# A Climate Change Adaptation Model for Māori Groups, Aotearoa, New Zealand

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## Abstract

Climate change is a global issue affecting Aotearoa/New Zealand and the wider world. It is primarily driven by human activities, particularly the release of carbon dioxide into the atmosphere from burning fossil fuels, with its impacts widely felt (WWF, 2024). Indigenous groups around the world are severely affected by climate change. These impacts affect cultural practices, increase health risks within indigenous communities and exacerbate existing inequalities that they face (Green et al., 2009; Abate & Kronk, 2013; Jones, 2019). In Aotearoa New Zealand, Māori are among the groups that are especially vulnerable to these effects, facing unique challenges stemming from colonisation, urbanisation and their deep spiritual and physical connection to the land (Marques et al., 2020; Ministry of Environment, 2022a; Macinnis-Ng et al., 2024). Climate change threatens Māori cultural knowledge and practices and their health and well-being (MftE, 2023). With adverse effects of climate change expected to worsen over time, adaptation is pivotal in minimising the damage it can cause. Adaptation not only lessens the impact of climate change but also helps deal with its consequences by taking appropriate action as well as maximising opportunities. The primary focus of this article is climate adaptation as it pertains to Māori groups, including iwi, hapū, Māori communities, Māori entities and Māori land trusts. A literature review on climate adaptation models highlights a gap in models designed for Māori groups. Given this gap, there is an urgent need for climate-adaptation models designed for Māori groups that incorporate a Māori perspective (MftE, 2022). This article addresses this gap by presenting a climate adaptation model, '*Nekenekehia i te Taiao,*' designed to assist Māori groups in tackling climate adaptation challenges. Additionally, it is hoped that this article inspires further discussions on Māori-led climate adaptation models for Māori.

**Keywords:** climate adaptation model, climate impacts, Māori groups, Māori customary values

## Introduction

Climate change is already a global issue affecting many lives worldwide (Karl & Trenberth, 2003; Ministry of the Environment & Stats NZ, 2019; Loucks, 2021). While mitigating atmospheric greenhouse gas emissions is vital for reducing the long-term impacts of climate change, adaptation plays a crucial role in minimising risks associated with its current and future effects (Fawzy et al., 2020). Māori, the Indigenous people of Aotearoa, like many other First Nations peoples, are particularly vulnerable to climate impacts. This is due to several factors such as geographical isolation (e.g., coastal, rural, remote places), historical injustices (e.g., displacement and dispossession), cultural and spiritual ties to the land, lack of resources and socio-economic inequalities. Māori groups can refer to iwi, hapū, Māori communities and Māori land trusts. Consequently, Māori groups must possess the capacity to adapt to these rapidly changing conditions. One way to do this is through the implementation of climate adaptation models. This article begins by examining the impact of climate change on Māori and highlights the necessity of climate adaptation models that are aligned with Māori cultural values and practices. Then, this article proposes a climate-adaptation model, *Nekenekehia i te Taiao,* designed for Māori groups aimed at supporting them to adapt to climate change.

## The Impact of Climate Change on Māori

Māori are vulnerable to the impacts of climate change in various ways. Factors such as existing socio-economic inequalities and their strong spiritual, cultural, social and economic connection to the landscape (i.e., water and natural resources) make them vulnerable to these impacts (MftE, 2022; NIWA, n.d.-a). Many Māori communities are located in rural coastal areas that are often prone to increased flooding and coastal erosion (Bailey-Winiata et al., 2023). Additionally, Māori culturally significant sites such as urupā (cemetery), marae and papakāinga are highly susceptible to climate impacts because they are located in high natural risk zones (Bailey-Winiata, 2021). Māori communities are already facing compounding challenges of climate-related issues, such as water and food insecurity, increasing insurance premiums in coastal areas and pressures on health and well-being (Jones et al., 2014; MftE, 2022a). Climate change is impacting the environment and will continue to, which will profoundly affect mātauranga and cultural practices, including losing taonga and tikanga associated with them (MftE, 2022). With climate impacts expected to increase in intensity and frequency, there may be cases in the near future when Māori communities may be forced to relocate because the area in which they reside will become no longer inhabitable (Expert Working Group on Managed Retreat, 2023). This would result in a complex relocation process for Māori communities, given their historical and cultural connection to specific areas over centuries.

## The Importance of Climate Adaptation Models Designed for Māori Groups

In Aotearoa, several climate adaptation models have been developed, including NIWA's climate change adaptation toolkit (NIWA, n.d.-c) and the ten-step cycle coastal hazards and climate change guidance for local governments (MftE, 2024). However, these models fail to account for the distinct cultural, ecological, political and social contexts of Māori groups. As a result, the one-size-fits-all approach inherent in these models is inadequate for addressing the needs, interests and values of Māori. Tailoring climate adaptation strategies specifically for Māori would ensure their cultural values, concepts, traditional knowledge and practices are effectively incorporated into climate resilience planning.

Developing climate adaptation models specifically designed for Māori groups is crucial to reflect their understanding, aspirations, lived experiences and perception of the world. Adaptation models need to cater for the cultural beliefs, values, mātauranga and practices that promote culturally appropriate and effective strategies to address climate issues that Māori are faced with. Māori customary knowledge and practices have been cultivated over generations through long-term observations and close coexistence with the natural world, and this can help lessen the climate impacts (Harmsworth & Awatere, 2013). Additionally, Māori values and practices can also contribute to more resilient ecosystems (Harmsworth & Awatere, 2013). Furthermore, climate adaptation should reflect Māori concepts such as whakapapa and kaitiakitanga. For example, whakapapa is a central concept that demonstrates the interconnectedness of humans and the natural environment, which helps to understand the ecosystem as a whole system (Harmsworth & Awatere, 2013). Therefore, there is a need for climate adaptation models to be aligned with the values, beliefs, realities and aspirations of Māori groups.

Māori groups must initiate and control the climate adaptation process within their communities or areas instead of local governments. However, local governments are vital in supporting Māori groups with the adaptation process (MftE, 2022b). Māori groups' voices, ideas, opinions, needs, goals, expertise, and experiences are better represented when they are actively and directly involved in every aspect of the adaptation process. When Māori are in control of the adaptation process, this can help to empower them as well as provide assistance in more equitable solutions (Blackett et al., 2022). Additionally, there are many benefits when Māori groups take charge of their own climate change responses rather than having local or national governments dictate to them (Blackett et al., 2022).

Te Tiriti o Waitangi plays a key role in supporting Māori with climate adaptation (MftE, 2022b; Iorns, 2022). Tino rangatiratanga is asserted in Article Two of the reo Māori version of Te Tiriti o Waitangi. This means that the Crown not only has an obligation to protect Māori lands (e.g., forests, fisheries, taonga) but also enables Māori to protect

these taonga (Iorns, 2022). Māori sovereignty, decision-making power and Māori control over things Māori are also acknowledged in this article (Broughton et al., 2015). The government must recognise and assist Māori to conduct tino rangatiratanga in climate adaptation. Giving Māori the necessary tools to exercise mana motuhake, or equal decision-making power at the governmental and local council levels, may be one way to achieve this. Adapting to a changing climate is important because some taonga (e.g., native species, culturally significant sites) that are significant to hapū are under threat (Egan et al., 2020).

The government also has a partnership with Māori and is responsible for upholding the rights of Māori, including the protection of taonga (Iorns, 2022). This partnership, founded on good faith and equal rights, should extend beyond mere consultation or engagement with Māori to appropriately informing iwi and hapū and empowering them to define value on their own terms. Both parties are required to work together in co-constructing or co-designing strategies and policies that will benefit both. Furthermore, Māori are often given little authority or voice in decisions about their lands, so the partnership should allow Māori greater input into critical decisions such as climate adaptation. A key feature of Te Tiriti o Waitangi is the protection of Māori interests, including their traditional lands, resources and heritage. The government must provide Māori with the appropriate measures that will allow them to protect and manage their lands. This may involve assisting Māori-led climate projects or initiatives and providing them with adequate funding or relevant resources (MftE, 2022b).

## A Climate Adaptation Model for Māori Groups

*Te Nekenekehia i te Taiao – Moving with the Environment*

During my doctoral studies, developing a climate adaptation model to help an ahuwhenua Māori land trust with climate adaptation planning was one of my goals. Reviewing the literature about climate adaptation models, there were several available for Māori groups to use, such as the NIWA Climate Change Adaptation Toolbox (NIWA, n.d.-c) and the 10-step decision cycle for coastal hazards and climate change for local government (MftE, 2024). Yet, these models were underpinned by a Western worldview, as were their approaches. While climate adaptation models are a developing field, there are few, if any, models that are grounded in a Māori worldview and endorse Māori values and practices. A Māori world view, as described by Ka'ai and Higgins (2004), is "holistic and cyclic, where every person is linked to every living thing and to the atua (p. 13). They further state that three primarily cultural concepts that help frame a Māori world view include tapu, noa and mana. While this is a general definition, each iwi or hapū will have its own distinct worldview that aligns with their environment. Thus, there is a need to develop climate change adaptation models that incorporate Te Ao Māori and embrace Māori realities, values, beliefs, experiences and practices.

The *Nekenekehia i te Taiao* is a model that I have developed to assist Māori groups (i.e., iwi, hapū, Māori communities and Māori land trusts) to adapt to climate change. The title, "*Nekenekehia i te Taiao*", translates as moving with the environment. The word 'nekenekehia' means to move gradually or manoeuvre, as 'taiao' refers to the environment, nature or the natural world (Te Aka Māori Dictionary, 2024). This title recognises the world's rapidly changing climate in terms of the increasing environmental impacts due to rising greenhouse gas emissions and that people and businesses must adapt to these conditions. The Nekenekehia i te Taiao model is seen in Figure 1.

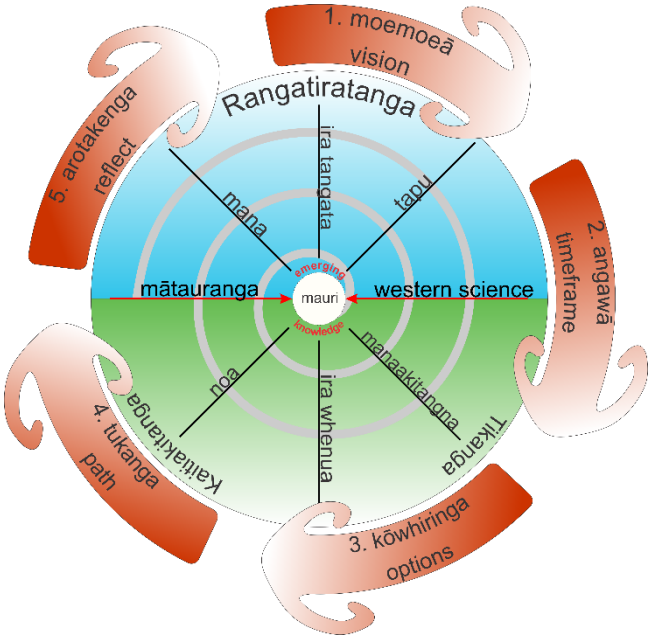


Figure 1: Nekenekehia i te Taiao Model. Climate Change Adaptation Model for Māori Groups (Mackintosh, 2025).

## What the Colours of the *Nekenekehia i te Taiao* Model Represent

The colours in this model signify distinct components. The white colour within the central circle, the mauri, symbolises Te Ao Marama, the realm of light. White was selected for its symbolic representation of beginnings, balance (of the mauri) and enlightenment (Ministry for Culture & Heritage, 2015). Furthermore, the intersection of two distinct knowledge systems - mātauranga and Western science gives rise to the emergence of new knowledge. This phenomenon can be described as enlightenment, in which new knowledge is created. The green colour at the base of the circle represents Papatūānuku, the Earth Mother, commonly regarded as the source of life (Royal, 2007). Green also symbolises growth, prosperity and the natural world (Matariki.co.nz, 2024). The blue in the upper half of the circle references Ranginui, the Sky Father, within whom the celestial bodies, including the moon and stars, are embodied (Taonui, 2006). Moreover, blue represents peace, calm and stability (Cherry, 2024). It is essential to safeguard Ranginui and Papatūānuku from human-induced impacts such as

deforestation and greenhouse gas emissions, to ensure the well-being of their offspring, humans and nature can thrive. The red colour of the arrows or mangōpare also known as the hammerhead shark symbolises the veins of the Earth Mother. The mangōpare was selected to represent the strength, determination, and resilience required by Māori to tackle climate-related challenges.

## The Components of the Nekenekehia i te Taiao Model

To explain this model, porowhita was selected, as it symbolises the circle of life and the interconnectedness of all elements within the cosmic family. Within the porowhita are the values and narratives of Māori. Rangatiratanga, tikanga and kaitiakitanga are positioned outside this model, while the mauri is centrally located. Three essential values, rangatiratanga, tikanga and kaitiakitanga, are vital to the climate adaptation process because they enable and recognise, self determination, cultural connection to the land, upholding the mana, tikanga and mātauranga of Māori, allowing for decision making over their natural resources and brings a holistic approach to care for the environment. Six of the concepts reflect the well-known principles of complementary dualism (Kawharu, 1975, p. 87) in Māoridom, including ira tangata and ira atua, tapu and noa, and finally, mana and manaakitanga. The model also incorporates the distinct knowledge systems of mātauranga and Western science. The five arrows surrounding the porowhita represent the steps necessary for the implementation of this model.

The customary values located within the circle are linked to the five steps of the process. While certain values can be associated strongly with particular steps, the values are interlinked and flow freely between each step. These values help identify what aspects are important to the group, prioritise options, inform decision-making, promote unity, guide behaviour and actions, and highlight future outcomes. An explanation is provided later in this article of how the values are linked to each step of this process.

## Mauri

Mauri is often described as the life force or internal energy system that sustains all forms of life (Barlow, 1991; Mead, 2016). Everything (living or non-living) has a mauri, such as people, animals, plants, waterways, landmarks and things (Harmsworth & Awatere, 2013). As a life force, mauri enables the harmonious functioning of various components within a system, such as the interdependent relationship between forests and waterways in the natural ecosystem (Whetū Consultancy Group, 2023). Additionally, mauri represents the divine power of Atua that permits all life in the natural environment to thrive. It also serves as a binding force between physical and spiritual realms (Barlow, 1991). Mauri plays a central role in ceremonies and rituals, such as karakia, which seek to honour and restore balance (Royal, 2007).

Whakapapa is central to mauri. It is inherited in all living things and can influence how Māori view and interact with their surroundings (Harmsworth & Awatere, 2013). Mauri

is fundamentally linked to whakapapa, representing the layering of knowledge of the past and present. Mātauranga transmitted through generations can help to enhance the mauri. From a whakapapa perspective, mauri is signified via our interlinked energy systems (Tapsell, 2021). The surrounding environment can influence the mauri and shift depending on the energy systems. If the mauri of an entity is functioning at a state of equilibrium, it is in a healthy state and is crucial for the well-being of individuals and the environment (Harmsworth & Awatere, 2013; Tapsell, 2021). Conversely, if the entity comes under threat, the mauri becomes unbalanced, which can lead to an unhealthy state. Viewing mauri requires a holistic perspective, recognising that changes in one system - whether human or natural- affect the other (Tapsell, 2021).

In the *Nekenekehia i te Taiao* model, mauri, central to this framework, is underpinned by whakapapa, as is mātauranga Māori. Represented by the spiral, mauri is dynamic, with its energy shifting positively or negatively in response to external physical and spiritual forces. Mauri also signifies the cause-and-effect relationship, where the cause brings a reaction (Tapsell, 2021). The goal of the mauri is to maintain a state of equilibrium (Morgan 2006). To preserve this balanced state, groups must consider how external forces and actions affect the mauri. For example, milling a tree near waterways raises questions about its impact. Evaluating both short and long-term impacts, along with sustainable practices, is essential in maintaining the mauri in a balanced state. Furthermore, there are mauri models that can be used, such as the Dr Kēpa Morgan Mauri model for decision-making used to assess sustainability and that balances various dimensions (e.g., social, cultural and economic) (see Morgan, 2015).

The complementary elements of Te Pō (the dark night) and Te Ao Mārama (the long-standing world) in this model are linked to the concept of mauri. Te Pō represents the state of darkness, confusion, chaos and uncertainty, whereas Te Ao Mārama signifies order, stability and the known (Kawharu & Tapsell, 2019). In the world of Te Ao Mārama, it may become unstable because of an imbalance between ira atua and ira tangata, such as tangata exploiting ira atua. Maintaining a balance of mauri of Te Pō and Te Ao Mārama may require people (from different disciplines and even different countries) to develop and implement innovative ideas in search of opportunities and develop innovative solutions for addressing current and future climate risks. Additionally, Te Pō and Te Ao Mārama also signify the search of knowledge that began in Te Pō and continues in the realm of Te Ao Mārama when tangata are seeking new innovative ideas to tackle climate change.

## Rangatiratanga

Rangatiratanga has several meanings depending on context, applications, and users (Jackson, 2013). Contemporary interpretations of rangatiratanga commonly encompass chieftainship, self-determination, sovereignty, ownership, authority, autonomy, trusteeship and leadership (Waitangi Tribunal, 1998; Walker, 2004; Jackson, 2010;

Mead, 2016; Kawharu & Tapsell, 2019; Mutu, 2021). This concept originated in the Declaration of Independence of New Zealand, He Whakaputanga o te Rangatiratanga o Nu Tireni, 1935. It is also fundamental to the Te Tiriti o Waitangi, 1840. Before this time, mana was the concept that was used by hapū (Kawharu, 1989; Ross, 2001; Jackson, 2010).

The term ‘rangatiratanga’ derives from the rangatira, which functions as both a noun and a verb. As a noun, it refers to a person of high rank esteemed leader, while as a verb, it denotes the act of attaining or embodying high rank (Biggs, 1989; Kawharu & Tapsell, 2019). Rangatira can also be further divided into "ranga" and "tira." Ranga stems from the word ‘raranga’, translating to weave, and ‘tira’, meaning a group (Mikaere, 2010). Ranga-tira-tanga is, in the words of Royal (2007), “the art of weaving groups together into a common purpose or vision” (p. 9).

Key principles characterise rangatiratanga, one of which is the right of hapū to manage, protect and care for their lands, taonga and affairs (Jackson, 2013). It invokes obligation, accountability and service within kin groups (Kawharu & Newman, 2018). It also embodies reciprocity, where both rangatira (leaders) and community members contribute to its practice. For instance, the community supports the mana of the rangatira, while the rangatira, in turn, elevates the mana of the community (Kawharu & Tapsell, 2019). With the establishment of the Te Awa Tupuna Act 2017, it revitalises tino rangatiratanga, affirms the river as a living ancestor, recognising its legal personhood (Parliamentary Counsel Office, n.d.).

Rangatiratanga encircles the Nekenekehia i te Taiao model, serving as an overarching value that includes the exercise of kaitiakitanga (trusteeship/guardianship) and other customary values. Without rangatiratanga over the land, it can be somewhat difficult for Māori groups to exercise kaitiakitanga. Rangatiratanga recognises the community’s power and ability to initiate and engage in the climate adaptation process (Stephenson et al., 2022). Some Māori communities have already begun exercising rangatiratanga to address climate-related issues.

## Ira Atua and Ira Tangata

Ira atua has been interpreted as a supernatural life or being or divine atua (Mead, 2016). Ira tangata has been described as human elements, human genes or mortals (Te Aka Māori Dictionary, 2024). It also refers to tangata whenua, Māori people, or iwi kāinga (Te Aka Māori Dictionary, 2024). Essential to ira tangata are intrinsic values of dignity, respect and well-being of people (McMeeking et al., 2019). In Māori cosmology, Te Kore is the void in which Te Pō emerged. In this realm, Ranginui and Papatūānuku were formed (Reilly, 2004; Mead, 2016). Nestled between them were their offspring. One of their offspring, Tane, decided to separate his parents by pushing them apart, in which light began to appear. The light realm became known as Te Ao Marama (the world of

light or the living), Papatūānuku represents the Earth and Ranginui, the sky (Mead, 2016). Their offspring became known as the demigods or atua of the natural world, each responsible for a domain such as Tane Mahuta, the god of the forests (Roberts, 2013). From these offspring came the birth of ira tangata or humankind. That means humankind is part of the whakapapa (kin relationships) and ecology of the natural environment (Roberts, 2013). Everything in the world is interconnected, such as people, trees, birds, animals and the wind (Royal, 2007). Because of this interdependent relationship, ira tangata and ira atua have a reciprocal bond that includes taking care of one another and working together to maintain a balance. This is reflected in the principle of kaitiakitanga. As described by Harmsworth and Awatere (2013), "this principle entails an active exercise of power in a manner beneficial to the resource. It can be illustrated by humans providing benefits to the ecosystem and natural resources, through, for example, guardianship and sustainability, and means that the ecosystem or resources is sustained, if cared for, and can then provide benefits back to humans" (p. 281).

In the *Nekenekehia i te Taiao* model, the whenua and the natural environment (represented as ira atua) hold social, political, cultural, ecological and economic importance for ira tangata (people). The dynamic energy system between the ira atua (whenua/natural environment) and ira tangata is embodied in the concept of the mauri. Ira tangata plays a pivotal role in protecting, nurturing and overseeing the environmental resources within geopolitical territories. The energy systems of ira atua must maintain equilibrium with ira tangata. Achieving this requires ira tangata to align with ira atua (concerning whenua) and make informed decisions that prioritise long-term ecological sustainability management practices, such as through pest and weed control, riparian planting or restoring wetlands and coastal areas.

## Mana

The concept 'mana' is commonly used to allude to 'authority', 'power' or control (Mead, 2016). It can also stipulate one's position or argument, the assertion of status or identity and exercise-based rights arguments (Barlow, 1991; Kawharu & Tapsell, 2019; Te Aka Māori Dictionary, 2024). Traditionally, mana has been the enduring power of the gods and was (and still is) attached to natural resources, whakapapa and intimate objects that could affect the behaviour of an individual or group. The more prestigious the entity, the greater the mana and tapu. The highest form of mana derives from Te Kore, the void (Royal, 2007). In more contemporary times, mana has often been referred to as the powers of tupuna, land and individuals (Barlow, 1991).

Mana is akin to the concept of mauri in that it can not be fixed as it fluctuates (Kawharu & Tapsell, 2019). It can rise and fall. Mana is based on an ethic of care (Perrett & Patterson, 1991). Mana can be heightened by performing tikanga, which then enhances the mana of others while also acknowledging the mana of atua or mana atua. Conversely,

mana can be negatively impacted. For instance, the mana of atua is diminished by the excessive use of natural resources (Harmsworth & Awatere, 2013). The goal is to restore mana to a balanced state if it has been negatively impacted. This, in turn, will benefit other people and the environment.

In the *Nekenekehia i te Taiao*, mana represents the recognition of the authority of atua, rangatira and kāinga, acknowledging the community's role in facilitating the climate adaptation process. Māori groups lacking confidence or familiarity with this process may seek guidance from the local government or appropriate organisations. While outside agencies provide support, the community/group leads the process. According to Te Tiriti o Waitangi Article Two, the government and local councils are responsible for uplifting the mana of the community by enabling them to establish their own plans. In doing so, the government will enhance its own mana (MftE, 2022).

## Manaakitanga

Manaakitanga stems from the word 'manaaki'. Generally, 'manaaki' translates as hospitality, generosity, kindness and acts of giving (Mead, 2016). It also considers the needs and interests of others (Kawharu & Tapsell, 2019). Manaakitanga can also be broken down into three parts, 'mana', 'aki', and 'tanga'. As noted earlier, mana is often referred to as power, authority, control and status. The word 'aki' broadly translates as encourage, urge, or challenge (Te Aka Māori Dictionary, 2024). The words 'mana' and 'aki' are interlocking in that mana places entities in high regard, and aki supports its position (Kawharu & Tapsell, 2019). The suffix 'tanga', as described by Biggs (1989), refers to 'the time, place, or occasions of the existence or assumption of the state indicated' (p. 310). Furthermore, tāngā turns the word into a derived noun. Manaakitanga is the application of manaaki in practice. Maintaining one's mana through hospitality, generosity, and kindness helps to enhance the mana of others by inspiring them to do the same (Kawharu & Tapsell, 2019). Manaakitanga, therefore, is the reciporical process.

Beyond human connections to the environment and the whenua, manaakitanga includes kaitangatanga, applying the same principles of care and respect to the natural world. Traditionally, respect for the whenua was expressed through customary values such as tapu, mana, mauri, and rāhui. Kaitangitanga is linked with whakapapa, the foundational principle guiding Māori to respect each other and the environment (Mead, 2016). Historically, respecting and managing natural resources was vital for the hapū's survival and long-term sustainability for future generations.

Tikanga is a key aspect of manaakitanga (Mead, 2016), guiding Māori conduct in social interactions, including their thoughts, behaviours, engagement and relationships. In the climate adaptation process, manaakitanga plays a critical role in how the group functions, helping them to achieve their objectives.

In the *Nekenekehia i te Taiao* model, manaakitanga is grounded in reciprocal relationships, where respect and interaction with others extend beyond tangata to include the environment. For instance, the mana of atua is upheld by manaakitanga, expressed through tikanga. Reciprocity also enables kin groups (hapū/kāinga) to maintain and strengthen connections with the spiritual world, the environment, ancestors and each other (Kawharu, 2000).

## Tapu

Tapu is generally understood as sacredness, spiritual restrictions and prohibition (Duncan & Rewi, 2018). It serves to protect the mana of atua. All living entities, descending from atua, inherently possess tapu. When using natural resources that stemmed from atua, they needed to be appeased by karakia before and after harvest. Tikanga fortified by ancestral practices safeguarded tapu, with violations resulting in retribution. To mitigate such effects, appropriate karakia and ceremonies were conducted. Over millennia, Māori ancestors demonstrated profound respect and gratitude for all entities, ensuring the equilibrium of the environment (Tapsell, 2021). Upholding the value of tapu practically ensured the ecological sustainability of natural resources for future generations, such as consuming only what was needed or giving time for natural resources to replenish. Rāhui was a strategy to maintain tapu, restricting access to specific areas or resources until the tapu was lifted. In the *Nekenekehia i te Taiao*, tapu serves as an approach for sustaining natural resources, with rāhui applied to areas until resources are restored.

## Noa

Noa, in its simplest form, can be interpreted as an ordinary, unrestricted, or balanced state (Duncan & Rewi, 2018). For noa to be applied, tapu must be understood. The process of whakanoa, or making ordinary, removes the tapu, often achieved through rituals involving food (whāngai hau), water (whakahoro) and prayer (karakia) (Mead, 2016). Together, noa and tapu, along with other values, maintain the environment's and community's well-being by asserting balance.

The *Nekenekehia i te Taiao* recognises the complementary values of noa and tapu, which help to protect the environment and its resources, which in turn look after tangata. These dual values work together to maintain a balance of energy systems. Today, they guide practices such as restricting the use of natural resources to allow for replenishment and provide a framework for respecting the natural environment. The model also acknowledges the importance of tapu and noa as foundational components of kaitiakitanga, influencing Māori beliefs and practices through tikanga still carried out today.

There are examples of Māori communities working with scientists at a regional level. This includes Porirua's Takapūwāhia community and scientists from It's our fault to map

exposure to natural hazards to use information to protect people and property from future weather events (Natural Hazards Commission, 2024). Another example is the Kura Whenua project with Ngāti Kahungunu iwi in Hawke's Bay and GNS scientists working together regarding geological hazards and impacts of climate change (Rerekua, 2015). Ngāti Kahungunu is sharing their tribal mātauranga with GNS and vice versa. These groups are focused on a particular area where there is evidence of the effects of climate change are starting to appear.

## Mātauranga and Western Science

Mātauranga is a broad term and generally means Māori knowledge or ancestral knowledge, which is a body of knowledge originating from Māori ancestors that was developed over centuries (Mead, 2022). Traditionally, mātauranga was understood as kōrero, tuku iho, pūrākau and wānanga (Matamaua, 2021). In modern contexts, the term mātauranga has evolved and often refers to ways of knowing (Mead, 2022). According to Matamua (2021), mātauranga is more than a knowledge system; it embodies living knowledge applied practically in daily life. It represents not only knowledge but also a value system and whakapapa (kinship), providing Māori with a lens to understand and engage with the world.

Mātauranga can differ from each kāinga catchment that has been developed in accordance with its surroundings and passed down through generations (Tapsell, 2021). However, much mātauranga has been lost due to colonisation, urbanisation, economic challenges on ancestral whenua, and the separation of tangata from whenua, which is a rich source of customary knowledge (Tapsell, 2021). The knowledge that remains today continues to shape Māori interactions with their surroundings and is still applied in contemporary contexts.

Mātauranga and Western science differ significantly. Tapsell (2021) explains that "Western science, in contrast, assembles knowledge from a position of detached objectivity and tests hypotheses through a process of reduction and elimination, down to constituent parts, which are studied in controlled isolation until results are deduced and solutions proposed" (p. 46). Additionally, Western science stems from academic and literary transmission, whereas Indigenous knowledge (e.g., mātauranga) was orally transferred from one generation to the next. Furthermore, Western science often detaches its subjects from the vital context, placing them in a controlled environment, while Indigenous knowledge is shaped by the context and local circumstances in which it is developed (Nakasima & Rouē, 2022). In relation to mātauranga, a major difference with Western science is that whakapapa underpins mātauranga (Broughton et al., 2015). Despite these differences, both systems are valid in its own right.

The *Nekenekehia i te Taiao* acknowledges that mātauranga alone can not address climate adaptation and that Western science and technologies are also essential. Both

knowledge systems offer valuable solutions and responses to climate change. When these systems intersect on the continuum within this model, they merge and can be applied practically. As Mercier reinforces that Western science and mātauranga Māori draw from different knowledge bases but have practical benefits for contemporary problems (in Muru-Lanning, 2022). However, for Māori groups, drawing on mātauranga may be challenging due to its loss over time. Nevertheless, Māori responses to climate change should be rooted in mātauranga while also incorporating Western science and technology. Despite potential conflicts between the two, climate strategies can integrate both customary mātauranga and modern knowledge, allowing them to work in harmony and better equip Māori to adapt to a rapidly changing climate.

## Implementing the Nekenekehia i te Taiao Model

The *Nekenekehia i te Taiao* model guides Māori groups to adapt to climate change, beginning with the group initiating the process. This approach ensures that the group is prepared, empowered and in control of addressing climate issues. The group can decide when, where and how the hui will be carried out. The steps in this model are continuous and may require revisiting. The five steps are:

1. Moemoeā (Vision)
2. Angawā (Time frames/climate risks)
3. Kōwhiringa (Options)
4. Tukanga (Path)
5. Arotakenga (Reflect)

| Steps | Description of the Steps |
|---|---|
| 1. Moemoeā | Moemoea can be classified as a vision. The group defines its moemoeā and sets objectives. This can be achieved by brainstorming ideas about what they hope to achieve regarding climate adaptation. From these ideas, they can formulate a moemoeā (vision). This may be achieved through hui (e.g., either in person or via Zoom). Zoom could be an option for descendants who live away from their ancestral land. The group may also explore values that are important to them, objectives they want to achieve and/or identify priority areas.<br><br>This step aligns with the values of rangatiratanga, tikanga and kaitiakitanga, allowing the group to define their own vision, interests, and aspirations, particularly regarding the protection or restoration of land. This step empowers the group to control and manage the adaptation process. The groups' aspirations may reflect the hopes their ancestors envisioned for future generations. Additionally, the |

values ira tangata and ira atua are relevant as the group balances the needs of the environment with those of the people.

2. Angawā

Angawā can be translated as timeframe, encompassing both the time needed to complete the process and the timeframes related to climate risks. This step involves assessing risks by drawing on both Western science and mātauranga, considering past, present and future climate change impacts on the people, land, significant sites, businesses, property and infrastructure. The group could create a list of risks, evaluating them as low, medium, or high. Additionally, current weather and climate effects, extreme weather events, and past responses to varying conditions should be examined.

The value of rangatiratanga is integral to this step, as the group determines the timeframe for the entire process, as well as establishing a realistic timeline to achieve their goals. In assessing climate risks, this links to the values of mātauranga and Western science. Mātauranga may include tohu (Māori environmental indicators) to predict local weather and climate conditions, such as the early blooming of plants and trees, which signal changes. In contrast, Western science may include climate risk assessments, such as those by NIWA or technological tools like NZ SeaRise, which models sea level rise over time.

3. Kōwhiringa

Kōwhiringa refers to options. The group evaluates potential solutions to address risks, considering factors such as costs, resources, feasibility, expert knowledge, practices and new opportunities. These options may be short or long-term, with the key question being whether they align with the group's vision or objectives. Early warning signs, such as flooding and droughts, could be considered. After discussing options, the group selects the most suitable option for implementation.

This step incorporates the values of mauri, mātauranga and Western science, noa and tapu, ira tangata and ira whenua. The group evaluates options by considering the impact on the mauri of the entity, adopting a holistic view that examines the cause-and-effect relationships between its components and seeks a balanced system. If achieving a balanced state proves challenging, the group assesses the best approach by weighing various factors. Mātauranga and Western science may be drawn upon to create options, which could include sustainable practices informed by tapu and noa, such as placing rāhui on areas to allow resources to replenish. Once tapu has facilitated

growth, noa can be applied, with further restrictions as needed, to ensure sustainability. The values of ira tangata and ira atua are connected to mauri, and the group's option should consider both environmental and community benefits. Focusing solely on human benefit, without regard for environmental impact would disrupt the mauri, causing it to become imbalanced.

4. Tukanga

Tukanga refers to a path encompassing a course of action. In this stage, the group implements the chosen option to meet their objectives, outlining the necessary steps such as costs, actions, support required and potential barriers. The group may develop a plan to guide the selected path.

Step Four draws on all the values, including rangatiratanga, tikanga, kaitiakitanga, mana, and manaakitanga, ensuring the pathway chosen protects the environment and that the mauri remains balanced. It also considers the balance between ira tangata and ira whenua, such as preventing the exploitation of the environment. Tapu and noa are reflected in sustainable practices and long-term impacts within the action plan. The integration of mātauranga and Western science supports the sustainable management and care of natural resources and ecosystems.

5. Arotakenga

Arotakenga, meaning reflection, involves the group evaluating the plan or path, assessing what worked, what did not work and the reasons behind these outcomes. The group considers the success of actions and identifies areas for improvement. If the current pathway is ineffective, alternative options may be explored.

Step Five aligns with the values of rangatiratanga, kaitiakitanga and manaakitanga, granting the group the authority to manage, protect and care for their lands. By following these steps, the group takes ownership and control of the process. These values reflect the group's capacity to establish their own climate-based solutions and assess their success. The group may evaluate their own mana by considering whether their decisions and actions enhanced or diminished the mana of the natural resources.

## Conclusion

Climate change presents a significant and accelerating global challenge that impacts various aspects of life, particularly for vulnerable groups such as Māori in Aotearoa, New Zealand. While mitigating greenhouse gas emissions is vital, adaptation strategies are crucial for reducing the risks and addressing the current and future impacts of climate

change. Māori are especially vulnerable due to historical, socio-economic, and cultural factors, including their deep spiritual and cultural connections to the land. Despite this, Māori possess valuable customary knowledge and practices that can guide effective climate-adaptation models tailored to their unique needs and contexts. The *Nekenekehia i te Taiao* model addresses the gap in the literature regarding climate adaptation models to assist Māori groups. This model emphasises a Māori worldview, reinforcing their connection to the environment. Māori customary values, beliefs, and practices provide valuable insights and strategies in addressing climate change. When vulnerable groups like Māori lead these processes, it fosters empowerment, leverages localised knowledge, enhances resilience, and promotes equity and sustainable solutions.

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## Glossary

Ahi Kā – continuous occupation of land by a group, burning fires of occupation

Ahuwhenua – land management trust, established under Te Ture Whenua Māori 1993

Angawā – timeframe

Aotearoa – the Māori name for New Zealand

Arotakenga – assessment, evaluation

Atua – an ancestor with continuing influence, a supernatural being, a god, a deity

Hapū – kinship group, clan, clan group, subtribe, key corporate group to which Māori belong

Ira atua – supernatural life, spiritual presence, spirit element, of godly essence

Ira tangata – of human essence, spark of life, practical element, human element, human genes

Iwi – tribe entity, extended kinship group, a large group of people descended from a common ancestor

Kāinga – kin community, marae community, tribal marae, settlement, village

Kaitiakitanga – guardianship, stewardship, trusteeship and protection of the environment, socio-environmental ethics of guardianship

Karakia – ritual chant, formulaic change accompanying ritual act addressed to the atua that uses archaic language, referring to the works inherited from the ancestors

Kōrero – talk, discussion, conversation, discourse, narrative, information

Kōwhiringa – option/path

Mana – authority, power, control, spiritual power, spiritual authority, influence, identity, prestige

Mana Atua – to live within the realms of a supreme power, divine authority, which within kaitiakitanga takes place

Manaaki – to support, respect and care, protect, hospitality, kinship bonds, inclusively

Manaakitanga – the process of showing respect, hospitality, love and care between people, duties of care and consideration of others

Marae – a complex social space at the centre of a Māori pā-kāinga, the open area in front of the wharenui and associated complex of buildings around the marae

Mauri – life force, life principle, material symbol of a life principle, such as a stone

Moemoea – vision, dream, goal

Mangōpare – hammerhead shark

Māori – Indigenous people of New Zealand, indigenous person, aboriginal inhabitant

Mātauranga – Māori knowledge, body of Māori knowledge, originating from the ancestors

Noa – unrestricted, ordinary, neutral state that is mundane, everyday and has a lesser degree of restriction

Papakāinga – home base, communal Māori land area, marae community, villages, i.e., the physical place

Papatūānuku – Earth mother

Porowhita – circle, to be circular, round

Rāhui – place a temporary ritual prohibition, a spiritual belief pertaining to restriction or prohibition; a ritual prohibition or ban over an area, either to conserve local resources or to deter access for particular reasons

Rangatira – chief, a person of high rank, leader, kin leader

Rangatiratanga – chieftainship, right to exercise authority, leadership, independent sense of leadership

Ranginui – Sky father

Taiao – world, earth, natural world

Tāne Mahuta – god of the forest and all forest creatures

Tangata whenua – Indigenous people of the land, people of the land, host people

Taonga – ancestral treasure, natural resources, or anything highly prized in Māori culture

Tapū – being under the influence of an atua, being sacred, spiritual belief pertaining to restriction and prohibition

Te Ao Māori – the Māori world, a Māori worldview

Te Ao Marama – the world of the living

Te Kore – the realm of potential being, the void

Te Tiriti o Waitangi – Māori name of the Treaty of Waitangi

Te Pō – the dark night, the perpetual night, darkness, underworld, potentiality

Tikanga – correct procedures or customs, protocols, customary practices, the right way to do things

Tukanga – process, method, procedures, course of action

Whakanoa – to remove sacredness (tapu), the ability of certain beings, behaviours or objects to render tapu objects and contexts

Whakapapa – genealogy, kinship connection, genealogical layering, practice and belief

Whānau – family group including extended family, to give birth, be born

Whanaungatanga – human relationships, kinship, sense of family connection

Whenua – land, territory, placenta of a child