Routledge
Taylor & Francis Group

Kōtuitui: New Zealand Journal of Social Sciences Online

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tnzk20

Landscape change as a platform for environmental and social healing

Clare Wilkinson, Angus H. Macfarlane, Daniel C. H. Hikuroa, Clint McConchie, Matiu Payne, Huata Holmes, Rose Mohi & Matthew W. Hughes

To cite this article: Clare Wilkinson, Angus H. Macfarlane, Daniel C. H. Hikuroa, Clint McConchie, Matiu Payne, Huata Holmes, Rose Mohi & Matthew W. Hughes (2021): Landscape change as a platform for environmental and social healing, Kōtuitui: New Zealand Journal of Social Sciences Online, DOI: 10.1080/1177083X.2021.2003826

To link to this article: https://doi.org/10.1080/1177083X.2021.2003826

Published online: 08 Dec 2021.

KOTUITUI: NEW ZEALAND JOURNAL OF SOCIAL SCIENCES ONLINE
https://doi.org/10.1080/1177083X.2021.2003826

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

OPEN ACCESS Check for updates

Landscape change as a platform for environmental and social healing

Clare Wilkinson[a], Angus H. Macfarlane[b], Daniel C. H. Hikuroa [c], Clint McConchie[d], Matiu Payne[e], Huata Holmes[f], Rose Mohi[g] and Matthew W. Hughes[h]

[a]School of Earth and Environment, University of Canterbury, Christchurch, New Zealand; [b]College of Education, Health and Human Development, University of Canterbury, Christchurch, New Zealand; [c]Department of Māori Studies, The University of Auckland, Auckland, New Zealand; [d]Te Runanga o Kaikōura, Kaikōura, New Zealand; [e]Te Runanga o Koukourarata, Koukourarata, New Zealand; [f]Kaitahu Fanui and University of Otago, Dunedin, New Zealand; [g]Ngāti Kahungunu ki Heretaunga, Heretaunga, New Zealand; [h]Department of Civil and Natural Resources Engineering, University of Canterbury, Christchurch, New Zealand

ABSTRACT

Aotearoa New Zealand is characterised by dynamic landscapes. Major landscape-altering events, such as earthquakes, floods, landslides and tsunami, have deeply influenced the relationships that many Māori, the Indigenous peoples of Aotearoa New Zealand, have with their ancestral landscapes. This work documents perspectives of landscape change from five Māori individuals from various *iwi* (tribes) and *hapū* (kin groups) around Aotearoa New Zealand, who have strong ties with their *tūrangawaewae* (place of connection). In exercising the Māori principle of *whanaungatanga*, we conducted semi-structured interviews following a general inductive approach over a series of meetings. This research indicates that no matter the cause of a landscape-altering event, connections, sustainability, reciprocity and adaptability are core values to uphold. These values can be used to guide human activity and involvement pertaining to responding to the event days, months and years after. This work also indicates that altered landscapes have a natural way of healing themselves through time, and that people play an important role in defining landscape change and recovery following landscape-altering events.

ARTICLE HISTORY
Received 16 November 2020
Accepted 18 October 2021

KEYWORDS
Mātauranga Māori; geomorphology; landscape evolution; indigenous knowledge; healing

CONTACT Clare Wilkinson clare.wilkinson@pg.canterbury.ac.nz; wilkinson.clareliz@gmail.com; Daniel C. H. Hikuroa d.hikuroa@auckland.ac.nz

Term*	Description
Aotearoa	A Māori name for New Zealand's North Island that is now commonly used to mean all of New Zealand
Atua	Departmental deities, energies
Awa	River
Awa kōpaka	Glacier
Hapū	Sub-tribe, kin-group
Hāpua	Coastal lagoon
Hoamahi	Work associate, colleague
Hononga	Connections
Horo whenua	Landslides
Hui	Meeting, gathering
Hūnga	Volcanic eruptions
Kai	Food
Kaitiaki/Kaitiakitanga	Guardian/the act of guardianship; principles of intergenerational sustainability and the practices to enact it
Kanohi-ki-te-kanohi	Literally 'face to face', usually in reference to people meeting in person
Kaupapa	Topic, subject, project
Kōwhai	Tree (genus *Sophora*) with yellow blossoms, endemic to New Zealand
Mā te wā	In good time (here, depicts natural changes over time)
Mana	Authority, prestige
Marae	Complex of buildings in tribal grounds that is communal and sacred for *iwi* (tribes)
Mātauranga Māori	Māori knowledge, culture and values, expressed through a Māori worldview
Maunga	Mountain
Mauri	Life force, essence
Papatūānuku	Earth Mother (primal parent)
Pātaka	Literally, 'storehouse' or 'pantry' but often used to refer to Horomaka Banks Peninsula
Pāua	New Zealand abalone (genus *Haliotis*)
Rāhui	Temporary prohibition/restriction
Ritenga	Cultural sustainability protocols
Rū	Earthquake
Rūnanga	Tribal council
Takiwā	Tribal area
Taonga	Treasure/what is treasured
Taonga tuku iho	Intergenerational protection of cultural treasures, including knowledge, values, language and cultural practices
Tauutuutu	Reciprocity
Te Ao Māori	The Māori world/worldview
Te Ao Turoa	The longstanding world of light; intergenerational resource sustainability
Te Ohomauri o te Whenua	The Awakening Lifeforce of the Land
Tūhononga	Connection
Tūrangawaewae	Place of standing and belonging; place of spiritual, cultural and ancestral connection
Urutaunga	Adaptability
Wai tai	Salt water
Whakapapa	Ancestral genealogy, application to all parts of nature
Whakatauki	Story, proverb or saying
Whakauka	Sustainability
Whānau	Family
Whanaungatanga	Familial connections; act of building sustained relationships
Whenua	Land; placenta
Whenua tapu	Sacred land

*We recognise there are regional variations in the use and meaning of some of these terms. We provide this glossary as a guide to how we use these terms in the context of this article.

Introduction

Indigenous communities around the world have been living with, managing, and responding to changes in their ancestral lands for centuries (Kelman et al. 2012). Intergenerational experiences of living with agents of landscape change – such as volcanoes, rivers, and earthquakes – have given rise to complex, empirical, observation-based

traditional knowledge systems that have enabled Indigenous communities to adapt and demonstrate resilience in times of change (Kenney and Phibbs 2015; Bryant-Tokalau 2018). Despite the intimate connections and understandings that Indigenous groups have of their ancestral lands, their knowledge, values, and traditional approaches to responding to major landscape changes are rarely considered in modern approaches to disaster mitigation (Kelman et al. 2012), land-use change adaptation and decision-making (e.g. Lane et al. 2003), or understandings of landscape evolution.

Mātauranga Māori is one such traditional knowledge system that has been developed over centuries of living with dynamic and sometimes challenging physical environments. *Mātauranga* Māori is the traditional knowledge of Māori, the Indigenous peoples of Aotearoa New Zealand (henceforth Aotearoa-NZ; e.g. Wilkinson et al. 2020), and the expression of that knowledge through language, values, ethics and cultural practices (Mead 2003; Royal 2009; Hikuroa 2017; Paul-Burke et al. 2018). *Mātauranga* Māori has been developed and refined over approximately 800–1000 years of ancestral occupation in Aotearoa-NZ (Wilmshurst et al. 2008; Broughton and McBreen 2015), thus it is both traditional and contemporary (King et al. 2007). Core to *mātauranga* Māori is *whakapapa* – the Māori way of connecting to the world through genealogies (Royal 1992; Forster 2019). *Whakapapa* links all elements of the natural world – human and more-than-human, physical and meta-physical – to each other (Hikuroa 2017) and is a relationally-based methodology for explaining the world and generating new knowledge (Royal 1998; Graham 2009). *Whakapapa* also informs cultural concepts within *Te Ao Māori* (the Māori world/worldview) pertaining to understanding and interacting with the surrounding environment, e.g. *mauri* (life force, energy), *kaitiakitanga* (guardianship), *mana* (traditional authority), *taonga tuku iho* (intergenerational protection of cultural knowledge and treasures), *ritenga* (sustainability protocols) and *Te Ao Turoa* (intergenerational resource sustainability) (Harmsworth and Awatere 2013). These guiding concepts and principles have the potential to inform bicultural perceptions of landscape dynamics in modern day Aotearoa-NZ.

Over the past 800–1000 years of human inhabitation of Aotearoa-NZ, landscape evolution in Aotearoa-NZ has been primarily controlled by *awa* (rivers), *rū* (earthquakes), *horo whenua* (landslides), *awa kōpaka* (glaciers) and *hūnga* (volcanic eruptions). In contemporary Aotearoa-NZ and the rest of the world, when these driving forces of landscape change result in a sudden transformation in the landscape that may cause damage to infrastructure and productive land that overwhelms a community's capacity to respond using their own resources, or causes physical or psychological trauma to people, they are considered disasters (UNISDR 2017). The perception of these events as 'disastrous' can evoke a negative connotation. Some perspectives informed by *Te Ao Māori* see such landscape-transforming events as common place, and central to Aotearoa-NZ's physical landscape identity. Despite the pain felt if human lives are lost during these events – and it must be acknowledged that trauma and loss suffered by people is not insignificant – some *Te Ao Māori* perspectives acknowledge that these events are natural manifestations that can be explained and understood through consideration of cultural concepts and values (e.g. Hikuroa 2017; Wilkinson and Macfarlane 2021). Certain Māori perspectives, therefore, may have the potential to elucidate a unique approach to understanding landscape change, recovery and healing following major perturbations in Aotearoa-NZ.

This paper illustrates a selection of Māori perspectives of landscape health and change in Aotearoa-NZ following major landscape-altering events. We adopted a Māori-centred research approach (Rauika Mangai 2020) to document some Māori understandings of landscape dynamics, informed by both traditional and contemporary *mātauranga* (Māori knowledge) through *kanohi-ki-te-kanohi* (face-to-face) semi-structured interviews (henceforth referred to as conversations). This work aims to explore and discuss landscape change and health following major disturbances from an Earth-surface-change viewpoint, similar to sociogeomorphology (Ashmore 2015) or ethnogeomorphology (Wilcock and Brierley 2012). Though not a main focus of this work, we acknowledge the important efforts of researchers working with Māori communities to inform disaster risk response and hazard mitigation (e.g. King and Goff 2006; King et al. 2007; Lambert 2014; Kenney and Phibbs 2015; Kenney et al. 2015; Lambert 2015; Saunders 2017; Carter and Kenney 2018; Thomas 2018; King et al. 2020; Cram 2021), and intend that our work contributes to the wider body of literature around landscape change following major perturbations.

We first outline the methods used to build our team and to analyse the data arising from our conversations. We then establish the context of our analysis by introducing the concept of landscape healing and providing a short discussion of cultural landscapes. We then present a thematic analysis of our conversations and discuss major topics that relate to landscape change. Finally, we synthesise the results and discuss post-perturbation landscape recovery through the worldviews of our research team, reflecting upon some of the cultural and environmental principles central to *Te Ao Māori*.

Research team safety

Cultural safety is a key component of cultural competence and responsiveness within bicultural research (Macfarlane and Macfarlane 2018). All members of our research team are equal participants in this work (and will henceforth be referred to as 'community-based participants' [CBPs] or 'university-based participants' [UBPs] to reflect how we each fit into this team). Our team is composed of both Indigenous and non-Indigenous individuals, brought together by a shared desire to learn about, care for and respect landscapes. Sharing co-authorship between UBPs and CBPs honours the *mana* (integrity, authority) of the CBPs and acknowledges them as core contributors to this work. We intend that this approach, as well as following an ethically approved, co-created approach to research with Māori, demonstrates our commitment to this work upholding the *mana* of the *mātauranga* shared here, and respects the safety of the entire research team.

Data sovereignty and knowledge dissemination

Mātauranga Māori is a *taonga* (treasure) passed down through generations from ancestors (Mead 2003; Royal 2009; Smith et al. 2016). *Mātauranga* Māori is complex and diverse, with much *mātauranga* being specific to individual *iwi* (tribes) and *hapū* (subtribes), and with some *mātauranga* varying within *hapū* or *whānau* (families) (e.g. King et al. 2020). We acknowledge that the *mātauranga* presented here has been generously shared by and among the CBPs in this work, and that their knowledge is informed by their own individual experiences as well as the inherited experiences of their ancestors

and teachers. We do not intend that the perspectives presented here to be considered universally shared by all Māori people. We strive to uphold the *mana* (integrity, authority) of our team by graciously acknowledging the willingness to share knowledge, and by caring for and respecting it. Ethical approval to conduct this work was gained through the Human Ethics Committee at the University of Canterbury, Aotearoa-NZ. We collectively aim to uphold the intellectual property of the CBPs and their ancestors, acknowledge their *mana* (integrity, authority), and thank them for allowing the contents of our conversations to be shared.

Methods

Qualitative data reflecting a selection of Māori perspectives pertaining to landscape change following major disturbances were collated through 10 *kanohi-ki-te-kanohi* (face-to-face) conversations. Five CBPs from around Aotearoa-NZ joined our research team by way of professional *hoamahi* (acquaintances) and personal *hononga* (connections) that were pre-existing within the university-based team. Seeking participation in this way – commonly called the 'gatekeeper' (Wanat 2008) or 'mediator' (Kristensen and Ravn 2015) method of participant recruitment – reflects Māori ideals of reciprocity and building enduring connections (Bishop 1999), and also ensured that CBPs would have the appropriate knowledge base to help with the research questions. Each of the CBPs was identified as having a strong connection to their *whenua* (land) and a detailed knowledge of the landscape processes (i.e. earthquakes, floods, tsunami, land slips, and deforestation) that are common to their *tūrangawaewae* (place of connection; Figure 1). All CBPs provided written consent to partake in the project. CBPs *whakapapa* (connect through ancestry) to or have deep personal experience in Koukourarata (Port Levy, Banks Peninsula), Kaikōura, Te Tai Poutini (West Coast, South Island), and Te Matau-a-Māui/Heretaunga (Hawke's Bay and the Heretaunga Plains). These regions of Aotearoa-NZ have all experienced major landscape transformations in the past (e.g. deforestation and tsunami, 2016 Kaikōura Earthquake; 1931 Hawkes Bay Earthquake) or are prone to experience major changes in the future (e.g. Alpine Fault earthquake, Orchiston et al. 2018; Hikurangi margin earthquakes and tsunami, Clark et al. 2019).

Formal conversations varied in duration from 1.5 h to 6 h, but in following the Māori principle of *whanaungatanga* (building relationships), much time was spent between UBPs and CBPs outside of formal conversations. In some cases, building relationships among the research team included sharing *kai* (food), going for a walk or driving around their local areas, or spending multiple days engaging in casual conversations. Being transparent and spending time in ways such as these helped build trust among the research team. *Whanaungatanga* also helps dismantle power and authority positions that are often associated with 'researcher' and 'participant' (Bishop 1996), and was especially important for acknowledging and maintaining respect for CBPs' *mana* (authority).

The conversations covered a range of topics relating to landscape health and change following major perturbations (Table 1 and Figure 2). Conversations were an appropriate approach for this project because they allowed all participants to raise topics found relevant and important to the overall research questions (Longhurst 2016). Typically, at

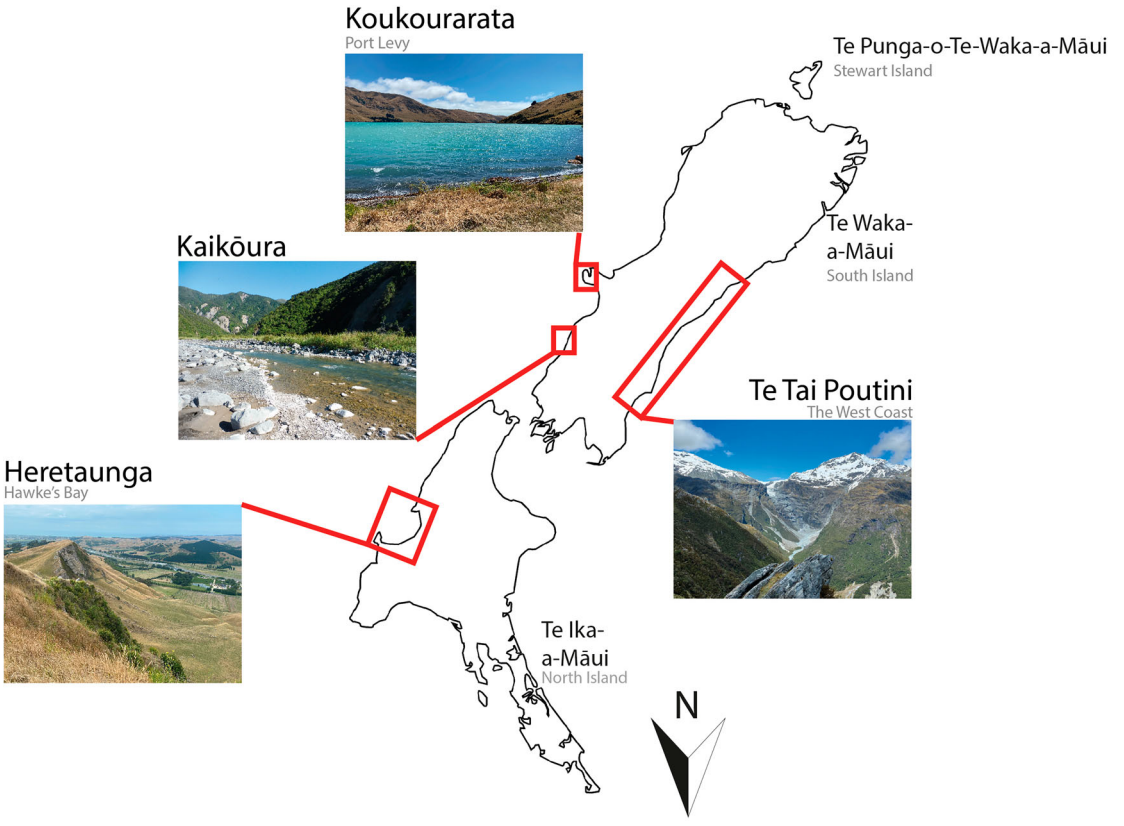

Figure 1. Areas of *tūrangawaewae* (place of connection) for the CBPs, mapped onto an image reflecting traditional Māori perceptions of the geographic orientation of Aotearoa-NZ. Major changes in these areas include earthquakes (Te Tai Poutini, Heretaunga, Kaikōura); deforestation and tsunami (Heretaunga, Kaikōura, Koukourarata) and flooding (Heretaunga, Kaikōura, Te Tai Poutini). Photos: C. Wilkinson. Outline of Aotearoa-NZ sourced from ArcGIS Online (University of Minnesota, n.d.).

Table 1. Topics and specific questions covered in semi-structured interviews.

Indicators of healthy landscapes
Human vs. nonhuman/more-than-human processes
Healing processes and actions
Changes in land use over time
The role of humans as *kaitiaki* following major disturbance events
Damaged landscapes
Te Ao Māori and the Māori worldview
Culturally significant landscape features
Do landscapes need to heal?
Is there a timeframe over which landscapes heal?

least two UBPs attended initial meetings, though it was only one for most follow-up meetings. Friend and *whānau* (family) support was also welcomed during meetings if desired.

Most of the conversations were recorded digitally. In some cases, conversations took place outdoors while travelling to local sites with CBPs. In cases such as these, notes, rather than audio recordings, were taken. Conversations were transcribed verbatim, and any notes were included at the bottom of the transcript. All CBPs had the opportunity to review their respective transcribed conversations, provide comment and amend as they saw fit. Information from the conversations was analysed following a general inductive approach to thematic analysis to identify commonalities across conversations (Thomas 2006). Individual sections of text were coded according to specific topics of conversation, and codes were grouped into themes. The themes that emerged from the initial analysis were shared among all participants to ensure that the preliminary results accurately reflected our conversations and experiences. Key to this procedure and analysis was accurate portrayal of CBP views (e.g. King et al. 2020), rather than the research questions or existing literature controlling or restricting responses. All co-authors had the opportunity to review early analysis (including grouping of themes into summary categories), manuscript drafts and the final iteration of this manuscript to ensure quotations from conversations were not misinterpreted or taken out of context.

Figure 2. Examples of landscapes that have experienced a 'major perturbation' event. Left: A landslide dam in the Tūtaeputaputa Conway River resulting from the 2016 Kaikōura earthquake. Right: A track cut into the side of culturally significant Te Mata Peak.

Te kaupapa/research context: landscape healing and cultural landscapes

In *Te Ao Māori* (the Māori world), all land is the body of *Papatūānuku* (Earth Mother), and ancestral connection is often manifested as personification of specific geographic features, e.g. some *maunga* (mountains) and *awa* (rivers). A main focus of this work was to discuss landscape change with respect to the concept of 'landscape healing,' and to explore what it means for an ancestral landscape to 'heal' following a major disturbance. In the wake of a major perturbation in the landscape, it can be common to think of the land as having sustained some sort of damage from which it must heal (e.g. Covington 2000; Wang et al. 2009; Jones 2011). In the modern disaster research context, major landscape perturbation events that do not cause impacts to communities are considered natural phenomena, whereas they are considered disasters when such phenomena have direct impacts on exposed populations, productive land and/or infrastructure (UNISDR 2017). In terms of landscape recovery and change, this framing has similarities with some Māori perspectives, in which landscape-altering perturbations do not necessarily inflict damage on the land but are rather part of the landscape's story and history (e.g. Wilkinson and Macfarlane 2021).

In some *Te Ao Māori* perspectives, landscape 'healing' must encompass the entire landscape, which includes 'everything seen and unseen, humans and more-than humans, the natural and spiritual world' (Clapcott et al. 2018, p. 457). Such a perspective resonates with certain understandings of cultural landscapes, in which a place is valued by people because of their longstanding and intimate relationship with that place (Buggey 1999). In referring to cultural landscapes for the purposes of this work, we embrace the definition proposed by Buggey (1999, p. 30):

> [A cultural landscape] expresses [an Indigenous group's] unity with the natural and spiritual environment. It embodies their traditional knowledge of spirits, places, land uses, and ecology.

By way of this definition of cultural landscapes, which also resonates closely with the UNESCO consideration of associative cultural landscapes (considered closely aligned with some Māori worldviews – e.g. Kawharu 2009), we consider the implications of landscape change with respect to *Te Ao Māori* and some wider Indigenous perspectives, in which landscape 'healing' may be more about healing people and healing relationships between people and land (Kimmerer 2013; Marques et al. 2018). We acknowledge that there is a great diversity of perspectives in *Te Ao Māori* (King et al. 2020), as well as in Indigenous knowledge systems elsewhere that may inform or influence how people understand and engage with cultural landscapes. We also acknowledge the multitude of different perceptions, criteria and characteristics of cultural landscapes (UNESCO 2008).

Results and discussion

Two major topics emerged from our conversations: the conceptualisation of 'damaged' landscapes and cultural values related to landscape change and recovery. Here, we discuss both of these main topics by presenting raw results in quotation form and discussing the implications of those statements. We then synthesise these two main topics to discuss the need to consider holistic understandings of landscape healing

following major disturbances, the opportunity to view landscape-altering events as impetus for change, and the growing call to prioritise Indigenous knowledge in understandings of landscape change.

'Damaged' landscapes and the human-nature relationship

In some of our conversations, the phrase 'damaged landscape' was used to refer to physical landscapes that had experienced major disturbances or changes. CBPs' reactions to this phrase varied. Some CBPs accepted the phrase as appropriate for describing altered landscapes while some indicated that landscapes are never in fact damaged:

> There is never damage to a landscape, it only changes.

Such a sentiment acknowledges the resilience of *Papatūānuku,* our Earth Mother, yet indicates that landscapes cannot be damaged. However, at times during our conversations, a distinction arose between how human-induced and nonhuman-induced landscape change is perceived to impact a landscape:

> When you say damaged, if it's been a natural process, it's one perspective that in effect it isn't damaged; it's just changed. And if it's just changed by natural process, then it doesn't need to heal—whānau support

Most CBPs indicated that actions taken by humans that disrespect *Papatūānuku* and her kin, actions that result in defaced landscapes or cause harm to other species, are what constitute 'damaged' landscapes:

> There's the hideous track. –a reflection on the track built on the side of culturally significant Te Mata Peak, Heretaunga Plains

> … when you drive to the [Dunedin] airport, as you look up at Saddle Hill and see the quarry, to me that's the classic example of a damaged landscape. –whānau support

> As children we could hear frogs all night long … and you never hear a frog now. The frogs are gone. So that's a huge change in the landscape, isn't it?

> … watching the land heal from a manmade mistake is entirely different to watching, from what I've seen, a natural disaster. There's no comparison … it's such a quick revert [from a natural disaster] … but if you have a manmade disaster it seems that the healing takes [longer], because we hurt the land so much more.

As discussed in our conversations, it seems that landscape change driven by nonhuman-induced processes does not elicit a 'damaged' landscape, but rather a process of change:

> Well … when I go up the coast north and look at the scarring on the land up there, I think … isn't that the way that New Zealand was created? It's part of the process. Like I just think, now, that's how it is. It used to be [one way], but now that's how it is.

However, at times, it was difficult to distinguish between 'human' and 'natural' processes because, in some *Te Ao Māori* perspectives, humans sit within natural systems (Hikuroa 2017):

> Is a human-made or a human-caused event a natural event as well?

> Yeah, yeah to be honest … I wouldn't distinguish between the two.

> … in Te Ao Māori, you're part of the circle of life … and of course we're only part of it. And the whole of it, from rocks to tree, to anything you care to name, animate or inanimate, they're all part of it … .it all connects. You're part of it but you're not the supreme, you know. And of course … [we must understand] that what [we] do affects brother and sister bird, brother and sister tree, brother and sister fish.

The lack of a clear distinction between 'human' and 'natural' processes due to their close entanglement in *Te Ao Māori*, and whether or not landscapes can be considered damaged by either, both or neither of those processes, is not necessarily a point of obfuscation, but is rather a point of certainty around the challenges potentially faced by some Māori people (as well as some non-Māori New Zealanders) pertaining to estrangement from nature. Because of the intimate entanglement of people and nature in *Te Ao Māori*, explained through *whakapapa* (Royal 1992), we found it important to also discuss cultural and social landscapes as a way to explore how people play roles in stories of local landscape change.

Although it is possible to think of physical, cultural and social landscapes as separate domains, the perception of people and place comprising a unified landscape can be seen through the ways people might respond to major landscape-altering events. Throughout our conversations, there was consensus around the ways people can respond to both human- and nonhuman-induced landscape change:

> If someone is in need or there is an [incident]—you pull together. That's regardless of whether it's [a] man-made or natural [incident]. That is our approach.

The unity of people is an important element of understanding 'damaged' landscapes and the human-nature relationship. The strength of community in responding to major landscape change – whether that be people coming together to help set up food and shelter resources after a disaster (e.g. Kenney and Phibbs 2015) or efforts to protect important environmental or landscape elements (Forster 2016) – is what helps elucidate how people and place are so intertwined. This unity helps define cultural landscapes for our research team in the context of this work: landscapes in which people and place are one. This relationship can be explored through cultural values relevant to landscape change and healing, which are the topic of the following section.

Knowing our altered landscapes: wisdom from Te Ao Māori

Values informed by *Te Ao Māori* related to landscape change and recovery were determined by identifying and synthesising ten themes that emerged from the initial thematic analysis (Figure 3A). Guided by cultural concepts within *Te Ao Māori*, five concepts and values – 'summary categories' as per the general inductive approach (Thomas 2006) – were apparent from the initial emergent themes: *tūhononga* (connections), *whakauka* (sustainability), *tauutuutu* (reciprocity), *urutaunga* (adaptability), and *mā te wā* (time/natural healing) (Figure 3B). These categories represent concepts and values that our research team envision as ways to relate to and understand rapidly transformed landscapes.

Tūhononga/Connection

A core Māori value reflected in our conversations is connection to the natural world. In some *Te Ao Māori* perspectives, humans are part of natural systems along with

landscapes, water and all biota (Hikuroa 2017). This positioning is guided by *whakapapa* (ancestry), in which both living and non-living elements of landscapes are considered kin (Royal 1992; Graham 2009).

> Our connection to the whenua (land) is through customary observances and knowledge bases that we call mauri (life force, energy), that we know as mana (authority, integrity), and that we know as the domains of our atua (Māori departmental gods), which are our spiritual entities. So, when we think of our river, our river is connected to our whenua, our whenua is connected to our mountains and to our sky, and to our sea and to the air, and to everything underneath and to everything above. We regard that all as Te Ao Turoa—the longstanding world of light. And everything that is connected in that world is connected by genealogy.

Marques et al. (2018) posit that landscape health depends on people re-building these connections to the landscape. The Cartesian dualism of the nature-culture split that arrived with the European settler culture lingers throughout Aotearoa-NZ today and has potential to obscure this sense of connection. When societies see themselves as separate or supreme to other beings, it can be easier to justify actions or activities that 'modify' landscapes, deplete resources and damage ecosystems.

> We have a very polite term called modify, but when you examine what's been done to the whenua tapu (sacred land), it's … heavy. It's always how you don't expect it. There are three timber mills here in [Koukourarata] bay alone. And Papatūānuku (Earth Mother) has been totally stripped … we've done something that's probably the equivalent to about 50 earthquakes, let's be honest … .Probably one of the best examples is driving to Okain's [Bay, Banks Peninsula], looking on the right-hand side up to the top, you see all those stumps that are still there. Kind of, how do you heal that? You're talking about a time that's gone, and a space in our history that's gone … you created this wound and how do you heal it? … And of course … you have to influence the mind and the thinking and I think we're on that journey and down that path, but … people have to understand from a Māori concept it's not about who has the title to the land, it's the other way round, it's the land has the title to you. And it's the way and the relationship you have, and this is the thing we gotta get across. We're kaitiaki (guardians) of the land and it's quite simple … it's about our small tenure of the land and how we address it.

A sense of frustration can be identified from the above remark; in some Māori perspectives, it can be difficult to see how some people might not realise their relationship with the Earth as they conduct their lives. Re-establishing human connections to landscapes may help alleviate this frustration by reframing the human-environment relationship (Mitten 2017) and encouraging a reconsideration of how people may interact with and utilise land (Sunde 2006). Having established connections between human and nonhuman landscape elements could help people realise their potential to be allies of the land:

> It's that connectivity, that connection with that world, Te Ao Māori, mātauranga Māori, and understand part of your place in it. It all connects, and it connects you to it, you're part of it but you're not the supreme.

Mātauranga Māori asks people to question their place in wider systems. Understanding how people connect to the other elements of the environment, and how those connections can enable healing of people and land (e.g. Sunde 2006; Kimmerer 2013), is likely a critical component of landscape healing.

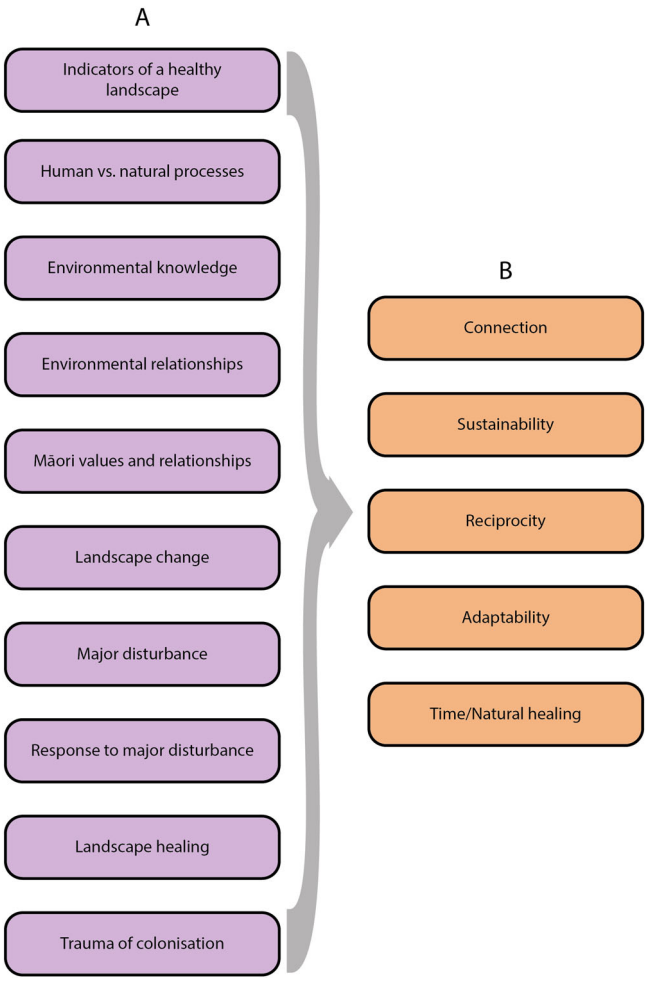

Figure 3. A, Initial emergent themes from interviews and **B,** summary categories from thematic analysis.

Whakauka/Sustainability

> You don't have to be appointed by anyone to be a kaitiaki (environmental guardian). You can be a member of the public. You can be a member of your own family … it's so important that the environment be looked after.

Sustainability is a core value in *Te Ao Māori* that underpinned many of our conversations. Indicators of a healthy landscape (Table 2), such as the annual blossoming of the *kōwhai* tree (*Sophora spp.*), glacial activity, or *pāua* (abalone) population and seaweed colony rebound following the 2016 Kaikōura Earthquake, all invoke the importance of sustainability of different parts of landscapes. Humans have a role in creating space for resource regeneration and a responsibility to maintain, rather than deplete, those resources. This role can be particularly important in the wake of major disturbances, where rapid changes to landscapes put stress on populations or communities.

Table 2. Indicators of a healthy landscape.

Regeneration of native vegetation
Abundant populations of nonhuman/more-than-human species (fish, shellfish, birds, etc.)
Glacial activity/advance
Seasonal floods and annual growth of vegetation (e.g. annual blossoming of the kōwhai tree)
Humans being aware of the world around them
Humans engaging in proactive, transparent, communicative relationships with each other
Water clarity
Rivers flowing in their typical flow paths
Closing of ground cracks following earthquake ruptures
Happy, healthy people and communities
No harm to lifeforms

Sustainability is not limited to the nonhuman elements of altered landscapes, but also applies to cultural elements of relationships, language, practices, values and knowledge. Sustaining both physical and cultural landscape elements was a strong theme in our conversations:

> I think that ties in with how we've been talking about gravel extraction [activities] and the pāua [rebound], and probably sustainable relationships among different organisations and different communities [matter] as well. And … [I wonder] if prioritising sustainability of many things could be the approach to healing a lot of these situations.

> Well yes, totally. And sustainability, really, that is my job. To manage that sustainability … I look at it as being the gatekeeper of this incredible takiwā (tribal area). And … that's a privileged position I've been put in. And sustainability is number one … if we can be sustainable as a people. Look, yeah, it's one objective isn't it, really … that's the ultimate isn't it. And obviously from there on, sustainability with relationships, the whole thing.

And of utmost importance, *mātauranga* (knowledge) and *taonga tuku iho* (intergenerational protection of knowledge) must also be sustained:

> Yeah, we learn all these tricks … And there'll be a time in the future where if we don't keep passing our knowledge on, our ancient knowledge, people are going to be in trouble. They won't even know where they are. The landscape will be so altered.

Sustainability of physical landscapes and their nonhuman elements, as well as cultural landscapes and their peoples, languages, practices, knowledges and relationships, is underpinned by *kaitiakitanga* (guardianship), *ritenga* (sustainability protocols) and *taonga tuku iho* (intergenerational protection of cultural treasures). These concepts resonate with a concept in *Te Ao Māori* that proposes that all that exists on the current Earth is on loan from future generations, and that it must be returned to future generations in as good, or even better, condition than it is today. In this sense, sustainability as described here in relation to landscape change could indicate positive change or improvement in an environment (e.g. social, cultural or physical environment), rather than simply maintenance of that environment. Here, the concept of sustainability indicates the importance of people taking action to ensure that changes in environments are net-positive for all who inhabit it, both human and nonhuman.

Tauutuutu/Reciprocity

Reciprocity is another core value in *Te Ao Māori* that was apparent in our conversations. Taking action towards healing a landscape is an expression of peoples' responsibilities in

the world, and an expression of reciprocity towards others, human and nonhuman, current and future. Examples of reciprocity discussed in our conversations included rescuing others from collapsing buildings during the 1931 Hawke's Bay earthquake, returning *pāua* that had been thrust out of the sea during the 2016 Kaikōura earthquake, and replanting native vegetation around waterways to decrease sedimentation in Koukourarata Bay.

> … my father, when the seas come up, my father you know … he was actually down there crying … putting the pāua back into the water.

> … you'd notice with the plantings as you drive in … we're trying to set an example here on the pātaka (literally, food storehouse; here, used to mean area) of our responsibility to the whenua (land) with what we've done here. We're pretty proud of it in just our little area, just our bay. We've planted over 60,000 trees, propagated [mostly] from here.

Reciprocity can also take place in the form of gratitude, acknowledgement, and education:

> We can only do things in such a way as to help educate the community at the same time.

Reciprocity is an expression of responsibility as tenants of the land, and our obligation to reciprocate is the same, no matter the source of the landscape disturbance:

> So we're surrounded by this area that has been deforested, and I gather from our conversations that it would be great to re-plant and intervene in that way. Do you think that the thought or the perspective would be same if, say, this was a forested hillside, and a big earthquake caused a bunch of landslides that resulted in slumps that removed the trees?

> It doesn't matter which way you look at it, what is retained will be retained because of the trees being there … it's the tree roots that survive that do the binding. It's simplistic answer, and of course, just helping then, with replanting and natural [regeneration] … Simplistic answer but it's true. It's our relationship to the land, and we're not the bosses. I think that's the important thing to understand. We're just a shared part of it. Because we got thumbs, you know, it gives us more responsibility to look after it, to protect it.

A lack of reciprocity, or mindless extraction from the land without giving back to the land, is considered by some participants a 'manmade disaster':

> … a manmade disaster that we cannot see … is pulling the resources out of our seas. You cannot even go out to Kaikōura now and catch a fish, compared to when I was a boy. Forty years ago. Yeah, that's what I call manmade, and the healing process is generational.

Guardianship of land is an inherited responsibility for *mana whenua*, guided by *whakapapa* (Jolly and Ngā Papatipu Rūnanga Working Group 2013). This responsibility, as discussed in our conversations, indicates a need to engage in reciprocity with the land. Reciprocity has the potential to provide the tools for land to heal. In contrast, the absence of reciprocity (e.g. engaging in extractive practices) provides no means for healing to occur and will almost certainly have the opposite effect.

Urutaunga/Adaptability

All CBPs indicated that adaptability to major disturbances is central in their experiences of living with and knowing dynamic landscapes. Traditionally, adaptability allowed Māori communities to use available resources responsibly. When resources started diminishing, Māori would let them replenish by placing a *rāhui* (temporary prohibition) and adapting to use other resources (Maxwell and Penetito 2007). In addition to *rāhui*,

proactive measures were also widely practiced, including habitat enhancement – e.g. periodic flushing of *hāpua* (coastal lagoons), population improvement (e.g. re-seeding shellfish beds), and harvesting restrictions – that ensured the breeding stocks were protected (Garven et al. 1997). This flexibility enabled Māori survival. Acceptance of and adaptability to being part of a larger system, rather than the supreme, was a common theme within our conversations that indicates how some Māori may have adapted to be resilient to major disturbances:

> Māori are very accepting of other-worldly things … [it was] a very Māori reaction … to pick up their shovels and get down there. They set up kitchens. Māori know how to do that—to feed huge numbers of people –a comment with respect to the 1931 Hawke's Bay earthquake

> I think what you gotta realise in the Māori world is that whatever takes place, takes place for a reason … But it's the world we live in, it's like, the hapū (kin-group) who doesn't have the discipline will disappear … And it's like that in the bigger world, if the gods all decide to get together and create this incredible event, that's the world we live in. That's what Māori understand. But we are survivors … And you can put that to any event, natural or physical that happened to the world. Māori would be kind of, more understanding about it. They might lose a lot of birds, trees, fishing holes and whatnot, but they're realistic enough to know that that's part of our place in the world.

Adaptability may enable people to quickly resume their roles as *kaitiaki* (guardians) of the land. Though the loss of human life in major disturbances is always mourned and acknowledged, the ability to adapt encourages healing.

Major disturbances also present an opportunity to adapt existing human-to-human relationships. Following both the 1931 Hawke's Bay earthquake and the 2016 Kaikōura earthquake, Māori and non-Māori 'pulled together' to ensure as many people were safe, healthy and well-fed as possible. One CBP considers the shift in relationships a part of healing landscapes:

> Now the earthquake … when it all happened, everyone pulled together up at Takahanga [Marae]. And there was no, there was no, what would I say, cultural divide? What I find now is that people are quietly disappearing off into their own groups again, you know. [But] Kaikōura was united as one. We're looking for more of a partnership agreement now. That 50–50 partnership agreement … there has been more transparency, more communication, so I think locally within Kaikōura we are moving forward. Yeah, partnership, yeah. Very much so. And also, like I said before … lessons are learnt on both sides. We are trying to heal that and actually … get that balance.

Major changes to landscapes provide opportunities for people to adjust, as was apparent in our conversations. Quietened voices are brought back to the table, people can work together to make decisions, and new potentials are realised. The aftermath of a distinctive shift in landscape is potentially a prime opportunity for cultural and social adaptation and advancement.

Ma te wā/Time and natural healing

> [It takes] as long as it takes …

All CBPs indicated that the only true healer of physical landscapes is time. It takes time for the indicators of healthy physical landscapes (Table 2) to rebound, and regeneration

or transition independent of human intervention is the primary means by which a landscape will heal.

> I've seen a lot of big, very serious [earthquake-caused] cracks [in the ground] and I have seen them heal themselves with more wind and landslides. It seems to be that mother nature does protect itself … [and] we've seen the land heal itself. And this is one of the most natural things, and it will actually heal itself quicker than anything.

Upon reflecting on stories told of a tsunami that occurred in the 1960s, one CBP indicated that the best way for the land to heal was for the rain to wash away the salt:

> They said they remember fish coming out the chimneys, especially at the old house, that's a story I heard recently. So what that would've done, if we had had plantations up the back they would've all been lost. Cows, the whole nine yards, all of our industry would've been severely impacted as a result of that. But, again, our response [to] that was to allow the land to heal. To let the rain wash away the salt, and to allow the cultivations to occur. And … if the grass would start to grow, if seedlings would start to grow, there was an indication that we could start to use that land again. But once the wai tai (salt-water) comes in, the salt water, everything dies.

But it can be acknowledged that humans, as a component of natural systems (Hikuroa 2017; Paul-Burke et al. 2018), can also have a role in healing processes:

> … we're part of the problem, which hopefully makes us part of the solution. We have whakapapa … we whakapapa back to trees, to gravel, to stone. You know, that's our worldview of things. So it's not a separation of things. As I say we're part of the problem so hopefully also part of the solution.

Cultural landscapes also take time to heal but may require more energy on the part of people. Re-building and sustaining relationships, especially following major disruptions, requires frequent interaction between groups and organisations. Healing relationships can be a generational process, requiring time for previous tensions and biases to pass. Advocating for land and community is a common experience for all participants in our team. Contributions from our CBPs include petitioning for the removal of a track on the side of Te Mata Peak, holding *hui* (meetings) with councils about water quality on agricultural lands, planting trees to slow sedimentation that is choking cockle beds, advocating for responsible interaction with the environment, and managing resources on behalf of a *rūnanga* (tribal council). Examples from our UBPs involve studying current and past landscapes, working with Māori communities and schools to improve Māori enrolment in tertiary education, and providing students of science and engineering from a range of backgrounds opportunities to engage with *Te Ao Māori* and *mātauranga* Māori to ensure these are normalised and practised in research and industry. Such examples are gestures of *kaitiakitanga* (guardianship) that aim to contribute towards a larger effort of landscape healing.

A holistic understanding of landscape healing – a synthesis of the summary categories

Mātauranga Māori reflects the cumulative experiences of Māori living with the dynamic landscapes of Aotearoa-NZ for centuries (Broughton and McBreen 2015). In some Māori perspectives, change in these lands is the only constant, a concept reflected in the

conversations shared here. Our conversations indicated that some Māori embrace the dynamic changes in physical landscapes by holding fast to the environmental principles so deeply ingrained in culture. Finding connections to *whenua* (land), having sustainable and reciprocal relationships with land, and adapting to and accepting change, are all ways to allow both people and land to flourish during all stages of landscape change.

Kaitiakitanga (environmental guardianship) embodies the cultural values that were identified as important in understanding how landscapes change and rebound following major disturbances. *Kaitiakitanga* reminds people that their tenure on this Earth is short when compared to that of the trees, mountains, rivers, oceans, and land. A Māori *whakatauki* (saying, proverb) embodies this philosophy: *whatungarongaro te tangata toitū te whenua* (people may disappear, but the land remains). *Kaitiakitanga* is a traditional obligation to protect the social and physical elements of environments for future generations (Selby et al. 2010) and has been shown to play a large role in community responses to major landscape-altering events in recent Aotearoa-NZ history. Engaging in *kaitiakitanga* allowed some Māori groups to show community resilience during and after the 2010–2011 Canterbury Earthquake Sequence (Kenney and Phibbs 2015), care for nearly 1000 tourists following the 2016 Kaikōura Earthquake (Carter and Kenney 2018), plant tens of thousands of native seedlings in Koukourarata Bay following extensive deforestation, and protect marine species through the use of *rāhui* (temporary prohibition) in times of stress (e.g. Memon et al. 2003). *Kaitiakitanga,* and all its implications for social and physical landscape response to major disturbances, is a way to remember that the health of the land is of utmost importance, and that health will be reflected in the people: *kei te ora te wai, kei te ora te whenua, kei te ora te tangata* (if the water is healthy, the land is healthy, the people are healthy). *Kaitiakitanga* shows that flourishing is mutual: if people take care of the land, the land will take care of the people.

Changes in landscape dynamics can also be explained through the concept of *mauri* (Hikuroa et al. 2018). *Mauri* is the life force or energy imbued in all elements of an environment, and exchanges of energy create fluctuations in *mauri* through time. *Mauri* is also imbued in people, and rebuilding connections to land may be one way to help heal a landscape (Sunde 2006; Marques et al. 2018), resulting in a positive feedback cycle between people and land health (Figure 4). A *mauri* framing sees landscapes as dynamic, rather than as static entities, and helps to perceive landscape-altering events as expressions of the energy of the natural world:

> We have no enemies. Aye, we simply have wild friends.

The CBPs revealed that landscape healing is not necessarily about a landscape reverting to the way it was before a major perturbation; rather, it is about the ongoing processes that a landscape undergoes and the way its *mauri* changes through time. In Aotearoa-NZ, dramatic changes in landscape, caused by the suite of dynamic processes that occur there, are part of the land's identity. A *mauri* framing of landscape change expects and anticipates changes in landscapes and recognises that agents of change can also be agents of healing.

Four of the summary categories presented here – *tūhononga* (connection), *whakauka* (sustainability), *tauutuutu* (reciprocity), and *urutaunga* (adaptability) – indicate that human relationships with land are the crucial elements to understanding landscape change and healing following a major disturbance. They draw distinctions between

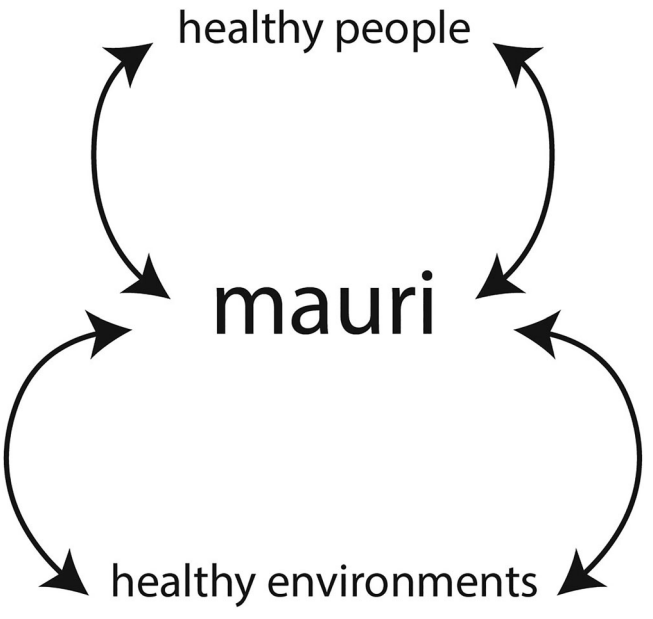

Figure 4. Cyclical transfer of *mauri* between people and environments.

physical and cultural landscapes, but also reveal how the two are intimately intertwined and dependent on each other. The fifth summary category – *mā te wā* (time/natural healing) – indicates that physical landscapes, that have existed long before humans and that will exist long after humans, will continue to operate on their own accords regardless of – yet alongside – human intervention. As one team member stated:

> There's only one healer and that's time.

This philosophy merits revisiting the discussion of cultural and physical landscapes, and how these two entities – albeit intertwined – may respond differently to landscape-altering events. Physical landscapes are resilient and are capable of healing themselves. Cultural landscapes, on the other hand, require effort from communities to rebuild social resilience. Lessons from the land, such being adaptable, may inform community resilience and therefore cultural landscape recovery following major landscape-altering events. When considered in tandem, the philosophies of the summary categories incite the narrative that all parts of the landscape – human and nonhuman, animate and inanimate – have shared interests when it comes to the ensuring the protection and safety of future generations (e.g. Mitten 2017).

Landscape-altering events as impetus for change

Some of our conversations revealed that major landscape-altering events provide an opportunity for societal change. This is consistent with an understanding that, for pre-colonised societies, major changes to physical landscapes promoted cultural evolution and development, rather than breakdown or collapse (Torrence and Grattan 2002). Adaptation and resilience strategies drawn from traditional Indigenous knowledge

systems and implemented by Indigenous peoples indicate that significant landscape change has the potential to build enduring knowledge. These strategies are increasingly guiding modern disaster risk reduction policies around the world (Becker et al. 2008; Walshe and Nunn 2012; Rahman et al. 2017; Thomas 2018). Though it can be argued that disasters do not always result in lasting change (Passerini 2000), major alterations to physical landscapes may provide the platform for changes in cultural and societal landscapes, and may generate opportunities to rebuild relationships between land and people, honour the land, and help decision-makers realise new possibilities in an ever-changing world.

We propose an innovative way of conceptualising landscape-altering events. Building upon the summary categories that arose in this work – namely adaptability and sustainability as positive change – and setting aside the idea that land sustains damage during major transformational events, we propose the concept of *Te Ohomauri o te Whenua: The Awakening Lifeforce of the Land.* This concept, informed by the capacity of the land to quickly jump into action, indicates that major events – earthquakes, storms, fires – are natural forces that have agency to alter their surroundings. *Te Ohomauri o te Whenua* reflects a concept informed by the conversations among our research team as a way of perceiving landscape change as a process through which the land has a right to grow, develop and change. This notion is consistent with the concept of *mauri* and reflects the 'rights of nature,' which honours Indigenous perspectives of land and waterways as having rights of their own to exist, change and endure through time (e.g. Boyd 2017; Brierley et al. 2018; O'Donnell and Talbot-Jones 2018; Cano Pecharroman 2018; Kauffman and Martin 2018). *Te Ohomauri o te Whenua* recognises that the land has the agency to come alive, to change rapidly, and to grow through time.

Major landscape-altering events provide the opportunity for people to learn from the land and consider those lessons in management and policy decisions. *Te Ohomauri o te Whenua* encapsulates the Māori cultural principles of *kaitiakitanga* (guardianship), *mauri* (life force, energy), and *mana* (authority, integrity), providing a holistic conceptualisation of major landscape-altering events. We do reiterate, however, that any loss of human life during such events is tragic. We do not intend to understate or diminish the importance of human relationships in our presentation of *Te Ohomauri o te Whenua*; indeed, connections and relationships are some of the important themes that arose from this work. We offer this concept as a potential way of using language and environmental literacy to understand place and process, as well as to connect to land (e.g. Carter 2005).

The call to prioritise Indigenous knowledge in understandings of landscape change

There is growing international recognition that local Indigenous knowledge plays an important role in risk reduction (e.g. Hiwasaki et al. 2014) and response (e.g. Kenney and Phibbs 2015) to major landscape perturbations. There is also increased acknowledgement that critical engagement with Indigenous knowledge systems is essential for long-term societal, environmental and cultural sustainability (Ford et al. 2016; Pingram et al. 2019). Scientific disciplines that study landscape change are being asked to consider if their current trajectories address societal needs satisfactorily (e.g. Koppes and King 2020) and to seek out knowledge systems that complement scientific endeavours (e.g.

Wilkinson et al. 2020). In many cases, the first step to moving towards a more holistic understanding of landscape change is documenting Indigenous perspectives and wisdom so that the knowledge can be preserved and woven into modern research and policy, bearing in mind this must be done appropriately. In Aotearoa-NZ, Māori communities are the *kaitiaki* (guardians) of *mātauranga Māori*. Similarly, worldwide, Indigenous peoples are the guardians of their knowledge. It must be understood that not all Indigenous knowledge will be accessible by everyone. When Indigenous knowledge is shared, at the discretion of those holding it, it is essential that the documentation of Indigenous knowledge and perspectives is done appropriately, respectfully, and in agreeance with those who shared that wisdom, so as to not perpetuate colonising practices (Smith 2012; Macfarlane et al. 2015; Macfarlane and Macfarlane 2018).

There are increasing numbers of resources for culturally respectful and responsive ways to weave Indigenous knowledge with science for better outcomes for communities (e.g. Bishop 1999; Harmsworth 2001; Morgan 2006; King and Goff 2010; Macfarlane and Macfarlane 2018; Rainforth and Harmsworth 2019; Maxwell et al. 2020; King et al. 2020; Wilkinson et al. 2020). These efforts, as well as the efforts of others too numerous to list here, have resulted in landmark policy achievements (e.g. legal personhood for rivers such as the Whanganui and Ganges Rivers; Cano Pecharroman 2018) that not only acknowledge but empower Indigenous approaches to landscape interactions (e.g. Brierley et al. 2018; O'Donnell and Talbot-Jones 2018; Aho 2019; Pingram et al. 2019; Eckstein et al. 2019), which are examples of contributions that Indigenous knowledge and worldviews can make to modern policy. There is an amplifying call that modern times require more holistic and systems understandings of the way people relate to and interact with the Earth's surface (Koppes and King 2020), and that weaving both scientific and Indigenous or local knowledge bases may provide the grounds for reframing research questions that better address the needs of modern societies – and landscapes – with respect to major changes on Earth's surface.

Conclusions

This paper presented a selection of Māori perspectives on landscape change and recovery following major perturbations in Aotearoa-NZ. The conceptualisation of *Te Ohomauri o te Whenua: The Awakening Lifeforce of the Land* reflects the individual and cumulative experiences of our research team, underpinned by many concepts central to *Te Ao Māori*. Significant values reflected in this work are connection, intergenerational sustainability, reciprocity and adaptability. Our conversations also revealed that time and natural healing are powerful tools for landscapes to settle after a major alteration.

The findings presented here encourage a reconsideration of how major landscape-altering events are conceptualised and managed. Our CBPs offered the following wisdom:

(1) Although humans sit alongside other elements of nature, there is a difference in modern implications of landscape change caused by human and nonhuman drivers.
(2) In the wake of major landscape-altering events caused by nonhuman forces, the role of people is to adapt to these changes without imparting additional stresses on the land.

(3) Major landscape-altering events caused by human forces have the potential to hurt the land and, in these situations, humans must redefine their roles as proponents of the land to help revert any mistakes that were made.
(4) No matter the driver of the change, humans must be *kaitiaki* (guardians) of the land.
(5) *Mauri* (life force, energy) embodies changes in landscapes through time, reflecting exchanges and interactions between physical and non-physical elements of landscapes.
(6) As *kaitiaki* (guardians) of the land, people should act with the land's best intentions in mind, being guardians of the land rather than masters of the land.

This wisdom, as well as the stores of wisdom held within *mātauranga* Māori, has the potential to guide transformative ways of conceptualising landscape dynamics as the holistic interactions between the land, people, and the nonhuman elements of environments. Collectively, we uphold that the perspectives presented here are reflections from the five CBPs as expressed through the combined worldviews of our team. *Mātauranga* Māori is a complex, detailed, and structured knowledge system that varies throughout different regions of Aotearoa-NZ; we by no means intend for the perspectives shared here to be taken as the only Māori perspectives. Our work contributes to prioritising Māori perspectives of landscape change, and advocates for respectful consideration of *Te Ao Māori* that we posit will contribute to cross-cultural conceptualisations of landscape evolution in Aotearoa-NZ.

Acknowledgements

The authors firstly thank our fifth participant, who was unable to accept the offer of authorship on this publication, and who shall remain anonymous. Their contributions to this work were paramount, and they are a core and valuable member of this team. Ngā mihi to you. We thank Dr Timothy Stahl for his constructive feedback on preliminary drafts of this article that greatly improved the final version. We thank Dr Sarah Beaven for her recommendations on qualitative data interpretation methods and for reading mature drafts of this article. We also thank Ariana Collier for her assistance with building the glossary of *te reo* Māori terms. We finally thank our managing editor and our peer-reviewers for their constructive reviews that further improved this work. This project was partially supported by QuakeCoRE, a New Zealand Tertiary Education Commission-funded Centre. This is QuakeCoRE publication number 0628. Author Hikuroa acknowledges work undertaken in previous Ngā Pae o te Māramatanga and Resilience to Natures Challenges funded projects that contributed to this research. This research was supported by an AINSE Ltd. Postgraduate Research Award (PGRA), awarded to author Wilkinson.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the University of Canterbury School of Earth and Environment and by QuakeCoRE [grant number 328MHQGRNT]. This research was supported by an AINSE Ltd. Postgraduate Research Award (PGRA).

ORCID

Daniel C. H. Hikuroa http://orcid.org/0000-0002-7340-7106

References

Aho LT. 2019. Te Mana o te Wai: an indigenous perspective on rivers and river management. River Research and Applications. 35(10):1615–1621. doi:10.1002/rra.3365.

Ashmore P. 2015. Towards a sociogeomorphology of rivers. Geomorphology. 251:149–156. doi:10.1016/j.geomorph.2015.02.020.

Becker J, Johnston D, Lazrus H, Crawford G, Nelson D. 2008. Use of traditional knowledge in emergency management for tsunami hazard: a case study from Washington State, USA. Disaster Prevention and Management; Bradford. 17(4):488–502. doi:10.1108/09653560810901737.

Bishop R. 1996. Collaborative research stories Whakawhanaungatanga. Palmerston North: The Dunmore Press.

Bishop R. 1999. Kaupapa Maori research: an indigenous approach to creating knowledge. In: Robertson N, editor. Maori and psychology: research and practice – the proceedings of a symposium sponsered by the Maori and Psychology Research Unit. Hamilton: Maori & Psychology Research Group; p. 1–7. https://researchcommons.waikato.ac.nz/bitstream/handle/10289/874/1999?sequence=1.

Boyd D. 2017. The rights of nature: a legal revolutoin that could save the world. Toronto: ECW Press.

Brierley G, Tadaki M, Hikuroa D, Blue B, Šunde C, Tunnicliffe J, Salmond A. 2018. A geomorphic perspective on the rights of the river in Aotearoa New Zealand. River Research and Applications. 12:1640–1651. doi:10.1002/rra.3343.

Broughton D, McBreen K. 2015. Mātauranga Māori, tino rangatiratanga and the future of New Zealand science. of the Royal Society of New Zealand. 45(2):83–88. doi: 10.1080/03036758.2015.1011171.

Bryant-Tokalau J, editor. 2018. Conclusion: what can Pacific Island conutried teach others about climate change? In: Indigenous Pacific approaches to climate change: Pacific Island countries. Dunedin: Springer; p. 85–94. doi:10.1007/978-3-319-78399-4.

Buggey S. 1999. An approach to aboriginal cultural landscapes.

Cano Pecharroman L. 2018. Rights of nature: rivers that can stand in court. Resources. 7(1):14 p. doi:10.3390/resources7010013.

Carter L. 2005. Naming to own place names as indicators of human interaction with the environment. AlterNative: An International Journal of Indigenous Peoples. 1(1):6–24. doi:10.1177/117718010500100102.

Carter LH, Kenney CM. 2018. A tale of two communities: B-race-ing disaster responses in the media following the Canterbury and Kaikōura earthquakes. International Journal of Disaster Risk Reduction. 28:731–738. doi:10.1016/j.ijdrr.2018.01.037.

Clapcott J, Ataria J, Hepburn C, Hikuroa D, Jackson A-M, Kirikiri R, Williams E. 2018. Mātauranga Māori: shaping marine and freshwater futures. New Zealand Journal of Marine and Freshwater Research. 52(4):457–466. doi:10.1080/00288330.2018.1539404.

Clark K, Howarth J, Litchfield N, Cochran U, Turnbull J, Dowling L, Howell A, Berryman K, Wolfe F. 2019. Geological evidence for past large earthquakes and tsunamis along the Hikurangi subduction margin, New Zealand. Marine Geology. 412:139–172. doi:10.1016/j.margeo.2019.03.004.

Covington WW. 2000. Helping western forests heal. Nature. 408(6809):135. doi:10.1038/35041641.

Cram F. 2021. Mahi aroha: Māori work in times of trouble and disaster as an expression of a love for the people. Kōtuitui: New Zealand Journal of Social Sciences Online. 0(0):1–15. doi:10.1080/1177083X.2021.1879181.

Eckstein G, D'Andrea A, Marshall V, O'Donnell E, Talbot-Jones J, Curran D, O'Bryan K. 2019. Conferring legal personality on the world's rivers: a brief intellectual assessment. Water International. 44(6–7):804–829. doi:10.1080/02508060.2019.1631558.

Ford JD, Cameron L, Rubis J, Maillet M, Nakashima D, Willox AC, Pearce T. 2016. Including indigenous knowledge and experience in IPCC assessment reports. Nature Climate Change. 6 (4):349–353. doi:10.1038/nclimate2954.

Forster M. 2016. Indigenous-Environmental-Autonomy-in-Aotearoa-new-Zealand. AlterNative: An International Journal of Indigenous Peoples. 12(3):316–330. doi:10.20507/AlterNative.2016.12.3.8.

Forster M. 2019. He Tātai Whenua: environmental genealogies. Genealogy. 3(3). [accessed 2019 Oct 22]. https://www.mdpi.com/2313-5778/3/3/42. doi:10.3390/genealogy3030042.

Garven P, Nepia M, Ashwell H. 1997. Te Whakatau Kaupapa o Murihiku. Wellington: Aoraki Press.

Graham JPH. 2009. Whakatangata kia kaha : toitū te whakapapa, toitū te tuakiri, toitū te mana : an examination of the contribution of Te Aute College to Māori advancement: a thesis presented in fulfilment of the requirements for the degree of doctor of philosophy in Education at Massey University, Palmerston North, New Zealand [thesis]. Massey University. [accessed 2019 Oct 22]. https://mro.massey.ac.nz/handle/10179/1254.

Harmsworth G. 2001. A collaborative research model for working with iwi: discussion paper.

Harmsworth G, Awatere S. 2013. Indigenous Māori knowledge and perspectives of ecosystems. In: Dymond J, editor. Ecosystem services in New Zealand-conditions and trends. Lincoln: Manaaki Whenua Press; p. 274–286.

Hikuroa D. 2017. Mātauranga māori—the ūkaipō of knowledge in New Zealand. Journal of the Royal Society of New Zealand. 47(1):5–10. doi:10.1080/03036758.2016.1252407.

Hikuroa D, Clark J, Olsen A, Camp E. 2018. Severed at the head: towards revitalising the mauri of Te Awa o te Atua. New Zealand Journal of Marine and Freshwater Research. 52(4):643–656. doi:10.1080/00288330.2018.1532913.

Hiwasaki L, Luna E, Syamsidik, Shaw R. 2014. Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities. International Journal of Disaster Risk Reduction. 10:15–27. doi:10.1016/j.ijdrr.2014.07.007.

Jolly D, Ngā Papatipu Rūnanga Working Group. 2013. Mahaanui Iwi Management Plan. Ngāi Tūāhuriri Rūnanga, Te Hapū o Ngāti Wheke (Rāpaki), Te Rūnanga o Koukourārata, Ōnuku Rūnanga, Wairewa Rūnanga, Te Taumutu Rūnanga.

Jones D. 2011. The water harvesting landscape of Budj Bim and Lake Condah: whither world heritage recognition. Proceedings of the 2011 International Conference of the Association of Architecture Schools of Australasia; Jan 1. p. 131–142.

Kauffman CM, Martin PL. 2018. Constructing rights of nature norms in the US, Ecuador, and New Zealand. Global Environmental Politics. 18(4):43–62. doi:10.1162/glep_a_00481.

Kawharu M. 2009. Ancestral landscapes and world heritage from a Māori viewpoint. The Journal of the Polynesian Society. 118(4):317–338.

Kelman I, Mercer J, Gaillard JC. 2012. Indigenous knowledge and disaster risk reduction. Geography. 97(1). [accessed 2019 Oct 10]. https://search.proquest.com/docview/1459729135?pq-origsite=gscholar.

Kenney CM, Phibbs S. 2015. A Māori love story: community-led disaster management in response to the Ōtautahi (Christchurch) earthquakes as a framework for action. International Journal of Disaster Risk Reduction. 14:46–55. doi:10.1016/j.ijdrr.2014.12.010.

Kenney CM, Phibbs SR, Paton D, Reid J, Johnston D. 2015. Community-led disaster risk management: A Maori response to Otautahi (Christchurch) earthquakes. Australasian Journal of Disaster and Trauma Studies. 19(1):9–20.

Kimmerer RW. 2013. Braiding sweetgrass: indigenous wisdom, scientific knowledge and the teachings of plants. Minneapolis (MN): Milkweed Editions.

King D, Goff J. 2006. Maori environmental knowledge in natural hazards management and mitigation. Auckland: National Institute of Water and Atmospheric Research Ltd Report No.: GNS05301-1.

King D, Goff J, Skipper A. 2007. Māori environmental knowledge and natural hazards in Aotearoa-New Zealand. Journal of the Royal Society of New Zealand. 37(2). [accessed 2019 Jun 12]. https://www.tandfonline.com/doi/abs/10.1080/03014220709510536.
King DN, Goff JR. 2010. Benefitting from differences in knowledge, practice and belief: Māori oral traditions and natural hazards science. Natural Hazards and Earth System Sciences. 10(9):1927–1940. doi:10.5194/nhess-10-1927-2010.
King DN, Manawatu M, Shaw WS. 2020. Comparing and combining ethnographic records with active Māori histories to provide insights on tsunami hazard. Quaternary Research. 95:43–55. doi:10.1017/qua.2019.84.
Koppes M, King L. 2020. Beyond x,y,z(t); navigating new landscapes of science in the science of landscapes. Journal of Geophysical Research: Earth Surface. 125(9):e2020JF005588. doi:10.1029/2020JF005588.
Kristensen GK, Ravn MN. 2015. The voices heard and the voices silenced: recruitment processes in qualitative interview studies. Qualitative Research. 15(6):722–737. doi:10.1177/1468794114567496.
Lambert SJ. 2014. Indigenous peoples and urban disaster: Māori responses to the 2010-12 Christchurch earthquakes. [accessed 2021 Jun 25]. https://hdl.handle.net/10182/6670.
Lambert SJ. 2015. Policy instruments for indigenous peoples and disaster risk reduction a case study of māori participation in Disaster and Emergency Management, Aotearoa New Zealand. [accessed 2021 Jun 25]. https://hdl.handle.net/10182/6552.
Lane MB, Ross H, Dale AP, Rickson RE. 2003. Sacred land, mineral wealth, and biodiversity at Coronation Hill, Northern Australia: indigenous knowledge and SIA. Impact Assessment and Project Appraisal. 21(2):89–98. doi:10.3152/147154603781766374.
Longhurst R. 2016. Semi-structured interviews and focus groups. In: Clifford N, Cope M, Gillespie T, French S, editors. Key methods in geography. Glasgow: SAGE; p. 143–156.
Macfarlane S, Macfarlane A, Gillon G. 2015. Sharing the food baskets of knowledge: creating space for a blending of streams. In: Macfarlane A, Macfarlane S, Webber M, editors. Sociocultural realities: exploring new horizons. Christchurch: Canterbury University Press; p. 52–67.
Macfarlane S, Macfarlane AH. 2018. Toitū Te Mātauranga: valuing culturally inclusive research in contemporary times : a position paper prepared under the auspices of the Māori research laboratory, Te Rū Rangahau, in conjunction with the child wellbeing Institute at the University of canterbury. Christchurch: University of Canterbury.
Marques B, McIntosh J, Hatton W. 2018. Haumanu ipukarea, ki uta ki tai: (re)connecting to landscape and reviving the sense of belonging for health and wellbeing. Cities & Health. 2(1):82–90. doi:10.1080/23748834.2018.1514754.
Maxwell KH, Penetito W. 2007. How the use of rahui for protecting taonga has evolved over time. MAI Review. 2:15.
Maxwell KH, Ratana K, Davies KK, Taiapa C, Awatere S. 2020. Navigating towards marine co-management with Indigenous communities on-board the Waka-Taurua. Marine Policy. 111:103722. doi:10.1016/j.marpol.2019.103722.
Mead HM. 2003. Tikanga Maori|living by Maori values. Wellington: Huia Publishers.
Memon PA, Sheeran B, Ririnui T. 2003. Strategies for rebuilding closer links between local indigenous communities and their customary fisheries in Aotearoa/New Zealand. Local Environment. 8(2):205–219. doi:10.1080/1354983032000048505.
Mitten D. 2017. Connections, compassion, and co-healing: The ecology of relationships. In: Malone K, Truong S, Gray T, editors. Reimagining sustainability in precarious times. Singapore: Springer; p. 173–186. [accessed 2020 Sep 14]. doi:10.1007/978-981-10-2550-1_12.
Morgan TKKB. 2006. Decision-support tools and the indigenous paradigm. Engineering Sustainability. 159(ES4):169–177.
O'Donnell E, Talbot-Jones J. 2018. Creating legal rights for rivers: lessons from Australia, New Zealand, and India. Ecology and Society. 23(1). [accessed 2019 Oct 9]. https://www.ecologyandsociety.org/vol23/iss1/art7/. doi:10.5751/ES-09854-230107.
Orchiston C, Mitchell J, Wilson T, Langridge R, Davies T, Bradley B, Johnston D, Davies A, Becker J, McKay A. 2018. Project AF8: developing a coordinated, multi-agency response plan for a

future great Alpine Fault earthquake. New Zealand Journal of Geology and Geophysics. 61 (3):389–402. doi:10.1080/00288306.2018.1455716.
Passerini E. 2000. Disasters as agents of social change in recovery and reconstruction. Natural Hazards Review. 1(2):67–72. doi:10.1061/(ASCE)1527-6988(2000)1:2(67).
Paul-Burke K, Burke J, Team TŪRM, Bluett C, Senior T. 2018. Using Māori knowledge to assist understandings and management of shellfish populations in Ōhiwa harbour, Aotearoa New Zealand. New Zealand Journal of Marine and Freshwater Research. 52(4):542–556. doi:10.1080/00288330.2018.1506487.
Pingram M, Price J, Thoms M. 2019. Integrating multiple aquatic values: perspectives and a collaborative future for river science. River Research and Applications. 35(10):1607–1614. doi:10.1002/rra.3562.
Rahman A, Sakurai A, Munadi K. 2017. Indigenous knowledge management to enhance community resilience to tsunami risk: lessons learned from *smong* traditions in simeulue island, indonesia. IOP Conf Ser: Earth Environ Sci. 56:012018. doi:10.1088/1755-1315/56/1/012018.
Rainforth HJ, Harmsworth G. 2019. Kaupapa Maori Freshwater Assessments: A summary of iwi and hapu-based tools, frameworks and methods for assessing freshwater environments.
Rauika Mangai. 2020. A Guide to Vision Matauranga: Lessons from Maori Voices in the New Zealand Science Sector. http://www.maramatanga.co.nz/sites/default/files/Rauika%20Ma%CC%84ngai_A%20Guide%20to%20Vision%20Ma%CC%84tauranga_FINAL.pdf.
Royal TAC. 1992. Whakapapa. GRINZ yearbook. (Journal Article): 21–25.
Royal TAC. 1998. Te Ao marama: a research paradigm. He Pukenga Korero. 4:1–8.
Royal TAC. 2009. Mātauranga Māori: an introduction. Porirua: Mauriora-ki-te-Ao/Living Universe Ltd. http://canterbury.summon.serialssolutions.com/2.0.0/link/0/eLvHCXMwY2AwNtIz0EUrE8wMkwxTjFIMzYySEs2TLYxTk80MLVIMLBItktMMjRLTUDe9MpQin1ZQAVoLhGoL5pGJKZnpoEs2dBGrh9B0FEFHw4v1kxNzC0qL9X19M0FrwVMgh7TqFaSkMQO7bgagzO0WEQHqwFmaWhhZAlvwZtCDemB8xJJEkPlI1ZGbIANrKmiPghADU2qeCIOIb-KZlpLEUmCtk56oAOLkF2WKMii6uYY4e-gijIiHDtWAtgiDTm8xFmPgTQQtcM8rAW-ES5FgUADW44lpwOZCairoztpUoyQDI2A_2DI5KSnFMtkgyUySQQq3gVL4JKUZuCBTJKBxBRkGlpKi0lRZZB_KgUMEAK1wjJU.
Saunders W. 2017. Setting the scene: the role of iwi management plans in natural hazard management. [accessed 2019 Aug 20]. https://shop.gns.cri.nz/sr_2017-030-pdf/. doi:10.21420/g26d2v.
Selby R, Moore PJG, Mulholland M, editors. 2010. Māori and the environment: Kaitiaki. Wellington: Huia Publishers. [accessed 2020 Sep 16]. https://www.royalsociety.org.nz/150th-anniversary/tetakarangi/maori-and-the-environment-kaitiakirachael-selby-pataka-j-g-moore-and-malcolm-mulholland-eds-2010/.
Smith LT. 2012. Decolonizing methodologies: research and indigenous peoples, 2nd ed. Dunedin: Otago University Press.
Smith LT, Maxwell TK, Puke H, Temara P. 2016. Indigenous knowledge, methodology and mayhem: what is the role of methodology in producing indigenous insights? A discussion from Mātauranga Māori. Knowledge Cultures. 4(3):131–156.
Sunde C. 2006. Healing Ecological and Spiritual Connections Through Learning to be Non-Subjects. [accessed 2018 Feb 19]. https://researchspace.auckland.ac.nz/handle/2292/18731.
Thomas DR. 2006. A general inductive approach for analyzing qualitative evaluation data. American Journal of Evaluation. 27(2):237–246. doi:10.1177/1098214005283748.
Thomas K-L. 2018. Research to inform community-led action to reduce tsunami impact, Wharekauri-Rekohu-Chatham Islands, Aotaeroa-New Zealand [masters thesis]. Christchurch: University of Canterbury.
Torrence R, Grattan J, editors. 2002. Natural disasters and cultural change. London: Routledge (One world archaeology).
UNESCO. 2008. Operational guidelines for the implementation of the World Heritage Convention. https://whc.unesco.org/archive/opguide08-en.pdf#annex3.
UNISDR (United Nations Office for Disaster Risk Reduction). 2017. Terminology. [accessed 2020 Sep 15]. https://www.undrr.org/terminology.

Walshe RA, Nunn PD. 2012. Integration of indigenous knowledge and disaster risk reduction: a case study from Baie Martelli, Pentecost Island, Vanuatu. Int J Disaster Risk Sci. 3(4):185–194. doi:10.1007/s13753-012-0019-x.

Wanat CL. 2008. Getting past the gatekeepers: differences between access and cooperation in public school research. Field Methods. 20(2):191–208. doi:10.1177/1525822X07313811.

Wang Z, Cui P, Wang R. 2009. Mass movements triggered by the Wenchuan earthquake and management strategies of quake lakes. International Journal of River Basin Management. 7(4):391–402. doi:10.1080/15715124.2009.9635397.

Wilcock D, Brierley G. 2012. It's about time: extending time-space discussion in geography through use of 'ethnogeomorphology' as an education and communication tool. Journal of Sustainability Education. 3:1–28.

Wilkinson C, Hikuroa DCH, Macfarlane AH, Hughes MW. 2020. Mātauranga Māori in geomorphology: existing frameworks, case studies, and recommendations for incorporating Indigenous knowledge in earth science. Earth Surface Dynamics. 8(3):595–618. doi:10.5194/esurf-8-595-2020.

Wilkinson C, Macfarlane A. 2021. Braiding the rivers of geomorphology and Mātauranga Māori: A case study of landscape healing in Koukourarata. In: Hill C, editor. Kia Whakanuia te Whenua: people place landscape. [place unknown]: Landscape Foundation; p. 245–257.

Wilmshurst JM, Anderson AJ, Higham TFG, Worthy TH. 2008. Dating the late prehistoric dispersal of polynesians to New Zealand using the commensal Pacific rat. PNAS. 105(22):7676–7680. doi:10.1073/pnas.0801507105.