



Looking backwards to move forwards: insights for climate change adaptation from historical Māori relocation due to natural hazards in Aotearoa New Zealand

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Abstract

Climate change relocation of Indigenous communities is increasing globally. For Māori (the Indigenous peoples of Aotearoa New Zealand), many pā (complexes of significant structures) are at risk to climate change impacts with relocation as one potential adaptation option. For Indigenous peoples, this step is not taken lightly, as connection to place is imperative. The aim of this research is to highlight some histories of Māori communities relocating in response to natural hazards, providing insights from the past to help plan for future adaptation. To do this, we undertook a national-scale textual analysis and identified 51 examples of pā relocating in response to natural hazards since pre-1840. We then focused on a case study with members of two iwi (tribes), who relocated following the 1886 eruption of Mount Tarawera to identify enablers and barriers to relocation, and to draw insights to assist with Māori-led responses to climate change adaptation. We found that key enablers of relocation included whānau (family)-level decision-making, cultural norms of awhi (support), whanaungatanga (relationships), whakapapa (genealogical connection), koha (donation), tuku whenua (gifts of land), and mātauranga Māori (Māori knowledge). In summary, Māori and other Indigenous peoples have rich histories of relocations, utilising their own Indigenous knowledge, local implementation, and adaptability to natural hazards that can be implemented in our modern context.

Keywords Managed retreat · Planned relocation · Natural hazards · Māori pā · Mātauranga Māori · Climate justice

Glossary common Māori kupu (words) used in this paper

Māori	Indigenous peoples of Aotearoa New Zealand
Marae	Māori meeting grounds
Pā	Broad encompassing term for complex of Māori structures and places important to Māori
Kaupapa Māori	Māori research methodology
Hapū	Subtribe
Whakapapa	Genealogical connection
Aotearoa	Māori word for New Zealand
Whānau	Close and extended family
Iwi	Tribe
Marae	Complex of buildings
Wāhi tapu	Sacred site/place
Te Ao Māori	Māori worldview
Kai	Food
Whakataukī	Māori proverb
Te Tiriti o Waitangi	Treaty of Waitangi

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Haukāinga	Home people
Kōrero	Prose/discussion
Whanaungatanga	Relationships/connections
Awahi	To support or embrace
Koha	Gift or donation
Mana	Authority
Tikanga	Protocols/the right thing to do
Mauri	Lifeforce
Mātauranga Māori	Māori traditional knowledge

Introduction

Climate change is increasing the frequency and severity of many natural hazards, including wildfires, droughts, and extreme weather events, inducing erosion and flooding (IPCC 2022; Van Aalst 2006). Many Indigenous communities are already experiencing (and adapting to) the impacts of climate change (Ford et al. 2020; Wildcat 2014). This includes in the North American Arctic, where Indigenous communities are losing land to melting permafrost, erosion, and flooding (Bronen 2010, 2015; Ford et al. 2008; Maldonado et al. 2013). The community of Isle de Jean Charles, LA, USA, including members of the Biloxi-Chitimacha-Choctaw tribe, face increased coastal flooding due to sea level rise (Simms et al. 2021). In the Pacific Islands, the Indigenous peoples of the Solomon Islands (Albert et al. 2018), Tuvalu (Farbotko & Lazrus 2012), Kiribati (Allgood & McNamara 2017; Storey & Hunter 2010), Fiji (McNamara & Des Combes 2015; Piggott-McKellar et al. 2019), and Torres Strait (McNamara et al. 2021; McNamara et al. 2017) all face sea level rise induced erosion and flooding.

Indigenous communities are generally considered more vulnerable to climate change due to factors including dependence on natural subsistence systems, elevated exposure (such as due to being situated on hazardous marginal land), and reduced ability for traditional seasonal movements due to colonisation (McEvoy & Mitchell 2019; Newton et al. 2005). Indigenous communities also have histories of marginalisation, lower socioeconomic opportunities, lack of resources, poorer health outcomes, and lack of contextually specific adaptation information, alongside continuing to suffer the ongoing intergenerational impacts of colonisation (Ford et al. 2020; Maldonado et al. 2013; Whyte 2017). Contemporary relocation is complicated by other colonial legacies including insufficient access to sustainable land (Fayazi et al. 2020), tribal land ownership (Whyte 2016), land tenure issues (McEvoy et al. 2020), and individual property rights (Hanna et al. 2022). Lastly, relocation for Indigenous peoples can result in loss of cultural heritage, identity, and Indigenous knowledges (Bronen & Cochran 2021; Whyte 2016).

There are, however, many lessons from the past and present highlighting the knowledge, strength, and adaptability of Indigenous peoples who have adapted to environmental changes for millennia (McNamara & Westoby 2011; Petzold et al. 2020). There are rich histories of community-level mobility in tune with the natural world and surrounding environment (Barnett & McMichael 2018; Bronen et al. 2020; Whyte et al. 2019). Elders tell stories of how relocations have occurred in response to natural hazards, and, if these are identified, collated, and their decision-making processes identified, these examples hold potential in informing contemporary policy on Indigenous adaptation, helping position Indigenous people as active responders rather than victims (Cochran et al. 2013).

In Aotearoa New Zealand (hereafter, Aotearoa), many Māori (Indigenous peoples of Aotearoa) communities are disproportionately at risk to climate change, particularly in coastal areas, as water is important as a resource and for cultural identity and traditions (Ruru 2013). Climate change is impacting upon Māori infrastructure (Bailey-Winiata 2021), economy (Awatere et al. 2021; King et al. 2010), and health (Jones et al. 2014) and alters traditional understandings of the environment (McMurdo Hamilton et al. 2021). New national legislation for planning for climate change is also being devised (Ministry for the Environment 2022), while many recent extreme flooding events continue to impact Māori communities (Desmarais 2023). Nationally and globally, there is much more that needs to be understood (and applied) of how adaptation should consider issues surrounding land governance, land rights, legal, and ethical considerations of relocated individuals and communities. For Indigenous communities adapting to climate change and associated legislation risks perpetuating colonisation for Indigenous people, termed by Whyte (2016) as the “colonial *déjà vu*”. As such, it is crucial that policy development for climate change adaptation draws on Indigenous knowledge and perspectives on decision-making within its frameworks.

This research aims to look backwards to contribute to the contemporary agenda of climate change adaptation by and for Indigenous peoples. The objectives are threefold: (1) to produce the first national dataset of previous relocations of Māori *pā* relocating in response to natural hazards (where *pā* is a broad term for the complex of Māori structures, places, and people, important to Māori culture and identity); (2) to explore an example within this dataset to ascertain enablers and barriers to relocation; and (3) to highlight insights that can help inform Māori-led relocation in response to current climate change adaptation planning and policy discussions. The case study relates to the *iwi* (tribes) of Tūhourangi and Ngāti Rangitihi following the 1886 eruption of Mount Tarawera. This research contributes to the growing international body of work on Indigenous adaptation to climate change. A key reason for this work is to gather stories of

what many Māori already know, but this dataset emphasises there are many more yet to tell. We wish to highlight the strength and resilience and bring together some ideas of ways forward to contribute to the narrative of power and self-determination of Māori and all Indigenous peoples.

National context of Aotearoa

Natural hazardscape

Aotearoa is surrounded by Te Moana nui a Kiwa (Pacific Ocean), Te Moana Tāpokopoko a Tāwhaki (Southern Ocean), and Te Tai o Rehua (Tasman Sea) (Figure 1), and is situated along an active geological plate boundary, subjecting the country to frequent natural hazards, extreme

hydro-meteorological events, and large-scale global climate cycles (Glavovic et al. 2010; Godoi et al. 2018; ODESC 2007). Climate change and sea level rise will amplify many of these hazards (Bodeker et al. 2022).

Legislative context

In February 2021, Aotearoa's Ministry for the Environment (2022) announced plans for a new Climate Change Adaptation Act (CCA) to address complex issues associated with financing managed retreat. Managed retreat involves the managed relocation of people and infrastructure away from hazardous locations and can be pre-emptive or in reaction to natural hazard events (Lawrence et al. 2020; Siders & Ajibade 2021). In Aotearoa, managed retreats have previously occurred, but without a clear legislative framework

Fig. 1 A Te Ao Māori view of Aotearoa New Zealand, which is “upside down” compared to conventional maps. Here the North Island is Te Ika a Maui (The fish of Maui). The South Island is Te Waka a Maui (the canoe of Maui) (Hikuroa 2020; Ka'ai and Higgins 2004) (Data source: New Zealand 10-m Satellite Imagery (2021–2022) & GEBCO Gridded Bathymetry (2020))



resulting in isolated policy experiments unable to respond to the diverse needs of communities (Hanna et al. 2022). The proposed CCA acknowledges the need to weave a “by-Māori-for-Māori approach” into legislation alongside typical science and government-led processes (Dexter 2023). This research, therefore, is timely and situated in the direct context of these debates.

Māori and Pā

Māori and the Moriori (of Rēkohu/Wharekauri) are the Indigenous peoples of Aotearoa, arriving in the thirteenth and fourteenth centuries from Hawaiki in French Polynesia (McConnell et al. 2021; McWethy et al. 2010). Māori kinship social structures stem from whānau (family), hapū (related whānau), and iwi (related hapū) (Reilly 2004; Winiata 1956). Māori hapū can be focussed in settlements termed pā, many of which are situated near water bodies as waterways provide resources, transport, and trade and the use of wai (water) in many traditional practices (Bailey-Winiata et al. 2022). The centre of pā is often a marae complex, which are ancestral Māori meeting grounds. At the centre of marae is the wharenuī (meeting house) where the structure physically and metaphorically is an ancestor of the hapū (Skinner 2016).

Pā connect past, present, and future generations in whakapapa (Rameka 2016). Whakapapa is a grounding force and genealogical link throughout time and connects people to each other and to the environment (Forster 2019). A kin-centric connection to the natural environment is also present in many other Indigenous cultures, such as in Tahiti (Maric 2016) and Australia (Kearney et al. 2019). However, many of these environmental relationships are at risk with climate change, and adaptation needs to provide for these connections.

Methods

Textual analysis

The research framework is underpinned by the whakataukī “He whakatōmuri te haere whakamua—I walk backwards into the future with my eyes fixed on my past” (Rameka 2016). A mixed methods approach incorporating a textual analysis was used to identify historical examples of pā relocating in response to natural hazards in Aotearoa. This was complemented with a thematic analysis of semi-structured interviews. For the textual analysis, we draw from the methods of Grace-McCaskey et al. (2021) and Tubridy et al. (2021), and our textual analysis includes both primary (e.g. original material) and secondary sources (e.g. subsequent material created from the primary sources) (Brundage

2017). Primary sources include Te Tiriti o Waitangi—Treaty of Waitangi Settlement documents (“Te Tiriti o Waitangi—Treaty of Waitangi Settlement documents” section), and Aotearoa-produced media available on Pressreader (“Pressreader” section), and secondary sources include Google search of Māori maps (“Māori maps” section), Google search of pā relocation (“Google search engine” section), and oral conversations (“Oral conversations” section).

In the textual analysis, three sets of keywords were searched relating to (1) pā, (2) natural hazards, and (3) managed retreat/relocation (see Supplementary 1). Pā is a collective term to describe Māori settlements, the people (hapū and iwi), and individual culturally significant sites such as marae. Furthermore, keywords regarding natural hazards were sought from “The Natural Hazardscape report” ODESC (2007), which is a non-statutory document aimed to inform hazard managers about the frequency, management, and occurrence of 17 key hazards for Aotearoa. Lastly, keywords relating to managed retreat/relocation were sought from Hanna et al. (2017), where a textual analysis was conducted to understand the different terminology used in relevant policy documents in Aotearoa.

Te Tiriti o Waitangi—Treaty of Waitangi Settlement documents

Te Tiriti o Waitangi—The Treaty of Waitangi (Te Tiriti) is a foundational document of Aotearoa New Zealand, signed in 1840, by Māori Rangatira (leaders) and British Crown (Crown) representatives (Orange 2020). Te Tiriti outlined the relationship between Māori and the Crown, with dominant principles of partnership, participation, and protection (Orange 2020). Te Tiriti has an English and a Māori version; however during translation, the gravity of the terms and conditions that Rangatira were agreeing to was not accurately conveyed, such as land ownership and sovereignty (Stokes 1992). In 1975, The Treaty of Waitangi Act was passed, and the Waitangi Tribunal was established to provide a mechanism where Māori who were disadvantaged by legislation or policy imposed by the Crown were able to seek redress. This study investigated historical not contemporary claims, as the tribunal only began reviewing these claims since 2020 (Ministry of Justice 2021). Historical claims total 87 documents. To search Te Tiriti settlement documents for pā relocations, a query in NVivo software was used to search for keywords.

Pressreader

Pressreader is a subscription-based online media platform accessing thousands of magazines and newspapers around the globe (Canuel et al. 2017). It is commonly utilised to identify articles and other written media with certain keywords (Fish 2020). This study utilised all publications produced and published in Aotearoa and only those written in

English. Using the advanced search in Pressreader, all keywords were searched.

Māori maps

The keywords were searched in the Māori Maps online database of marae locations (Te Potiki National Trust 2011). Within Māori Maps, histories of each marae were searched, which sometimes contained historical accounts of some form of relocation. Similar to research on climate change perceptions by Hayes and O'Neill (2021) and Walter et al. (2018), we utilised the Google site search, using the “site” query in the Google search engine with Māori maps as the site, then searched the website for keywords (Google Developers 2022).

Google search engine

Drawing on the methods of Ford et al. (2015) and Mbah et al. (2021) who identified relevant grey literature for their systematic reviews regarding adaptation of Indigenous peoples to climate change. The Google search engine was used to identify further examples of pā relocation in response to natural hazards that may have been missed by the above methods. A combination of media articles (10) and grey literature (5) was found.

Oral conversations

Oral communication is a key method of knowledge transfer within many Indigenous communities (Amare & Gacheno 2021), including Māori (King et al. 2018; Mercier et al. 2011). Only some aspects of oral information may be included in the textual analysis documents described above, such as quotes of oral accounts. Through oral conversations with other researchers, hapū and iwi members, and fellow students, further examples of pā relocating in the past surfaced. These examples were searched using the name of the pā, through the Google search engine to identify documentation for all cases mentioned.

Process for conducting kōrero with Tūhourangi and Ngāti Rangitihi

The case study of the relocation of Tūhourangi and Ngāti Rangitihi following the 1886 Mount Tarawera eruption is one of the most well-known cases of Māori relocation to a natural hazard. The lead author of this paper has whakapapa to Tūhourangi which benefits the research by the ability to facilitate informative discussions due to understanding of cultural norms and whānau connections, which is a key aspect (albeit not essential) of kaupapa Māori research theory (Smith 2012). This research incorporates aspects of

kaupapa Māori research theory to comprehend the inter-generational memory of the Tarawera eruption. Kaupapa Māori is a philosophy that guides research by Māori for Māori, delivering on emancipatory and empowerment outcomes (Smith 2012; Walker et al. 2006). Kaupapa Māori research has five key principles for ethical research outlined by Walker et al. (2006):

1. **Tino rangatiratanga:** self-determination over the research, with a Māori-centred agenda (Henry & Pene 2001; Pihama et al. 2002).
2. **Social justice:** redress of the power imbalance in research and build the capability and capacity of the current and next generation (Eketone 2008; Smith 2012).
3. **Te ao Māori worldview:** a Māori lens shapes a research project differently to western research, allowing for inclusion of Māori concepts (Bishop 1999; Walsh-Tapiata 2003).
4. **Te reo Māori:** conducting interviews or engagements in te reo Māori is beneficial to conduct kaupapa Māori research (albeit not essential) as it creates connections and enables deeper understanding to cultural concepts or texts (Powick 2003).
5. **Whānau:** collective view of the research team and the participants as whānau. This enables whakawhanaungatanga (process of establishing relationships) as well as a shared vision of the research outcomes (Bishop 1995).

In our research, whakawhanaungatanga and whānau were at the centre of the interview process, from the whakapapa of the main author, to whānau directing us to important people to approach to interview, through to the interactions before, during, and after the interviews. In line with positive outcomes for Māori, this research showcases the resilience and adaptability of Māori to natural hazards to help support and empower Māori to protect their pā in the face of climate change. In line with whanaungatanga (relationships or family connection) and Māori values, for each participant, there was an initial, unstructured kōrero about the reasons for the work, before a formal interview took place. This occurred in a combination of in person, including sharing of kai (food), as well as over the phone or via zoom, depending on the preference of participants. Kōrero were then conducted at a later date.

Kōrero involved inverting the roles of “researcher” and “participant” leading to more open and honest dialogue (Bishop & Glynn 1999). The kōrero were audio recorded (with permission) and transcribed, in line with human research ethics approval through the University of Waikato (HREC(HECS)2022#02). Interviews were conducted in English over the course of 1–2 h. Participants are not named and denoted as participants 1, 2, 3, and 4. These four knowledge holders are those we were directed to by our whānau

as key knowledge holders of the history. The kōrero were guided but not limited to the interview questions with data transcribed and analysed for key themes and enablers for the relocation process, for interview questions, see Supplementary 1.

Given the time passed since the Tarawera eruption, the kōrero shared can be defined as oral traditions, which is information passed down to the informant regarding recent and distant past events (not to be confused with oral histories which relate to events within the lifetime of the informant) (Mahuika 2019; Tau et al. 2008). Mahuika (2019) posits that both oral traditions and histories are ongoing narratives rather than just ancient tales, which evolve and recontextualise for new environments or generations and serve as foundational narratives that embody cultural values, world views, and histories.

Māori and Indigenous data sovereignty principles

The information identified in the national-scale textual analysis and shared by participants is mātauranga (Māori knowledge) which is a taonga (treasure) (King et al. 2020; Mead 2003). At the national scale, because publicly available textual sources were used, there is no connection between us as “researchers” and the hapū and iwi of the pā. However, we are not exempt from being ethically aware of the issues and exploitation of Indigenous and particularly Māori data (Kukutai et al. 2020). To mitigate these impacts, we have (1) included only previously published examples; (2) only disclosed non-identifiable information such as pā type, type of relocation, and regional location not exact location; and (3) kept analysis at a national scale to avoid revealing specific locations. For the kōrero, the ownership of the mātauranga shared remains with those who shared it. This mātauranga was treated with the upmost care, and all participants have viewed and approved this work prior to submission. We also highlight that the perspectives shared by the participants are their own and not representative of views of all hapū and iwi members or all Māori.

Results and discussion

National examples of Māori relocation

The textual analysis identified 51 cases of pā relocation, including seven that have relocated more than once. Twenty-four of these cases were identified from oral conversations; 15 from Google search engine; three from Te Tiriti settlement documents; five from Māori maps; and four from Pressreader. The timeline of these cases date pre-colonisation (pre-1840) to present day (Figure 2a). There were 38 completed pā relocations, 11 pā where discussion to relocate

occurred but with no imminent plans to relocate, and two pā that have planned to relocate at some stage but progress is unknown to us.

There was a wide range of natural hazards driving these pā relocations (Figure 2b), including 17 due to flooding, 11 due to tsunami, eight due to erosion, three due to flooding and erosion combined, two due to volcanic eruptions, one from a landslide, one due to subsidence, one due to an earthquake, and seven with unknown natural hazard causes (Figure 2b). For the flooding category (Figure 2c), seven were due to riverine flooding, four due to coastal flooding, four undefined, and two due to high rainfall (with an undefined location) (Figure 2c). Furthermore, those that were caused by erosion included three due to coastal erosion, two due to riverine erosion, one due to coastal and riverine combined, one due to high rainfall, and one undefined. For examples where a combination of flooding and erosion induced relocation, there were three coastal cases (Figure 2c). In addition, the textual analysis identified six cases of pā relocating in response to government acquisitions of land and two relocating to be nearer to urban infrastructure, which are excluded from analysis.

Tsunami caused 11 individual pā to relocate, all prior to colonisation, except for one case in 1840–1900. The tsunami were from local and distant sources, with some causing great devastation beyond Aotearoa, such as the 1868 AD Chilean Tsunami that originated from the magnitude 9 Arica earthquake, with damaging tsunami waves throughout the Pacific region (Lomnitz 2004). In Aotearoa, the physical impacts of this tsunami were greatest on the East coast of Aotearoa, and on Rēkohu (Chatham Islands) (Goff 2021; Thomas et al. 2020). The tsunami had run-up heights of up to 10 m and was able to move boulders of up to 500 kg (Goff & Chagué-Goff 2001). This tsunami destroyed a pā and European houses at Cape Pattison (Northwest section of Rēkohu), eventuating in relocation of the whānau away from the pā (Goff & Chagué-Goff 2001).

Another tsunami caused the relocation of a pā at Wairau Bar in the Marlborough region of Te Waipounamu (Figure 1). This pā is referred to by some as the first in Aotearoa and was occupied from 1300 AD (Higham et al. 1999; Jacomb et al. 2014). It relocated following a tsunami and was later reoccupied, evidenced by reworking of material in middens, although it is unclear how long after the tsunami this reoccupation occurred (King et al. 2017; McFadgen & Goff 2007). The return to the pā following this devastating event reflects the strong connection of Māori to their whenua (McFadgen & Goff 2007).

While most cases of pā relocation we found are coastal, there are also cases inland. For example, two landslide events occurred in 1846 and 1910, impacting Te Rapa pā located on the shores of Lake Taupō (Figure 1). These two events took the lives of around 50–70 people of Ngāti Tuwharetoa in

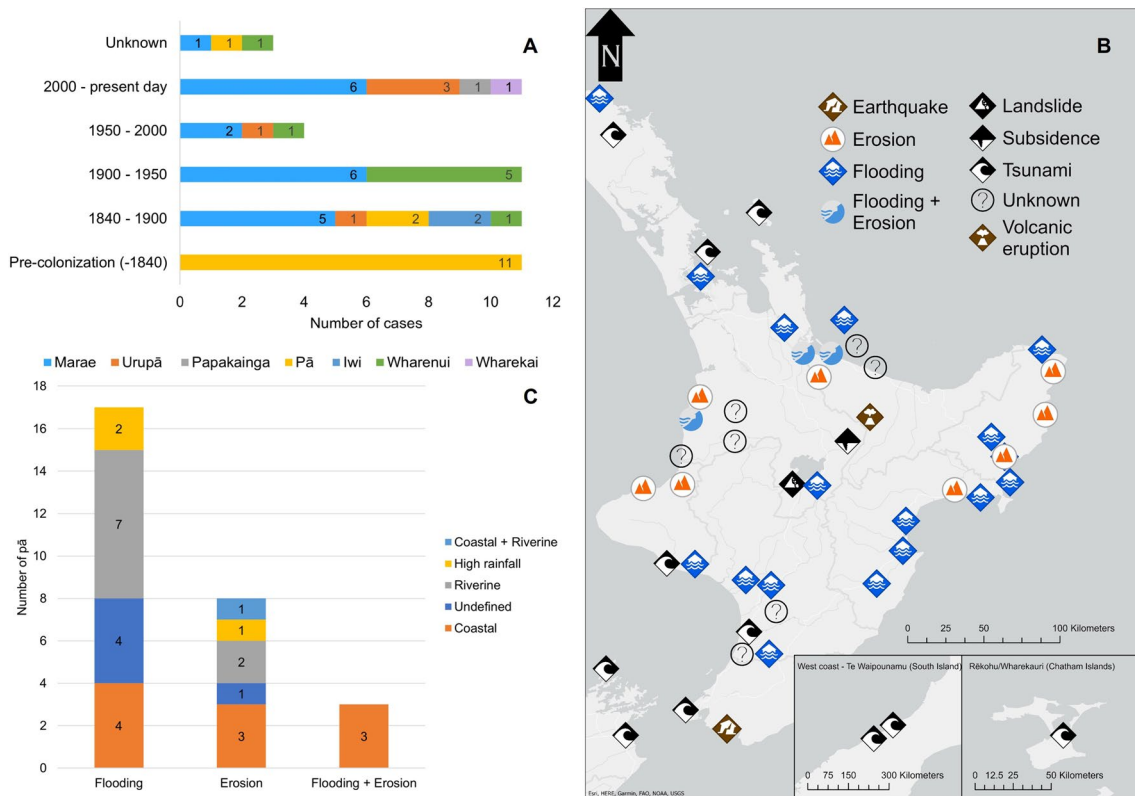


Fig. 2 (A) Timeline of pā relocating (completed or not); (B) national map of pā that have relocated (completed or not) in response to natural hazards; and (C) causes of pā relocation based on the origin of flooding, erosion, or both

1846 and one more life in 1910 (New Zealand Herald 1910). Both cases involved landslides and debris flows from the Waimatai Stream above the pā (Massey et al. 2009). There is also evidence of an earlier event at a nearby pā at the mouth of the Omoho Stream that was buried by another landslide in 1780 (Massey et al. 2009).

1886 Mount Tarawera Eruption—relocation of Tūhourangi and Ngāti Rangitihi pā

The hapū and iwi of Tūhourangi and Ngāti Rangitihi relocated following the 1886 eruption of Mount Tarawera. Tūhourangi and Ngāti Rangitihi are iwi of Te Arawa that arrived to Aotearoa on Te Arawa waka (canoe) around 1350 from Hawaiki (Stafford 2016; Tapsell 2005). After initially settling at Maketū in the Bay of Plenty (Figure 3a), Te Arawa spread throughout the region, particularly around the 18 lakes surrounding Rotorua (Stafford 2016). The second largest of these lakes is Lake Tarawera, 14 km Southeast of the city of Rotorua, 45 km South of Maketū (Figure 3a and 3b). In the early hours of the 10th of June 1886, a sudden basaltic eruption of Mount Tarawera occurred, burying the famous silica terraces Ōtūkapuarangi and Te Tarata (Pink and White terraces), which were deemed by some as the eighth natural

wonder of the world (Figure 3c and 3d) (Keam 2016). The eruption killed many Māori and non-Māori families, leading to ~150 fatalities (Keam 1988; Pene 2015). The Māori survivors evacuated the area and headed to Ōhinemutu at Rotorua, seeking refuge and shelter. Many of the displaced hapū and iwi were now landless, without kai, and without income because the prosperous tourist economy built around the now buried pink and white terraces was in disarray. Tūhourangi were offered lands by hapū and iwi near and far, such as in the Coromandel, at Ngāpuna, Whakarewarewa, and Matatā where Ngāti Rangitihi moved to live with their whānau that were already there (Pene 2015).

Through kōrero, four key themes of a relocation process arose including tuku whenua—land gifting; autonomy and decision-making; perspective on lands and infrastructure; and the relocation site.

Tuku whenua—land gifting

In the wake of the devastating 1886 Tarawera eruption, survivors were dispossessed of their whānau, lands and thriving tourist economy. These survivors were predominantly from the two hapū of Tūhourangi and Ngāti Rangitihi. Participant 1 noted “As far as Tarawera was concerned, that was

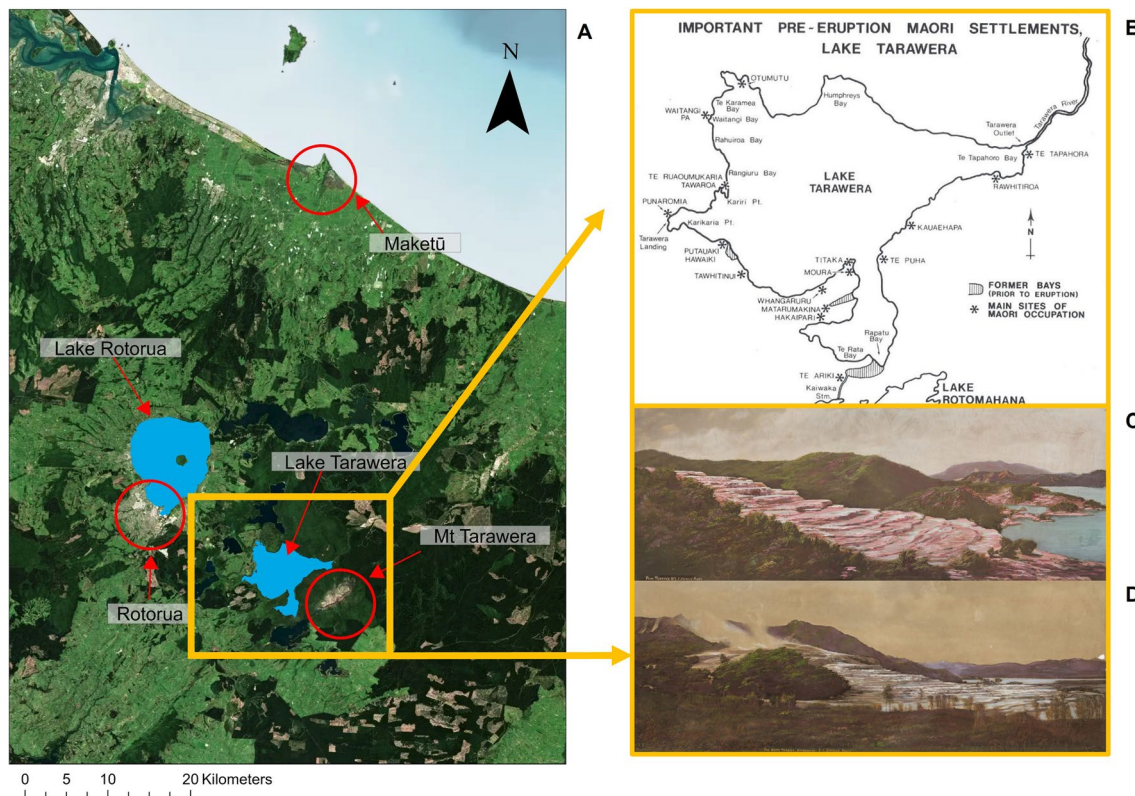


Fig. 3 (A) Geographical sites of importance to Te Arawa in the Bay of Plenty in the context of Tūhourangi and Ngāti Rangitīhi. (Data source: New Zealand 10-m Satellite Imagery (2021–2022) and GEBCO Gridded Bathymetry (2020)); (B) Locations of pre-eruption Māori settlements surrounding Lake Tarawera. Acknowledgement to the Don Stafford Collection. (C) Painting of Ōtūkapuarangi

(fountain of the clouded sky) or Pink Terrace, circa 1900, New Zealand, by Charles Spencer, Charles Spencer. Purchased 2013. Te Papa (O.041083); (D) Te Tarata (the tattooed rock) or The White Terrace, Rotomahana, circa 1900, New Zealand, by Charles Spencer, Charles Spencer. Purchased 2013. Te Papa (O.041082)

such a traumatic event... there was nothing to go back to". Returning to live at the site was not deemed favourable, as participant 2 noted "the land would have been treated like land where blood was shed during battle, the land was tapu to them". Tapu is a complex topic that can be defined as an object or a place being sacred, prohibited, or restricted (Moorfield 2023). The prominence of the trauma of the Tarawera eruption in intergenerational memory is reiterated by participant 1, who said "From as long as I can remember we all knew we came from Tarawera, but as kids we never knew where Tarawera was..., I'm talking about the 1950's ... That event was so traumatic that we were never going to go back".

Soon after the eruption, whānau, hapū and iwi with whakapapa to Ngāti Wāhiao, Ngāti Hurungaterangi, Tapuika, Ngāti Maru, and Ngāti Rangitīhi offered the two hapū to either come and settle with them (in the case of Ngāti Rangitīhi) or provided land to re-establish (in the case of Tūhourangi), often based on whakapapa. Tuku whenua is the customary process of gifting land between whānau, hapū, iwi, but it also occurred between Māori and Pākehā

in the nineteenth century (Healy 2009). Based on kōrero for this research and examples given in Pene (2015), there were at least 15 offers of land from around the country, from as far North as Hokianga (580 km away) and as far South as Taranaki (390 km away). Surviving hapū members settled in a range of places including:

- Whakarewarewa offered by Ngāti Wāhiao.
- Ngāpuna offered by Ngāti Hurungaterangi.
- Ōtūkawa (East of Te Puke) offered by Tapuika.
- Hauraki (Coromandel) offered by Ngāti Māru; and
- Matatā offered by Ngāti Rangitīhi.

Ngāti Rangitīhi also relocated post-eruption, by moving with whānau at the coast of Matatā, as mentioned by participant 3 who shared "Matatā would have been the place to be, trade and resources. Tarawera as it is now the mountains, pre-eruption, the focal point would have been the pink and white terraces, after the eruption they were destroyed, hence there wasn't a significant pull towards living at Tarawera".

Autonomy and decision-making

During the interviews, strong leadership and whānau-level decision-making shone through as powerful mechanisms of the relocation process. Decisions were made by whānau, for whānau, which ensured their best interests were protected. As participant 1 shared “At the time the event was so traumatic that perhaps thinking/processing the options that were given wasn’t a high priority, we’re lucky we survived... The other thing is that they had really strong leadership right from the word go. We are the ones that are left, and we must carry on... Anyone of that era would have been very pragmatic about it”. Participant 3 discussed how leadership at the whānau level helped decision-making, “Whānau were able to deal with the issues at hand, they dealt with them at the whānau level”.

Accompanying sound leadership, whanaungatanga and awhi (support) played an important role. Whanaungatanga is related to whakawhanaungatanga and whānau and which is a collective affiliation with roles and responsibilities to work together and support each other (McCarthy 1997; Moeke-Pickering 1996). Whanaungatanga accompanies awhi. Following the Tarawera eruption, these concepts were central to the post-relief effort for the survivors, participant 1 shared that “We had some whānau come to Ngāpuna at Ngāti Hinemihi and to Ngāti Tarāwhai. All our relations came to awhi us... even our whanaunga at Coromandel, they also came and showed awhi”.

Koha (donation or contribution) was a key enabler of successful relocation, where koha in a general sense is part of tikanga Māori (Māori ways of doing) in formal ceremonies and informally in everyday life such as hui (meetings) as a symbol of reciprocity. Koha can be in the form of food, a taonga such as a valuable cloak, ornament, or weapon, and today often money. Koha is traditionally offered with no expectations from those giving it, both the donor and the recipient recognise this gesture while both maintaining their respective mana (authority) and self-determination (Bishop and Glynn 1999). Participant 1 reflects: “Koha was a mixture of things, there were offers of land, but also resources, kai or even a place to sleep. Everybody moved over and made room for you”. One of the many gifts of land to Tūhourangi was from Ngāti Maru of the Hauraki and Coromandel regions. These offers are embedded in whakapapa, as Tamatekapua (Captain of Te Arawa waka) is buried at Moehau, a prominent mountain peak of the Coromandel Peninsula. This is reflected in kōrero from participant 1, who shared “Some of us went to Coromandel with Ngāti Maru ... that’s where Tamatekapua is buried as well as Hei. People from our canoe are buried there, we’ve got connections there, they are whānau”. In addition, whakapapa included that Uenukukopako (Son of Tūhourangi-Ancestor of Tūhourangi iwi)

married Taoitekura (Daughter of Marutūāhu-Ancestor of Ngāti Maru) (Pene 2015).

We can learn from these concepts and collective response heading into the future with increased climate change impacts, as participant 1 mentioned “The past is really how you deal with the future... I know that if we had something as bad as that again, we know that people would come offering bread, kai etc. different way of doing it now but the same support is there”. Reciprocity was important in relocation as it translated to generosity in the future as participant 3 mentioned “If we have to do that again I think it would lead to reciprocity, we would repay the favour. That happened with Tūhourangi with Coromandel... Generosity often leads to reciprocity. This cements relationships and people remember this stuff”.

It is clear from the relocations following the Tarawera eruption that mātauranga Māori (Māori knowledge) influenced actions and decision-making, as it still does today. For example, tohu, which are defined as signals or indicators, are important cues utilised by kaitiaki (guardians) and local people, varying from environmental changes, events, or processes, which are an aspect of mātauranga Māori (Paul-Burke et al. 2022). Regarding the Tarawera eruption, tohu were a key indicator of the impetus of an eruption occurring, for instance that shared by participant 1, “Rūaumoko (God of Earthquakes) is shaking, and we have to pay the price of not putting the baby to sleep properly... Te Pāea and some of the people of Tūhourangi saw a ghost waka, those were all tohu, so they knew something was up”. Being aware of these tohu can help with disaster preparedness and hazard management, which in a changing climate, is incredibly valuable.

Interviews highlighted that the A-frame marae near the eruption was a more resilient design compared to the lower pitched roofs of the European settler buildings. The A-frame roof allowed ash to runoff, reducing ash build-up, whereas the lower pitched roofs crumbled under the weight of the accumulated ash, as shared by participant 2 with regard to the marae Hinemihi “It was one of two marae that survived the eruption due to the A-frame engineering compared to the flatter European houses and hotels”. The extra protection offered by the A-frame aligns with the concept of making buildings and infrastructure more resilient to natural hazards and is a poignant example of how Māori developed extensive mātauranga in engineering and construction (Treadwell 2017), and how it can be influential to the decision-making process of adaptation to climate change.

Perspective on lands and infrastructure

Following the Tarawera eruption, a key way other hapū and iwi offered support to the displaced hapū was by gifting land. Land is highly valued in te ao Māori, where land is Papatūānuku (the Earth mother) to which Māori are linked

by whakapapa, not an asset as in western discourse (Moe-waka Barnes & McCreanor 2019). Thus, land was not (and is not) given lightly. However, following the Tarawera eruption, the tikanga (right thing to do) was to support Tūhourangi and Ngāti Rangitihi to recover from the tremendous loss they suffered. Tikanga was also followed when Tūhourangi returned the land at Coromandel back to Ngāti Maru in 1986, the centenary of the Tarawera eruption. Participant 4 describes this event: “I remember also when Tūhourangi gave the land back at Coromandel, that was 1986 as a 100-year celebration. The reasoning behind the gifting back of that land was that we weren’t there. And they would never presume to take back ownership, it was under the understanding that they have given it to us, they would never have objected. But it was the right thing to do. It also keeps everyone happy and strengthens the ties as well”. Land governance structures of the late nineteenth century meant no one person owned the land, as participant 1 shares “we never had a little spot that says that this naught .0000 [sic] belongs to this person or that person and his whānau”.

Today, land governance, land availability, and top-down approaches to adaptation are barriers that many communities face when trying to adapt to environmental changes, including by relocation. As Fayazi et al. (2020) noted in their case study of the Mohawk community of Kanasatake, Canada, the historical loss of land created tensions which still exist today between community and government. They posit a settlement is required to resolve these disputes; otherwise, they risk returning to the status quo with no advancement in adaptation. This is a common story globally and as participant 2 shared, a bittersweet reality “Inevitably, some whānau will have to give up some land as in history whānau have agreed to gift some land to establish a marae, land will have to be sacrificed”. In addition, as participant 3 posed the question about how relocation of a pā would work, they shared the concept of mauri (life force) that pā have, and that the physical relocation is the easy part, but maintaining or recreating the mauri is the challenge, they share: “There is an obligation of the crown to assist us in restoring the mauri. Now it’s almost like someone needs to be responsible if people have to be moved, for retaining/maintaining the mauri. It would be easier if you had a prior connection to the land you are moving to, but I don’t think that would be the case for many people, therefore, how to establish and create one. It’s all of those intangible values, I don’t think the physical relocation is much of a challenge at all, it’s the values”.

The challenges faced during the relocation process by the survivors of Tūhourangi and Ngāti Rangitihi were many. Relocating away from ancestral lands comes at a cost to physical and cultural wellbeing, which is still highly understudied in the literature (Feliipe Pérez & Tomaselli 2021). This is noted by participant 1 regarding sea level rise “Relocation will be sad. They will always regret having to leave

their papakāinga, papa is the earth and that’s our mother. We will always mourn the loss of it”. The decision was made to relocate to the Coromandel region, taking up the offer of land from Ngāti Maru. In the early twentieth century, those at Coromandel were invited back by Ngāti Wāhiao chief Mita Taupopoki to live at Whakarewarewa. In doing so, the koiwi (human remains) of Tūhourangi who died while living at Coromandel were exhumed and returned to Whakarewarewa where they were reinterred in the local urupā (Waaka 1982). Whakarewarewa is now identified as the kāinga (home) of Tūhourangi alongside their whānau and original occupiers, Ngāti Wāhiao, where they both remain to this day. However, as participant 2 commented “For the whole of both tribes, Tūhourangi and Ngāti Rangitihi there has been no resettlement back at Tarawera after the eruption. I only know of three Tūhourangi people who are living in houses up there”. When relocation was contextualised with climate change, participant 2 shared “Until you’re faced with the fact that your marae is impacted by climate change, you’ll put the relocation off as long as you can, for sentimental reasons... Until they can be shown the evidence that this is going to happen in the future, there is no impetus to start to do something revolutionary such as moving their marae”.

Relocation site

Having a relocation site that provides similar and plentiful resources, whakapapa, or opportunities for transformation supported Tūhourangi to relocate in the past and is relevant for future relocation. The awhi from whānau and the importance of keeping whānau together was an important objective of the relocation, as participant 1 mentioned “Had [sic] whānau at Rotorua at Whakarewarewa and they said come and stay...they also knew we could make a living, keep our families together”.

In addition, resources and having a sense of place is an important factor when relocation occurred for Tūhourangi, being able to call a place their own and to stand and belong is integral. This emphasises the move away from risk is not the end goal; for Indigenous people, it is just a step on a journey of forging a new relationship with whenua. For instance, participant 2 shared: “What’s clear for me is that we all yearn for a sense of place (Tūrangawaewae) which is a driving force for Ngāti Hinemihi. Ngāpuna where they settled is a stone’s throw from Whakarewarewa... However, we wanted our own place to stand”.

A key theme that also arose out of the kōrero was the concept of transformation and post-relocation relationships with land. Transformation is the dominant ideal in climate change adaptation discourse in that any form of adaptation should change the status quo and address social injustice (Siders et al. 2021). Transformative potential arose post-eruption for Tūhourangi at Coromandel, particularly gold mining and

the thriving industry of the nineteenth century, kauri gum digging, as emphasised by participant 4 “economic prosperity could possibly have helped determine where they moved to and what offer to take up on”. Conversely, Participant 1 stated “I actually think that it was whakapapa that drew them to the Coromandel, economics came second. I think at that time the push was so great to get away from Tarawera that they didn’t have time to think about the economic prospects”. Kōrero shared by participant 2 speaks about the similarity/replication of the relocation destination compared to the original site. Specifically, they mentioned “When we came to Ngāpuna they had the puna (water source) to bathe, what they were used to having before, having jobs and that sort of business, it made sense to come here”.

Comparison of Māori relocations with contemporary managed retreat discourse

The national textual analysis and the case study contrasted the enablers and key considerations of a Māori relocation process of the past with the current focus in policy discourse. Some of these contrasts are highlighted in Table 1, such as maintaining connection and keeping whānau together, this should also be evident in the selection of the relocation site. This in comparison to western notions of removing people, disrupting social cohesion, and relocating assets away from risk (Bronen 2010; Maldonado et al. 2013; Siders et al. 2019). Decision-making for Māori was and should be at the whānau and hapū level, supported by iwi and made for the collective. These decisions should also be conducted in a reciprocal manner ensuring all people included in the process are supported. This is in contrast to the typical western practice of decisions being made by local, regional, and central governments with community consultation (Farbotko & McMichael 2019; McNamara & Des Combes 2015); however, issues remain around resourcing and effective engagement. Furthermore, the view of buildings, infrastructure,

and lands as ancestors rather than assets or commodities will impact how such entities are treated in a relocation process. This comparison calls attention for a parallel relocation process by Māori for Māori which ensures autonomy and incorporates Māori worldviews and values.

Looking back to move forwards

This paper identified 51 cases of Māori pā relocation in response to a range of physical natural hazards since pre-colonisation (pre-1840) to present time. The case study of Tūhourangi and Ngāti Rangitihī gave a deeper insight into a historical relocation process and that the decision-making power sat at the whānau and hapū level and was for the collective. The whānau and hapū were supported by whānau and implemented traditional mechanisms of dealing with natural hazards and adversity, such as whanaungatanga (relationships), awahi (support) whakapapa (genealogical connection), tuku whenua (gifts of land), koha (donation) and the utilisation of mātauranga Māori (Māori knowledge) were at the forefront of every decision. The research highlights the rich learnings from kaupapa Māori-based methods focused on understanding Māori process, enablers, and barriers that provide insight into how we can respond to climate change. We have focused on only one example in depth after the 1886 Tarawera eruption, and there is a wealth of potential further learnings from other examples.

Regarding the current dialogue on relocation as an option to adapt to climate change, for Māori, it is important for Government to acknowledge that pā and land are not just a building or an asset with a monetary value, they are living, breathing ancestors. Interview results reveal that relocating the physical aspects is the easy part, but the intangible aspects of pā and the land present a difficult challenge to relocation. Establishing or maintaining the connection between the present generation and the past is complicated,

Table 1 Points of difference between a Māori relocation process of the past with the current managed retreat discourse

	Enablers	Key considerations for a Māori relocation process	Current relocation process policy
Tuku whenua—land gifting	Availability of land	Protect and keep whānau together + opportunities and resources for the collective	Remove people + assets from at risk locations
Autonomy/decision-making	Whānau level decision-making	Decisions made for the collective by whānau, hapū, and iwi—high level of reciprocity—influenced by Mātauranga Māori	Decisions made for the individual by local, regional, and central government—low reciprocity—influenced by Western Science and processes
Perspective on infrastructure and lands at risk	Holistic interconnectedness	Ancestor rather than asset—more than bricks and mortar	Asset and infrastructure—bricks and mortar
Relocation site	Keep together + maintain connection to place	End goal = maintain and create connection and tūrangawaewae to whenua + transformation	End goal = move away from risk

and there is no one right solution. However, if relocation is autonomous, by Māori for Māori, perhaps drawing from decision-making processes from the past, then innovation can occur as to how this connection is maintained in a relocation process.

A view to the past has strongly highlighted the need for an autonomous approach to climate change relocation by Māori for Māori. This process should avoid a “one size fits all” notion. Whānau and hapū have the authority and the capacity to lead in this space and with their rich histories of relocation, local implementation, and adaptability. Notwithstanding this wealth of experience and knowledge, we cannot negate that society as a whole has a role to support Indigenous adaptation. In the context of Māori, given Te Tiriti o Waitangi, regardless of its debated intention, the Crown has an obligation to actively protect Māori lands and cultural sites and to support kaitiakitanga over their lands. If these principles are not ensured, adaptation risks breaching Te Tiriti.

Despite all of the aforementioned legality, an opportunity exists for substantial change. In establishing a parallel autonomous relocation process for Māori by Māori, we begin the process of redress, as autonomy initiates redress. If the Crown enables a parallel autonomous whānau and hapū led relocation process and provides lands or resources for relocation, this is a first step in rebuilding the relationship between Māori and the Crown. This alone is a worthwhile endeavour. While this research concerns the Indigenous peoples of Aotearoa, we hope that it will also stimulate discussion within Indigenous communities globally.

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Data Availability In line with the CARE (Collective benefit, Authority to control, Responsibility and Ethics) principles devised by (Carroll et al. 2020) and as outlined in Māori and Indigenous data sovereignty principles, we do not provide exact locations of Māori sites referred to in this paper, only regional locations, and links to sources of these examples. This ensures we maintain respectful and ethical relationships with the people from which this data originates. In line with our ethical

approval, raw interview data are not provided. Cases from the textual analysis are available from: Treaty of Waitangi Settlement Documents (<https://www.tearawhiti.govt.nz/te-kahui-whakatau-treaty-settlements/>), Māori maps (<https://maorimaps.com/>), Pressreader (<https://www.pressreader.com/>), and Google search engine.

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