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CLIMATE CHANGE AND WHENUA MĀORI

A management perspective

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Abstract

This article is about the utilisation of whenua Māori in the context of climate change and its implications for owners, governors and managers of such lands. The article draws on existing literature and employs a whānau-centric methodology to discuss Māori land-owning entities and their awareness of, preparedness for and action on the matter of climate change in Aotearoa New Zealand. Forty-five survey respondents and interviews with three governors of Māori authorities provided data for the following research question: *What is the state of Māori authority readiness for climate change and its effect on whenua Māori utilisation?* Climate change represents an existential challenge, a phenomenon that has not escaped whenua Māori landowners, trustees and managers. Findings show that climate change awareness among Māori is high and brings additional complexity to Māori land use and decision-making with broader considerations to ensure the ecological stability and sustainability of whenua Māori. Māori are actively considering and implementing strategies to adapt to and mitigate the effects of climate change. Access to credible research, information and expertise; effective engagement with whānau and landowners; and finding solutions within Indigenous knowledge are identified as necessary factors to support whenua Māori decision-making.

Keywords

climate change, Indigenous people, Māori authority, Māori management, whenua Māori

Introduction

Whenua Māori is fundamentally important to Māori people, holding cultural, social and economic significance as a vital source of identity and spirituality that has nurtured and sustained whānau, hapū and iwi over generations. Therefore, when the sustainability of the whenua is put at risk because of human activity or natural processes, consequences for whānau, hapū, iwi and hāpori can be devastating. This article contends that climate change is one such risk impacting whenua Māori, requiring a considered and active response.

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Changes in temperature, precipitation patterns, rising sea levels and extreme weather events pose threats to the ecological stability and sustainability of whenua Māori (Ministry for the Environment & Stats NZ, 2021). These environmental challenges affect biodiversity, agriculture, water resources and cultural heritage sites. The social and cultural implications of climate change for Māori communities are already being felt, with extreme weather events becoming more common (Parata et al., 2023). Cyclone Gabrielle, which struck New Zealand in February 2023, viscerally brought to the fore what can happen when imprudent land use meets extreme weather (Parata et al., 2023). Drawing on existing literature and data collected from a small group of Māori landowners and whenua Māori decision-makers, this article discusses Māori authority awareness of, preparedness for and action on the matter of climate change in Aotearoa New Zealand.

The article proceeds with a review of key concepts, primarily whenua Māori, Māori management and climate change. Next, the use of mixed methods research is outlined, as well as participants, data collection, analysis and ethics. This is followed by presentation of findings and discussion of key themes, before concluding with remarks on the state of Māori authority readiness for climate change.

Literature review

Whenua Māori

As an Indigenous people, the traditional relationship that Māori have with the environment and te taiao, including whenua, wai and ngahere, forms an integral part of their identity (Rout et al., 2021; Tassell-Matamua et al., 2020). Despite colonisation eroding this human–environment relationship, Māori and other Indigenous peoples continue to defend their ancestral lands from state and corporate actors intent on depriving current and future generations of their heritage and means of sustaining traditional economies (Mika et al., 2022). For Māori, the importance of land is expressed in whakataukī as one manifestation of mātauranga Māori (Brougham et al., 2012; Hikuroa, 2017). The whakataukī "Whatu ngarongaro te tangata, Toitu te whenua" translates to "As people disappear from sight, the land remains" (I. Warbrick et al., 2023, p. 1) and alludes to the permanency of land and to the transiency of humanity. Another whakataukī, "Ko au te whenua, ko te whenua ko au: I am the land, and the land is me" (Mark et al., 2022, p. 1), depicts the deep physical and spiritual connection and interreliance Māori have with whenua. This perspective, Kingi (2008) argues, stems from a belief system that humans *belong to* rather than *own* the land. Such knowledge also speaks to a fundamental premise of Māori thinking that human wellbeing is contingent upon environmental wellbeing (Mika, 2021) or, more specifically, upon healthy human-to-nature relationships (Rout et al., 2021), a premise Durie (1985) articulated in his holistic view on health.

The word "whenua" also translates as "placenta", and the term for people, tangata whenua, metaphorically means "born of the earth's womb" (Kingi, 2008, p. 134). A tikanga Māori observed is to bury their babies' placenta on ancestral whenua, reinforcing the connection to Papatūānuku, the Earth Mother, and the lifelong nourishment she provides to the land, flora and fauna, and humans. Whenua has a strong relationship with wairuatanga, which is vital for intergenerational wellbeing (Durie, 1985; Hēnare, 2021). An example is the Te Awa Tupua Act passed in 2017, which recognises the Whanganui River as a legal person (Cribb, Macpherson, & Borchgrevink, 2024; Cribb, Mika, et al., 2024; Mika & Scheyvens, 2023). Cultural rights in the Act recognise the Whanganui River as the source of spiritual and physical sustenance supporting and sustaining the health and wellbeing of the iwi and hapū of the river, who in turn have responsibility for its health and wellbeing (Collins & Esterling, 2019).

Given the intrinsic value of whenua, there are consequences for Māori identity, wellbeing and prosperity when alienated from whenua. Thom and Grimes (2022) analysed the impact of land loss, through colonisation, on Māori cultural wellbeing and health outcomes. The relationship that Māori have with whenua and the importance of kaitiakitanga (M. Kawharu, 2000; Spiller et al., 2011) are aspects of tikanga Māori that are vital in understanding the social, cultural and health impacts of Māori land loss (Thom & Grimes, 2022). Harmsworth and Awatere (2013) describe Māori relationships with the natural world as intricate, holistic and interconnected, with a rich knowledge base—mātauranga Māori—dating back to life in Polynesia and trans-Pacific migrations. Harcourt et al. (2022) echo this sentiment, asserting that, in the Māori worldview, people are seen as part of, and genealogically connected to, the natural world.

Pre colonisation (1769–1839), Māori land was communally owned (Kingi, 2008; Sinclair, 1992). Figure 1 shows how Māori land holdings in the North Island of Aotearoa substantially reduced

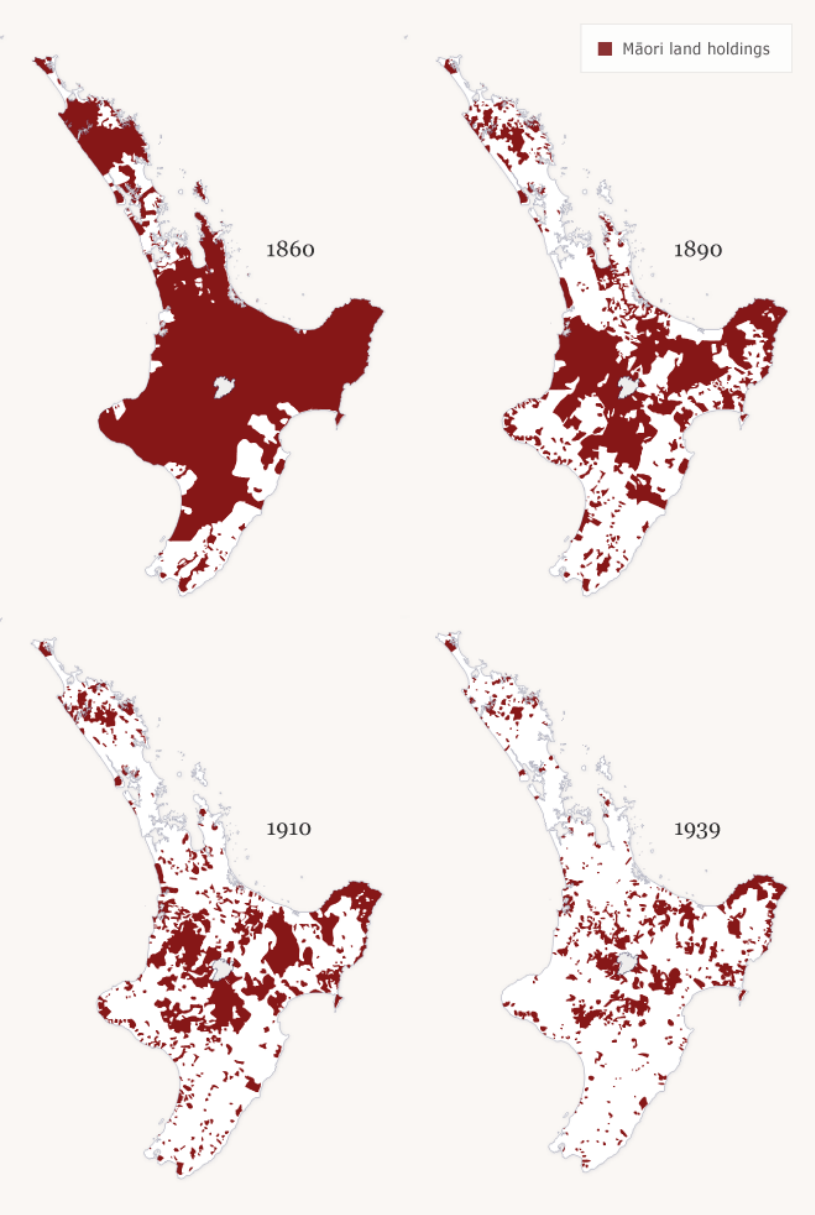

FIGURE 1 Māori land in the North Island, 1860–1939

Source: McAloon (2008), adapted from Orange (2015, pp. 318–319). CC BY-NC 3.0 NZ (https://creativecommons.org/licenses/by-nc/3.0/nz/).

between 1860 and 1939, following the signing of te Tiriti o Waitangi | Treaty of Waitangi in 1840 (I. H. Kawharu, 1989; Orange, 1987). The relatively sudden and substantial loss of land during this period is attributed to Crown and governor legislation and actions, primarily the confiscation and individualisation of Māori land and its eventual transfer into European ownership, governance and control (Mika et al., 2022). In the 1950s and 1960s, the New Zealand Government recognised the detriment of the previous legislative framework to Māori and introduced legislation to protect Māori land from further alienation (Brady, 2004).

Today, the Te Ture Whenua Māori Act 1993 governs Māori land and sets out the jurisdiction of the Māori Land Court. Section 2(2) states the Act is to be interpreted in a way that "facilitates and promotes the retention, use, development, and control of Maori land as taonga tuku iho by Maori owners, their whanau, their hapu, and their descendants, and that protects wahi tapu". This provision clearly shows Parliament's expectation

that Māori landowners are to be supported to both retain and develop Māori land. Successive attempts by the New Zealand Government at Māori land reform (Te Puni Kōkiri, 2021) suggest that resolving the plurality of legislative objects (autonomy, utilisation and retention) has been deeply problematic for policymakers and landowners alike. For example, despite "extensive consultation" and "16 drafts over a period of some 30 months" on the Te Ture Whenua Māori Bill 2016 (Korako et al., 2017, p. 2), the Bill and associated reforms were widely criticised (P. Warbrick, 2016). One submitter offered a scathing assessment, asserting that the Bill was hastily assembled, offered organisations of its kind little value, lacked empirical evidence, and was incomplete and flawed (Wakatū Incorporation, 2016). The Māori Affairs Committee recommended the Bill pass with amendments, with a minority expressing an opposing view (Korako et al., 2017). Given its contentious nature, the Bill was not progressed by the new government in 2017. Proposals to reform aspects of Te Ture Whenua Māori Act 1993 are now subject to public consultation (Te Puni Kōkiri, 2025).

It is acknowledged that "Māori landowners are part of a complex land system that owners of general land are not" (Brady, 2004, p. 8). For instance, with 2.3 million land interests (Brady, 2004) across a population of 978,246 Māori (Stats NZ, 2024), multiple ownership is a complex and growing management challenge for whānau who aspire to retain and develop their whenua. Multiple ownership issues are compounded when decision-makers of Māori land seek to give effect to their "kaitieki [kaitiaki] and fiduciary obligations" because owners may have differing values and priorities (Pohatu et al., 2019, p. 4), while considering the decision effects on future generations (Acosta, 2019; Pohatu et al., 2020). In the specific case of developing native forestry on Māori land, Pohatu et al. (2020) found that "restrictive governance, limited access to resources and expertise, timeliness and poor communication can be insurmountable barriers within the Māori land decision-making process" (p. 31).

Māori management

The retention and development of whenua Māori in the context of climate change is as much a management problem as it is a governance one. While Māori governance is well canvassed in the scholarly literature (Joseph & Benton, 2021), particularly in relation to environmental matters (Joseph, 2014; Joseph et al., 2020; Magallanes, 2021; Simmonds et al., 2016), knowledge of Māori management as it relates to Māori land is less well covered (Iremonger & Scrimgeour, 2001; Joseph et al., 2016; Mulligan & Tuuta, 2003; Phillips et al., 2016). Traditional (precolonial) approaches to Māori management, according to Mika and O'Sullivan (2014), concern the way in which Māori managed their social, cultural, spiritual and economic activities within tribal institutions, where the central object was group survival. Contemporary approaches concern the way in which managers who identify as Māori draw on their whakapapa and aronga to achieve purposes beneficial to Māori and others in both what is done and how in Māori and non-Māori organisations (Mika & O'Sullivan, 2014). The Mika and O'Sullivan (2014) model of Māori management does not preclude non-Māori management knowledge but integrates this within a Māori worldview and approach to achieve Māori-defined purposes.

Nicholson et al. (2017) similarly contend that Māori management is ambicultural, integrating Indigenous and Western paradigms to achieve mauri ora through kaitiakitanga as a decision-making framework oriented to enterprise planning horizons of 500 years or more. In place of the cultural incongruity of integrative approaches like the balanced scorecard and quadruple bottom line, Nicholson et al. (2017) propose He Whenua Rangatira—A Balanced Landscape as a culturally grounded framework for organisational success. In this framework, paradoxical tensions between economic and ecological wellbeing (Xiaoliang et al., 2023) are resolved through the relationality of the Māori worldview (Marsden, 2003), metaphorically described as a whāriki (Nicholson et al., 2017), and enacted as a synthesis of spiritual, human and ancestral connections (Rameka et al., 2024). A good kaitiaki, whether governor or manager, in this view recognises that ancestral land has spiritual, cultural and material value (Nicholson et al., 2017) and its retention and use must account for and manage within the relational value that exists among dimensions of atua, tangata and tīpuna (Rameka et al., 2024; Reid & Rout, 2024).

Māori and climate change

Indigenous peoples' connection to their environments has enabled them to understand and adapt to climate and environmental change (Scheyvens et al., 2017). King et al. (2008) acknowledge the value of Indigenous peoples' knowledge of weather and climate, including Inuit, Icelandic, Yukon and Aboriginal peoples. King et al. (2008) assert that

Māori environmental knowledge has been "an important factor in [their] successfully responding to past weather and climatic change in New Zealand" (p. 385). While Māori are experienced in dealing with climate variability, the authors argue that new strategies will be needed, including collaboration with other iwi.

The impact of climate change on the environmental, economic, social and cultural elements of Māori society cannot be overestimated, given climate events are expected to become more intense (Ministry for the Environment & Stats NZ, 2021). Longer growing seasons and warmer temperatures may bring opportunities for Māori land (Harmsworth et al., 2010), but more extreme weather like floods, droughts, heatwaves, intense storms and climate change–induced sea-level rise will disproportionately affect Māori communities (King et al., 2010). Packman et al. (2001) note that remote areas of New Zealand such as Northland and the East Cape, where larger populations of Māori rely heavily on natural resources and ecosystems to sustain modern and traditional livelihoods and cultural practices, have been identified as especially vulnerable to projected impacts of climatic change.

In 2021, Te Arawa iwi published Te Ara ki Kōpū, their climate change strategy (Te Urunga o Kea, 2021). This strategy anticipates the impacts of climate change within the Te Arawa rohe being rising sea levels and increased storm events; warming rivers, streams, lakes, and coastal waters; warming air temperatures; and higher average temperatures. In response, the strategy outlines the following 10-year priorities for Te Arawa:

- adaptation planning & resilience building
- biodiversity
- circular enterprise & economies
- energy security & sovereignty
- food and water security & sovereignty
- land use change & practices (Te Urunga o Kea, 2021, p. 11)

Further, Māori economic, social and cultural systems are strongly tied to the natural environment, with 50% of the Māori asset base in climate-sensitive primary industries (King et al., 2010). Stats NZ data for Māori exports in 2015 shows that primary industry products, seafood, dairy and meat made up 89% of the total value of Māori exports (Clarke-Nathan, 2016). Seafood was the top export commodity, being 59% of the total (Clarke-Nathan, 2016). BERL has reported that the Māori economy is overrepresented in New Zealand's emissions profile, largely due to the Māori economy's activities in agriculture (McMillan et al., 2021). BERL also states, however, that despite the risks and challenges that climate change poses for the Māori economy, as it does for the national and global economies, climate change also brings opportunities (McMillan et al., 2021). Some of these opportunities are native forestry (Pohatu et al., 2020), carbon farming, wood energy and sustainable wood production (Harmsworth et al., 2010).

Methodology

Mixed methods

The study reported here was based on data and information the first coauthor collected for their master of business administration research on the impact of climate change in primary sector uses of, and decision-making on, whenua Māori. Waikato Management School granted ethical approval to conduct the research (approval no. WMS 23/168). Permission from interview participants to use their data for this article was obtained. Survey participants were informed prior to answering questions that their data would remain confidential and be used solely for academic purposes.

This study deals with several complex issues, including climate change, whenua Māori, Māori governance, and Māori landowner and decision-maker perspectives associated with these concepts. Therefore, mixed methods research was applied due to its known effectiveness in addressing both exploratory and confirmatory questions, revealing a fuller picture of a problem in practice (Ivankova & Wingo, 2018). Mixed methods research was overlaid with a whānau-centred approach through the targeted selection of survey and interview participants from within the first coauthor's whānau network. A whānau-centred research approach ensures personal and cultural safety for researcher and participants due to their familiarity with one another, while prioritising the perspectives of Māori families and communities. By the same token, limitations exist such as affinity bias given that people from the same social grouping may not provide sufficiently diverse responses and the small study size. The limitations are not, however, considered detrimental to our aim because the study is primarily exploratory, seeking to uncover prevailing views of whānau and indicate valuable lines of further inquiry.

Data collection

Quantitative data was collected through an anonymous online survey administered by the

first coauthor using Qualtrics (https://www.qualtrics.com). The only criterion to take part in the survey was that a participant identified as a Māori landowner or a descendant of a Māori landowner. The latter category is deliberate and recognises the intrinsic connection to whenua through whakapapa and not just legal title. The quantitative data is derived from 60% of the invited participants, totalling 45 respondents. Qualitative data collection involved kanohi-ki-te-kanohi interviews with three participants who hold decision-making or other significant advisory roles in whenua Māori entities. Participants were provided with information and consent forms. Interviews were audio recorded and transcribed, with transcripts provided to participants to review. Participants were assured of anonymity. Given the familiarity of those working in the Māori primary sector, care is taken to ensure that "generic identifiers" are sufficient to protect the anonymity of the interview participants and their organisations.

Data analysis

The online survey yielded quantitative data, which were analysed using IBM SPSS (Version 30). Descriptive analysis was employed for scrutiny, with discrete values removed as needed before the application of specific analyses. Reliability and internal consistency were assessed using Cronbach's alpha analysis, followed by Pearson correlation analysis. Thematic analysis was applied to the qualitative data to reveal significant patterns and meanings, culminating in identified themes. In line with the methodology of mixed methods, the quantitative and thematic analyses were integrated (Creswell & Plano Clark, 2011).

Findings

Māori landowner perspectives

Nearly half (48%) of the 45 survey responses related to whenua in the Bay of Plenty. The majority (84%) of responses related to Māori freehold land (55%) and Māori customary land (29%). Forestry (exotic and Indigenous) and farming (sheep, beef and dairy) were the main primary sector activities being undertaken or considered. Sixty-one per cent of respondents had a formal decision-making role as a trustee or governor (37%), manager or executive (7%) or advisor (17%). The way respondents engage in decision-making was somewhat passive, with the highest categories being "discussing with whānau" (23%) and "attending meetings" (21%). More active participation in decision-making could likely be achieved by "analysing performance" and "voting in meetings", which scored lower, at 12% and 14%, respectively. Results demonstrate that respondents were aware of and concerned about climate change, believing that climate change is having a negative effect on productivity, sustainability and decision-making of whenua Māori. That said, the mean result indicates that climate change–induced consideration of land-use change is limited, with only 30% of respondents saying that "significant changes" are being contemplated. Responses to the open-ended survey questions provide some insight as to why this might be the case:

> Too many of our people want to bury their head in the sand about the impact of CC [climate change] and emissions reductions on the whenua … [This is] largely because they do not fully understand what this might mean and the most "backward" view is they do not want to spend funds while there is still time to carry out their investigations/modelling before the landowner has to pay real money when that time eventually does arrive. (Respondent 1)

Whenua Māori decision-makers' perspectives

Climate change awareness is high among Māori

The interview results aligned with the survey results, affirming participants were aware that climate change presents a risk for the long-term sustainability and utilisation of whenua Māori, and that action is needed. For some, awareness gave way to concern that had developed due to the detrimental impacts on whenua, awa, marae and hāpori from previous or "legacy" land-use decisions. Therefore, decision-makers were exercising a cautionary approach when assessing land-use options. This approach involves undertaking extensive due diligence, commissioning external research and expertise, and increasing engagement with landowners and whānau before making significant land-use decisions. One decision-maker explained how their trust undertook whānau and landowner engagement, due diligence, and environmental monitoring over 10 years before proceeding with a new land development:

> We waited for 10 years. We didn't put in any money … We watched to see what impact that would have environmentally and whether our whānau could come along on the journey or whether they would oppose any further development. (Interviewee 1)

For others, while awareness was high, the level of concern was lower:

> Very aware of the impacts. The concern, I guess, would be minimal—I wouldn't say it's Tūhoe-centric, but we're quite resilient at observing our taiao and then adapting to those changes. So, it's more of an opportunity rather than a barrier. (Interviewee 2)

Having awareness, though, did not mean that decision-makers knew exactly what they might do to mitigate climate change risk on their whenua:

> I think for, in particular my father, who is a decision-maker, it makes it more challenging because he hasn't been exposed to climate change, and I suppose understanding what it is, the impacts and strategising where to next. (Interviewee 2)

Climate change risk is a key consideration

The responses demonstrated that climate change risk has exacerbated the challenges and complexities of managing land-use activities. In particular, increased environmental compliance set by government, industry and export markets, which is increasingly expected by climate-conscious consumers and customers, incurs extra cost and requires additional capability (external and internal), time and investment. In addition, whānau and landowner expectations regarding long-term sustainability and impact of any land-use activity on the whenua remains a priority:

> I don't think any of us object to utilising the whenua, it's just how. And what impact will it have? We see things differently probably as Māori in that we will imprint in every generation that will come after us. What legacy do you want to leave behind? (Interviewee 1)

One participant described the "biggest challenge that Māori face in this area" as being the clash of values between Western and Māori approaches. This was raised in the context of engaging and receiving external technical expertise but not always being able to act on the advice:

> We receive reports all the time where it says, "You could do this, that and this, and it will make you more money if you run some chemicals through the system." It rolls off their tongue. And we're like, "Say what? Chemicals through our whenua? No." "Oh yeah, but it will get rid of blah, blah, blah." "No, it doesn't matter. We can't explain that to the whānau. It doesn't belong there. Therefore, we can't do it." . . .
>
> What's hard for all those people to understand is the responsibility of a board member of an ahu whenua trust [the most common type of Māori land trust]. They don't understand why what they're saying, we can't do. That might make a lot of sense to them, but in our world it doesn't. (Interviewee 1)

The findings show that effort is being made to address environmental concerns in, for example, effluent disposal, water recycling and reducing carbon emissions. However, decisions around climate change mitigation and adaptation were not straightforward for three main reasons. First, information is lacking, not readily available or not easily accessible to support whenua Māori decision-makers, especially those on smaller land blocks who are unlikely to be financially able to commission research or external expertise. Second, decision-makers felt "stuck" with their current land use given the significant infrastructure and capability investment made over many years. Third, decision-makers were aware that climate change is a risk to whenua Māori but were not clear on the specific impacts or the action required to address the risks to their whenua.

There are solutions in Indigenous knowledge

The findings emphasise the importance of incorporating Māori perspectives, values and aspirations into climate change decision-making and land-use planning. Te ao Māori approaches of balancing economic, environmental, social and cultural aspects of land use were viewed by participants as complementing the holistic approach necessary to tackle issues associated with whenua Māori utilisation and decision-making amid climate change: "If we take care of the whenua, the whenua will take care of us" (Interviewee 1).

When discussing climate change, participants could see opportunities for whenua Māori and Indigenous knowledge. These included potential for growing different crops and vegetables on their whenua due to a warmer climate. They were already noticing a change in species coming into their forests and expressed excitement about the potential to cultivate different food crops:

> Where the taiao is concerned, what couldn't grow in those altitudes or climates could potentially be grown going forward. As a strategy for the farm, we've always looked 50 to 100 years ahead. So, looking 50 to 100 years ahead and what we could potentially grow within that 50 to 100 years is quite exciting, given that the climate is warming, and we could potentially grow vegetables that we wouldn't have been able to grow before. The

> change in species coming into the forest is changing as well. Not only does it bring more opportunities, but also challenges. (Interviewee 2)

Indigenous-to-Indigenous connections were occurring in acknowledgement of the unique insights and holistic perspectives that Indigenous knowledge can contribute to environmental management and climate adaptation:

> I think it just keeps showing us that we have to go international to see some of this stuff as well. But a lot of international Indigenous people are looking back at Māori. …
>
> We had a group contact us from Canada. … They wanted to talk to us about whether this is actually good for Papatūānuku? They didn't want to hear from scientists; they wanted to hear it from other iwi taketake [Indigenous people]. (Interviewee 1)

Whānau and landowner engagement is essential

The need for effective communication, trust-building and education to engage whānau and landowners was identified as essential to mitigating climate change risk on whenua Māori. This study highlights the need for consideration of the impact on the environment and whānau, and the importance of involving whānau and landowners in decision-making processes. One interviewee spoke of their two-year journey to find and engage with their landowners and whānau across the country. This coincided with their 10-year journey of undertaking due diligence by engaging scientists, environmental planners, cultural monitors, business consultants and sector experts. They wanted to be assured as decision-makers—and gain the confidence of their landowners—that the land-use opportunity would deliver intended economic benefits without negatively impacting cultural, social and environmental dimensions: "If it doesn't answer that and it doesn't do that, then the answer is no. And it will be the same for our whānau" (Interviewee 1).

Some of the barriers to effective communication with landowners and whānau exist at a practical level. These barriers include limited email access for whānau and landowners, misinformation spread through social media, and the sheer number of landowners with whom to engage, which can number in the thousands and be dispersed across the country and around the world.

In some instances, effective communication and education were also needed with decision-makers who may be unfamiliar with climate change risk, mitigation and adaptation. One participant spoke of the challenge for long-serving trustees to consider alternative land uses due to their lack of understanding of climate change. Conversely, while climate change may be unfamiliar to some decision-makers, landowners and whānau, there still exist those close to the whenua with a deep understanding of the taiao who identify and recognise changes through particular tohu:

> Climate change has never really been something that we as Māori look at, it's just normalised. It's the taiao changing and you have indicators—tohu—to tell you at what time to plant and depending on what's flowering, birds have come back at a certain time, or the tuna are going out to sea. So … watching and observing those, I suppose, is impacted by climate change. But then also understanding that within te ao Māori, and then translating that to your trustees. … You're trying to help them understand what climate change is like and is what they do anyway … helping them understand that it has the same meaning, but not quite. In a Western sense that's what it's called, but in te ao Māori, you do it anyway. (Interviewee 2)

Access to credible research, information and expertise needed

While Māori have confidence in their knowledge as Indigenous people and kaitiaki of their whenua, there was also an acknowledgement that credible research, information and expertise from scientists, climate change specialists, sector experts and the like are necessary for a deeper understanding of the impact of climate change on whenua Māori and managing its effect.

It was clear that the larger trusts could invest in external expertise and research, and did so on an ongoing basis to responsibly monitor and manage their whenua. Even for them, however, access to relevant, balanced and credible climate resilience research, information and expertise was lacking. Having this information would facilitate a more informed dialogue and enable prudent decision-making.

Participants acknowledged the role of industry in the urgency for addressing climate change. Initiatives such as B-Corp certification—which signifies a company's commitment to high standards of social and environmental performance—and Environmental, Social and Governance goals were cited. While there was mention of the government's role in supporting Māori communities to manage the impacts of climate change on their whenua,

there was some scepticism about the government's overall effectiveness and motives.

> [The] current political climate with change of government provides lots of uncertainty on our business including being able to deliver future aspirations of our owners, whānau, hapū and iwi. (Respondent 2)

> Not from the government, who tend to interfere rather than being helpful. We trust our own tikanga and mātauranga to guide us. (Respondent 3)

Discussion

This study represents much-needed research on the state of Māori authority readiness for climate change and its effect on whenua Māori utilisation by exploring Māori awareness of, preparedness for and action on climate change in Aotearoa. The key themes that emerged from the findings can be summarised as follows:

- Māori awareness and concern regarding climate change is high.
- Climate change risk is a key consideration for Māori decision-makers and landowners.
- Indigenous knowledge, peoples and approaches can and are contributing to climate change solutions.
- There is a greater need for whānau and landowner engagement.
- Greater access to credible research, information and expertise is required.

At the heart of these themes lies a strong commitment to stewardship of the land and the necessity for a holistic approach to land use that spans economic, environmental, social and cultural considerations.

The high level of awareness and concern among Māori about the risks and impacts of climate change on whenua Māori is evident in the prioritisation of climate change considerations in decision-making processes related to land use. Māori are actively considering and implementing strategies that adapt to and mitigate the effects of climate change. These include exploring renewable energy as well as downstream opportunities from current geothermal power activities (Bargh, 2012), reducing and diversifying stock, and investigating the cultivation of other food crops more suited to a warming climate. The literature points to other opportunities, including native forestry (Pohatu et al., 2020), carbon farming, wood energy and sustainable wood production (Harmsworth et al., 2010). These options indicate that the Māori economy's overexposure in climate-sensitive primary industries (King et al., 2010) may be unavoidable given they are born of the whenua. Māori are, however, exploring alternative, high-value land-use opportunities, such as bioenergy, that are known to mitigate environmental effects (e.g., carbon, water quality and erosion) (Hall & Jack, 2009), while building a knowledge economy that requires and values, as Ruckstuhl et al. (2019) argue, the integration of mātauranga Māori, science and research, and sector-specific expertise.

While an awareness and active consideration of climate change risks to the whenua was demonstrated by participants, this was not always attributed to a climate change response but rather to a fundamental understanding of the taiao and its interconnectedness to the presence or absence of certain tohu indicating changes in the environment. This reinforces the findings of King et al. (2008), who point out that Māori environmental knowledge is an important factor in Māori responses to climatic change. Indigenous-to-Indigenous connections reflect that Māori can and are providing leadership to contribute to climate change solutions. In commenting on the Te Arawa Climate Change Strategy, kaitiaki Doug Macredie emphasises the importance of Māori and Indigenous leadership:

> It is generally accepted that climate change is an unforeseen consequence of colonisation, global forest removal, capitalism, and rampant industrialisation. … The solutions needed therefore must be sourced from a different values base and thought processes and this is why Māori and indigenous peoples must lead climate change solutions rather than just contributing to them. (as cited in Te Urunga o Kea, 2021, p. 4)

Leadership is exhibited as other Indigenous communities and international bodies seek advice from Māori on their experiences in managing environmental impacts on their whenua. The Māori approach to land management, characterised by a balance of economic, social, cultural and environmental factors, aligns with Indigenous understandings of intergenerational stewardship and ecological balance (Harmsworth & Awatere, 2013). Our findings underscore the importance of mātauranga Māori and contemporary scientific understanding, harnessing the strengths of both Indigenous and scientific knowledge systems to effectively address climate change.

Climate change adaptation and mitigation

approaches and initiatives are being considered, even if they have not yet been "formalised" into a specific climate change strategy. For example, reducing debt and keeping debt levels low was one trust's strategy to mitigate the impact of operating in an uncertain, climate-sensitive sector such as farming. This allowed for flexibility and options to transition from current land uses. Affordability, especially for smaller Māori land blocks, is acknowledged as a barrier to climate change adaptation and mitigation. Despite this, whenua Māori entities are showing great resolve by making changes as their balance sheets and capabilities allow.

Climate change considerations are creating a more challenging environment for whenua Māori decision-makers. Some of the challenges include

- additional costs involved with climate change mitigation, let alone adaptation
- longer timeframes to make decisions given the need for greater information sharing and engagement among decision-makers, landowners and whānau
- uncertainty about where and how to access reliable and credible research and expertise
- lack of understanding and experience navigating modern science, acknowledged as a knowledge system that, in conjunction with Indigenous knowledge, will generate required solutions

Despite frequent comments from participants that there was a lack of relevant research and information relating to climate change, participants demonstrated a sound understanding of the issues and impacts of climate change on their whenua and proffered practical solutions to close the information gap. The grounding that Māori have in te ao Māori and their deep relationship with the taiao likely provides an intrinsic knowledge of, or at least a high level of engagement in, how to manage climate change risk on the whenua.

Conclusion

This study sought to understand the state of Māori authority readiness for climate change and its effect on whenua Māori utilisation. Understanding the impacts of climate change on whenua Māori is complex. Still, in some ways, it is not because Māori historically have been adapting to changes in their taiao and surroundings for centuries. Practices like rāhui are applied to regulate human activity when there is a risk to the oranga and sustainability of natural resources—an example of climate change mitigation in many ways but from a te ao Māori perspective. The complexity of climate change partly arises from a lack of appreciation from both within and beyond Māoridom of how Indigenous knowledge and practices have contributed to, and continue to contribute to, addressing climate change risk.

This study has identified examples of Māori drawing on different knowledge systems—mātauranga Māori, contemporary science, sector-specific expertise and Western business approaches—to inform and develop holistic climate change solutions. Māori certainly acknowledge that the complexity of climate change requires input from all aspects. Hence, credible, reliable, relevant information and expertise must be accessible to address climate change risk. Study responses also identified that while Māori are taking action to address climate change, recognising those actions as climate change mitigation and adaptation responses is not always evident.

This study's small sample size and whānau-centred approach present limitations in the diversity and range of responses. However, given the lack of research and literature in this area, this study stands as a useful contribution to understanding how climate change is impacting utilisation of, and decision-making on, whenua Māori. The importance of a holistic and comprehensive approach that combines Indigenous knowledge with scientific understanding, and of whānau engagement in decision-making on sustainable land management is highlighted. Our findings offer climate change–related policymakers and stakeholders insights into the unique challenges and opportunities Māori landowners and decision-makers face.

Glossary

Aotearoa	New Zealand
aronga	worldview
atua	gods
awa	rivers
hāpori	communities
hapū	sub-tribe
iwi	tribe
kaitiaki	guardian, steward
kaitiakitanga	guardianship over people and the environment
kanohi-ki-te-kanohi	face-to-face
Māori	Indigenous peoples of New Zealand
marae	tribal meeting grounds

mātauranga Māori	Māori knowledge
mauri ora	wellbeing
ngahere	forests
oranga	health
Papatūānuku	Earth Mother
rāhui	restriction
rohe	region
taiao	the natural world
tangata	humans
tangata whenua	people of the land; lit. "born of the earth's womb"
taonga tuku iho	cultural heritage
te ao Māori	the Māori world(view)
Te Arawa	a large confederation of iwi and hapū based in the Bay of Plenty region of the North Island
te Tiriti o Waitangi	the Treaty of Waitangi
tikanga	customary practice
tīpuna	ancestor(s)
tohu	signs, signals
Tūhoe	iwi based in Te Urewera in the eastern North Island
tuna	eel(s)
wahi tapu	sacred sites
wai	waterways
wairuatanga	spirituality
whakapapa	identity
whakataukī	proverb(s)
whānau	extended family
whāriki	woven mat
whenua	land; placenta
whenua Māori	Māori land

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