insurance to coastal property owners. To what extent can or should homeowners rely on the EQC or local or central government to compensate them if their homes

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
[Sea level rise housing and insurance liability and compensation](#)	Accessed May 2023	Kaipara setting				become uninsurable due to sea level rise or associated climate risks like storm surges or coastal erosion.
Risk management for Māori coastal assets. Project team lead: Huhana Smith Massey University [Risk management for Māori coastal assets](#)	Deep South Challenge Research website Accessed May 2023	Local Rohe of Horowhenua – Kāpiti.	Sea level rise and beach erosion, flooding due to rising groundwater	Māori led interdisciplinary action research approach. Phase 1: interdisciplinary approach to identify indicators of change and staged strategies for adaptation. Phase 2: Co-developing Transition Action Plans at the local level to enable Māori communities to assess the risks and benefits of alternative coastal land use.	Deep South Challenge	This project builds on the collective knowledge about climate change risks and opportunities from 2015–17 in the rohe of Horowhenua– Kāpiti. Phase 1 combined data about soil, floods, topography, river sedimentation and sea level rise to identify the most vulnerable areas coastal farms. Although multiple reports have been produced about coastal erosion risks – including by local and regional councils – none have highlighted social engagement processes that could lead to effective community action. Our Māori-led research approach prioritises social engagement when considering how to respond to sea level rise and other climate change impacts.
The role of coastal marae in natural hazard response and climate change adaptation. Bailey-Winiata A, Gallop S, Hikuroa D, White I. [The role of coastal marae in natural hazard response and climate change adaptation](#)	2022 Report Chapter 3 In Coastal Adaptation: Adapting to coastal change and hazard risk in Aotearoa New	National	Coastal sea level rise, refuge		University of Waikato	To understand the role of coastal marae in response to a natural hazard or climate change. Describes the significance of marae and their location close to waterbodies e.g. rivers/streams, estuaries, and the ocean. Also, self-determination and coastal adaptation. To manage the risk hapū and iwi are drawing on mātauranga. Hapū/iwi are developing innovative solutions to adapt and mitigate risk. 3 broad types of coastal adaptation: protect, accommodate and retreat.

Title, Author & link	Date published & Article Type	Scale	Hazard type or risk	Vulnerability and risk frameworks, approaches and methods	Organizations Involved in action/ guidelines	Purpose of resource, recommendations/ gaps identified
	Zealand. (pp. 41–44)					If retreat or relocation is to be conducted, it needs to be done carefully given historic injustices from colonisation. Adaptation for marae needs to be cognisant of history and ensure Māori self-determination. Māori should be active at every stage of the process, from knowledge collation and generation through to selecting adaptation options.

Table 11. Resources models, tools, and frameworks for adapting and addressing climate change to support section 3.5

Title, Author & link	Date published & article type	Scale/ setting	Hazard type or risk	Model or framework	Organisations Involved	Purpose of resource, recommendations/ gaps identified
Tangoio Climate Change Adaptation Decision Model: A process for exploring adaptation pathways for Tangoio Marae. Colliar J and Blackett P. [Tangoio NIWA Client report](#) .	1 July 2018 NIWA Client report 2018242HN	Local – Tangoio Marae Community	Climate Change and flooding	Adaptation Decision Model and Adaptation pathways. Also used a serious game to support climate change decision-making as a community process.	Prepared for Maungaharuru-Tangitū Trust and Deep South National Science Challenge	8-step Adaptation decision model Te Huringa ki te Rangi - He Rautaki Tāwariwari. Brings together Mātauranga Māori community experience, and hydrological modelling. Information was presented back to the community using a range of formats, flooding history timelines, videos, visualisations of hydrological modelling outputs. This was to help the wider community better understand the potential impacts of extreme flooding to different future climate change scenarios over a range of timeframes. Actions: The Tangoio community have a vision and aspirations for themselves, the marae and their local environment, developed a shared understanding of the past and of what the future could bring and identified a range of potential options for assessment. By developing adaptation pathway maps for their marae, the community is considering the adaptation options proposed e.g. building stop banks, lifting building floor levels, improving site drainage, water-proofing buildings, riparian restoration works and developing a response plan and preparedness kit for large storm events.
A Māori love story: Community-led disaster management in response to the Ōtautahi (Christchurch) earthquakes as a framework for action. Kenney, CM and Phibbs S. [A Māori love story: Community-led disaster management in response to the Ōtautahi](#)	2015 Peer-reviewed article. International Journal of Disaster Risk Reduction 14: 46-55	Regional Ōtautahi Christchurch	Earthquake	Māori disaster management response to the Christchurch earthquakes and urban recovery process. Māori Recovery Network was used to operationalise cultural	Joint Centre of Disaster Research in partnership with Te Rūnanga o Ngāi Tahu.	An overview of the Māori risk management. The response was collaborative, effective and kaupapa-led emergency management. A Māori Cultural Technologies Approach to disaster risk reduction – using tikanga (cultural practices), Mātauranga Māori (Cultural knowledge) and Kaupapa (cultural values & principles) to achieve Whakaoranga Iwi whānui (community recovery, restoration and resilience). Action: The potential of Māori kaupapa-based technologies for addressing disaster management and risk reduction strategies. The Māori Recovery Network is conceptualised as an Actor-Network constructed through assemblages of actors, artifacts

Title, Author & link	Date published & article type	Scale/ setting	Hazard type or risk	Model or framework	Organisations Involved	Purpose of resource, recommendations/ gaps identified
(Christchurch) earthquakes as a framework for action - ScienceDirect				technologies that could be used in an emergency context. Hyogo Framework for Action supports the integration of Māori technologies into national civil defence emergency management policies.		and technologies. Aroha nui ki te tangata – extending love to all people - is the principal value. Cultural values such kotahitanga (unity), manaakitanga (hospitality), whanaungatanga (relationality) and rangatiratanga (leadership) guided action. Coordinated action that includes principles of the Treaty of Waitangi and the Hyogo Framework for disaster risk reduction encourages coordinated action within and between government agencies and the community. This value-based recovery approach should be supported by establishing a national Māori Recovery Network which is linked in with mainstream emergency management.
Decision-support tools and the indigenous paradigm. Morgan, Te Kipa Kepa Brian. Decision-support tools and the indigenous paradigm	2006 Peer-reviewed article. Proceeding of the Institute of Civil Engineers: Engineering Sustainability 159(4) 169-177	National		Decision-making Support Tool (DST) using Mauri as a conceptual basis and holistic concept - The Mauri Model. AHP – Analytic Hierarchy Process is used to determine the weightings of 4 dimensions relative to each other.		The Mauri Model uses 4 dimensions: community (social), whanau or family unit (economic), ecosystem (environmental) and hapū group (cultural) to evaluate mauri. Weightings are applied to each dimension to reflect their relative importance (See sections 3.3-3.6 and Figure 2 for more details). The relative importance of the dimensions can be determined with stakeholder groups before assessment. The result is a sustainability barometer for mauri (Figure 4), which indicates whether the mauri will be destroyed, diminished, neutral, maintaining or enhanced. The Mauri Model is an expert-weighted decision matrix that provides a culturally based template within which indigenous values are explicitly empowered alongside 'western' thinking. It provides the basis for consistent prioritisation of well-being. See 'Mauri model analysis: Proposed Rotorua Eastern Arterial 4 lane highway bypass' for an application of the Mauri Model. (NgapunaFinalReport.pdf (mauriometer.org).

Title, Author & link	Date published & article type	Scale/ setting	Hazard type or risk	Model or framework	Organisations Involved	Purpose of resource, recommendations/ gaps identified
Marae-opoly: supporting localised Māori climate adaptation decisions with serious games in Aotearoa New Zealand. Blackett et al [Marae-opoly: supporting localised Māori climate adaptation decisions with serious games in Aotearoa New Zealand](#)	2021 Peer-reviewed article. Sustainability Science, 1-17.	Hapu – Tangoio Marae Community		Marae-opoly - a serious game developed as a platform which assembles cross-cultural climate change knowledge to learn, safely experiment and inform adaptation decisions.	NIWA, Maungaharuru-Tangitū Trust	Described and analysed a serious games approach which was utilised by the Tangoio community to support their decision-making on what they considered place appropriate adaptation. This serious game was used to explore adaptation pathways for Tangoio Marae in Colliar and Blackett (2018) above. Marae-opoly was the platform used to integrate diverse information into a digestible format to enable the hapū to experiment with different strategies to achieve their desired adaptation outcomes. See [Marae-opoly	Deep South Challenge.](#)
Decolonising Māori narratives: Pūrākau as a method. Jenny Lee [Pūrākau as a decolonising method for Māori narratives](#)	2009 Mai Review 2: Article 3					How pūrākau - a traditional form of Māori narrative was used as a methodology to describe the engagement with decolonising methodologies and kaupapa Māori. Pūrākau, Bricoleur - weaving together sets of practices as possible solutions to a specific problem. Need to have a broad knowledge of a range of methods that may adapt and evolve during the process of finding a solution to the problem.