

Exploration of Indigenous Practices and Knowledge Concerning Natural Hazards and Risk Reduction

Case studies: Māori of Aotearoa/New Zealand
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A Note from the Author

It's a conundrum: it seems the more I learn, the more my ignorance becomes apparent – and particularly, about traditional Indigenous knowledge. It is a broad and rich field of exploration that I have come to appreciate more though the opportunity of this consultancy.

Here is why, in part: the landscape of Indigenous knowledge seemed narrow when viewed through the small window through which I had initially been exposed. That's not to say that I ever suspected that the knowledge of Indigenous Peoples was not rich. It most certainly is. Rather, my limited, and frankly negative view of the phrase came from my professional experience in the field, where I had too often seen the phrase used as what I considered a placeholder—in meetings, conferences, needs assessments, etc.—for a broader and deeper discussion that should and would happen at some time... but never seemed to happen. To me, it seemed a way to suggest that a deliberative body had given reasonable consideration to the necessity to respect Indigenous Peoples, their experience and their needs without defining what that experience was, what those needs were or how, specifically, they would be met. And too frequently, when reports of meetings or findings of assessments were written, the words used were not the words of the Indigenous delegates themselves; for, more often than not, there was neither a sufficient number of Indigenous delegates assembled, nor was there enough time to discuss various Indigenous perspectives (they are not homogenous), nor were sufficient interpretation and translation resources available, nor... ad infinitum, to accurately represent the many and varied needs of the communities about whom the meetings were convened and the assessments commissioned.

Humankind developed complex societies over thousands of years in a world in which 'disasters' as we know them today did not occur. That is not to say that their exposure to natural hazards was non-existent nor that their vulnerability to these natural hazards was less. The way in which the first humans related to disasters and hazards is likely not too different from conventional beliefs that were widely held until fairly recently: that disasters were considered acts of god(s) or a divine supra-natural force; they were examples of animism. These beliefs endured for many reasons, including the fact that population centers were very dispersed and structural assets less complex than today.

In a not too distant past, beginning in the early 1970's, as death tolls continued to rise dramatically, another school of thought began to take root: it is potentially possible to avoid disasters if we change our approach. The idea of preparedness was born, which further evolved into disaster mitigation and risk reduction. Today it is commonplace to speak in terms of risk management and resilience.

From a personal interview with Dr. Jean Luc Poncelet, former head of the Pan American Health Organization/WHO Department of Public Health Emergencies.

1. Māori of Aotearoa/New Zealand

Traditional Indigenous Knowledge

Understanding Indigenous worldviews and whether and to what extent they lead to reduced risk to natural hazards is at the core of this initiative. And it would be possible to spend a great deal of time discussing traditional Indigenous knowledge (TIK) and the many and varied characterizations that describe TIK (or TEK, Traditional Ecological Knowledge, or other similar terms).

My personal view of Indigenous knowledge is that it comprises content, empirical evidence gathered over generations and tested, assimilated and transferred through culturally-framed processes. It is the filter (comprised of customs, beliefs, values) through which experience, past and present, is processed and science and technology is adopted or adapted by individuals and communities. It is an ongoing process.

It is interesting and worthwhile to explore the many and varied understandings of Indigenous worldviews, cosmivision, and the diversity of ideas surrounding the terms. But to dwell too long on definitions, particularly when attempting to explore only a small facet of a much larger cultural experience (in our case DRR), runs the risk of becoming too involved in the frequently contentious discussion over what is meant by traditional Indigenous knowledge and the similarly contentious argument as to whether there is an equivalency between traditional knowledge and “Western Science”, or whether it matters. For a richer understanding of the traditional experience and reasons why TIK is such an important issue to many Indigenous people, the reader is encouraged to make the effort to explore the issue. In this author’s experience, however, this discussion can challenge our ability to move the broader conversation forward.

For the purpose of this paper the term traditional Indigenous knowledge will be characterized using the definition offered the Dene Cultural Institute (Canada), which captures well the inclusive nature of traditional knowledge (in this case, through an environmental lens):¹

“Traditional environmental knowledge is a body of knowledge and beliefs transmitted through oral tradition and first-hand observation. It includes a system of classification, a set of empirical observations about the local environment, and a system of self-management that governs resource use. Ecological aspects are closely tied to social and spiritual aspects of the knowledge system. The quantity and quality of TEK varies among community members, depending upon gender, age, social status, intellectual capability

¹ For the reader who is interested in further exploring the discussion of TIK, I suggest, as a start, looking at the several definitions of the topic compiled by the National Aboriginal Forestry Association of Canada http://nafeforestry.org/forest_home/documents/TKdefs-FH-19dec06.pdf.

and profession (hunter, spiritual leader, healer, etc.). With its roots firmly in the past, TEK is both cumulative and dynamic, building upon the experience of earlier generations and adapting to the new technological and socioeconomic changes of the present” (Dene Cultural Institute 1995 in English translation, quoted in Stevenson 1996: 281).

Let’s look at the experiences and understandings of the Māori I visited in New Zealand in November of 2017. My visit took place over the period of 10 days during which I visited several cities and communities from the north to the south of New Zealand.

Aotearoa is the Māori name for the country of New Zealand. The literal translation of Aotearoa is “*land of the long white cloud.*” The legend of the long white cloud, itself, is an example of TEK with clouds rising above islands, making land discoverable from tens if not hundreds of miles away.

Auckland is Aotearoa’s largest city and is one of the world’s most ethnically diverse cities, with a population of over one and a half million people. It is home to the largest Pasifika population in the world and to two-thirds of the country’s Māori population. Wellington is Aotearoa’s capital city, yet Auckland hosts many important Māori organizations and institutions, including research programs concerned with Indigenous issues. Although I spent some time in Auckland, most of the meetings and interviews in which I participated occurred in smaller towns and communities in the country. Ten days is insufficient to fully understand the Māori culture and its views on disaster risk reduction, but I received considerable assistance from a friend and colleague, Dr. Simon Lambert, who is Māori and a former researcher at Lincoln University in Christchurch. Dr. Lambert’s research interests include the role of Indigenous communities and Indigenous knowledge in disaster risk reduction. Further, I found and read what I thought to be a surprising number of journal articles specifically dealing with disaster risk reduction in Māori communities. (Links to text and audio outtakes can be found throughout this report and journal articles are cited where appropriate).

Disaster Risk Reduction Terminology

Within the professional community, several key terms are used in discussions of disaster risk reduction, including ‘hazard,’ ‘disaster,’ ‘emergency,’ ‘risk,’ ‘vulnerability,’ and more recently, ‘resilience’. Although the terms ‘response,’ ‘relief,’ and ‘recovery’ are not commonly associated with disaster risk reduction (DRR), they do figure in discussions surrounding disaster resilience and are more typically associated with post-event activities.

This following simplified scenario can help to explain these DRR terms: Communities located in areas that frequently experience hurricanes are at **risk**. Hurricane-related **hazards** are related to strong winds, excessive rainfall and storm surge that accompany these events. The community is **vulnerable** if it lacks systems, infrastructure, etc. to deal with the impact of a hurricane; in other words, the absence of early warning system; no building codes or codes not enforced; and poor land use management that has resulted in deforestation, which may promote flooding, etc. The United Nations Office for Disaster Risk Reduction summarizes the definition

of risk as: The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

A hurricane is a naturally occurring phenomenon. Whether or not it becomes a disaster rather than an emergency situation depends on the degree to which a community can manage the aftermath. The threshold for considering it a disaster would be if it results in significant loss of life, property or other economic loss and if the magnitude of the event outstrips the community's ability to cope using its own resources. (It's important to note that the intensities and frequencies of hurricanes are influenced by a warming climate. And humans are influencing a warming climate, to an extent that we are only recently discovering. Therefore, the damage caused by hurricanes might not necessarily be described as entirely 'natural.')

The resilience of a community is characterized by its ability to function throughout the hurricane, or at least the ability to restore critical systems soon afterwards, thereby preventing or significantly mitigating disruption to lives, livelihoods and economies (resilience usually is not the result of luck. Rather, it is attributed to the development and implementation of community-specific disaster risk reduction strategies).

It is also important to understand that Indigenous (and other) communities may simultaneously exhibit vulnerability and resilience. The resilience is often from 'learned strength' (as distinct from TIK). That is, individuals and communities, through adversity, are becoming stronger than they originally were, simply as a means to survive daily emergencies and struggles. This is a useful, if new, observation, as it gets away from the assumption that Indigenous Peoples are resilient through some sort of cultural 'magic' (i.e., DNA and culture do not confer resilience).

Brief History of New Zealand and the Māori

Until the 1800s, Aotearoa was exclusively Māori and governed by tribal (*iwi*) or sub-tribal (*hapū*) laws. In the early 1800s, Christian missionaries began putting pressure on the King of England to colonize New Zealand. Initial steps in that direction included encouraging New Zealand to assert its independence, which occurred in 1835 in the northern-most tribes, with the signing of the Declaration of Independence of New Zealand by 34 Māori chiefs. The Declaration asserted the independence of Aotearoa, with all sovereign power and authority residing with the hereditary chiefs and tribes. From the British perspective, the motivation to encourage this declaration was so that the independent country could then formally call upon King William IV of Britain to become their 'father and protector.'

Subsequently, in February of 1840, *Te Tiriti o Waitangi* (the Treaty of Waitangi) between Māori and the British Crown (with Queen Victoria the reigning monarch) was signed. The Treaty guaranteed Māori full possession of their land in exchange for their recognition of British sovereignty. The Treaty of Waitangi is regarded as Aotearoa's founding document.

The English version of the Treaty of Waitangi guaranteed to Māori the full, exclusive and undisturbed possession of their lands, forests, fisheries and other properties, in exchange for ceding their sovereignty to the Crown. The Māori version of the treaty, which was the version most Māori signed, preserved for Māori their *rangatiratanga* (literally, ‘chieftainship’) over their lands, villages and all their *taonga* (treasures), in exchange for their gift to the Crown of their complete *kāwanatanga* (literally, ‘governorship’). In both versions the Crown guaranteed Māori its protection and conferred upon them the rights and privileges, or *tikanga*, of British subjects.²

A constitution introduced by the Crown in 1852 established a system of representative government for New Zealand. Six (eventually ten) provinces were created, with elected superintendents and councils. At the national level, a General Assembly was established consisting of a Legislative Council appointed by the Crown and a House of Representatives, elected every five years by men over the age of 21 who owned, leased or rented property of a certain value. As Māori possessed their land communally, nearly all were excluded. Four Māori parliamentary seats were eventually created in 1867, but in a Parliament with 76 members their impact was negligible.³

A Few Words about a Big Issue: Colonialism in Aotearoa

One possible explanation for the historical disregard of Indigenous knowledge in established DRR may be due to issues associated with power relations stemming from colonial times and the hegemony of western values and ideas. Given that knowledge is power, in this case the power over resources and the discourse about them, Indigenous knowledge has been largely ignored by those who protect their own interests and established political structures. In post-colonial times, it was not uncommon for the language and religion of the colonizer to be forced on Indigenous Peoples (it’s no accident that today many Māori, and in particular youth, do not speak their native language). Other insidious and long-term implications include the loss of stories and storytelling and similar traditions of an oral culture as well as an erosion of traditional decision-making customs that defined trusteeship of the land and environment.

Nonetheless, there seems to be a resurgence of the value of Indigenous knowledge for disaster risk reduction that is increasingly recognized in mainstream academia and research institutions and, to a lesser degree, in concrete policies. International initiatives and national policies that incorporate it, as well as the advantages and challenges behind this integration, will be discussed in subsequent sections.

Dr. Adreanne Ormond, Māori, and a researcher at Lincoln University in New Zealand, characterized the relationship between colonialism and hazards in philosophical and cultural terms. Of the several natural hazards she might have described, her focus was on the challenges of “being Indigenous people in a society that is not based on Indigenous values... it's almost like we exist as beings clinging to an extinct identity in a world that does not support (that identity) to

² Matthew Palmer, 'Constitution - Constitutional relationships between the Crown and Māori', Te Ara - the Encyclopedia of New Zealand, <http://www.TeAra.govt.nz/en/constitution/page-6> (accessed 15 August 2018).

³ 'History of New Zealand, 1769-1914', URL: <https://nzhistory.govt.nz/culture/history-of-new-zealand-1769-1914>, (Ministry for Culture and Heritage), updated 17-Mar-2016.

flourish.”. The significance of this, according to Dr. Ormond, is that lack of respect for Māori culture influences many of the other ways that Māori would otherwise know about and recognize hazards. She says, “One of the main things that we fight at home in terms of trying to survive, is trying to keep our identity. And that identity is largely linked to natural resources.”

Dr. Ormond also gave an example of what she characterized as the vulnerability of cultural resilience resulting from erosion of traditions. She described how youth, frustrated by political decisions affecting land use management, felt forced to engage in civil disobedience. Their vulnerability, in her opinion, results from the fact that these youth are at risk of breaking the law, forfeiting their cultural traditions of being respectful.

In terms of resilience and survival, Dr. Ormond sees these as having their origin in colonization. “I think that in these communities you're dealing with a real sense of how to survive. What affects us the most? What puts us at risk the most? It's not the natural disasters ... it's this incremental stuff that we see people die from. We don't see them die from volcanoes or tsunamis, we see them die from diabetes, heart attack, worry, lack of education, poverty.” In Dr. Ormond's view, their lives are about survival. “... death by a volcano, tsunami, or earthquake, is a quick death. This other stuff I see as slow death.”

Māori Spiritual Worldview

Mātauranga Māori

During my visit was to New Zealand, I spoke with several Māori professionals and academics, including Garth Harmsworth, an environmental scientist at Landcare Research (*Manaaki Whenua*). Mr. Harmsworth used the phrase *Mātauranga Māori* while speaking about traditional Indigenous knowledge, which, he said, embraces a wide range of knowledge forms, beyond the traditional. “When we use the term *Mātauranga Māori* we're actually talking about a continuum of knowledge forms, right through to the fusion with more contemporary Western knowledge. It's a Māori-led or Indigenous-led way of thinking about a problem or an issue.” The term, Harmsworth believes, came into use in the late 19th century, to differentiate between Christian and Māori belief systems. Since that time, the term has been increasingly used in a large body of work in New Zealand, demonstrating that traditional knowledge has a place in contemporary society.

Another interpretation of *Mātauranga Māori* states that it can be seen as a “...holistic perspective encompassing all aspects of knowledge and seeks to understand the relationships between all component parts and their interconnections to gain an understanding of the whole system. It is based on its own principles, frameworks, classification systems, explanations and

WHAT IS MATAURANGA MĀORI?

Mātauranga Māori can be defined as ‘the knowledge, comprehension, or understanding of everything visible and invisible existing in the universe’ and is often used synonymously with wisdom. In the contemporary world, the definition is usually extended to include present-day, historic, local, and traditional knowledge; systems of knowledge transfer and storage; and the goals, aspirations and issues from an Indigenous perspective.

Mātauranga Māori is a dynamic and evolving knowledge system, has both qualitative and quantitative aspects, and includes the processes for acquiring, managing, applying and transferring that body of *knowledge*.”

terminology. *Mātauranga Māori* is a dynamic and evolving knowledge system, has both qualitative and quantitative aspects, and includes the processes for acquiring, managing, applying and transferring that body of knowledge.”

In present day, *Mātauranga Māori* is being fused with other knowledge forms, including Western science. Harmsworth notes that with regard to these changes, “you’ll see them around the country with all these projects going on. They’re very much a fusion of knowledge forms, despite a lot of cultural monitoring across New Zealand, particularly in the water area, where they are drawing on modern science and traditional knowledge forms to really assess the health and the state of water or other resources. So, we’re seeing a lot of this being used in resource management now, particularly by Indigenous groups.”

Dr. Harmsworth further explained that “Māori believe they are connected to all things within nature.” This includes living things as well as physical features, such as mountains, rivers, rocks, and land, that in other cultures are most often considered inanimate objects. For Māori, everything has a life force, an essence or a *mauri*. Māori are bound to be continually respectful of those who preceded them in their genealogy. *Mātauranga Māori* places importance on Māori history, knowledge, and language, and to ‘Māori ways of thinking, doing, and acting’. “It is a multi-faceted and complex concept that is connected to a multitude of sources of language, culture, land, and bridges both traditional and contemporary Māori knowledge and philosophies through which Māori history and knowledge are uncompromisingly told,” explained Dr. Harmsworth. The platform of *Mātauranga Māori* advocates for a system of Māori knowledge that recognizes cultural identity and cultural affirmation as important foundations that are connected to Māori world views.

Mātauranga Māori is a crucial element in chronicling perspectives, experiences and knowledge of specific landscape and volcanic events within iwi history in Aotearoa New Zealand. Information surrounding volcanic hazards exists within the *mātauranga-ā-iwi* (specific tribal knowledge), for *Ngati Rangi* principally through *waiata* (song) and *karakia* (prayer). As a repository of cultural knowledge and information (From H. Gabrielsen, J. Procter, H. Rainforth, T. Black, G. Harmsworth and N. Pardo paper).

Because *Matauranga* is so specific to the Māori worldview, non-Indigenous communities face challenges in understanding or assimilating this knowledge. Dr. Ataria remembered asking a question of several elders who had Christian beliefs and were also regarded by him as expert practitioners, or *tohunga*, in many respects. They were steeped in Māori cultural law, processes, and philosophies. What struck Dr. Ataria was just how seamlessly they moved from one world to the other. He asked, “How do you do it? Do you live a dual life and a Dr. Jekyll and Mr. Hyde type of existence?” The response of the *tohunga* was, “We just do it, and it feels absolutely normal.”

In the culture of the Māori of New Zealand, a **tohunga** is an expert practitioner of any skill or art, either religious or otherwise. **Tohunga** include expert priests, healers, navigators, carvers, builders, teachers and advisors.

“Māori experts,” he continued, “have been experts at picking the best things out of both cultures: technology is a case in point. They are happy to use something if it makes the job or the process go more smoothly. And it's almost as if religion was seen in that same light as well, as that there were some really good aspects that Māori liked and took it and used it and still use it today, but still are absolutely comfortable moving into the more traditional space when and where that's needed and required, and only they will know best when to do that. But it just seemed they could just, without flicking an eyelid, just move seamlessly between the two.”

Māori Respect for Knowledge

Dr. Ataria believes that Māori respect knowledge is critical, with established processes, structures, and safeguards in place to protect the integrity of that knowledge. The *whare wānanga* were an example of this. A *whare wānanga* was a university, a place of higher learning - traditionally, places where *tohunga* taught their people's knowledge of history, genealogy and religious practices. The *whare wānanga* had strict entrance criteria, some of which were based on genealogy—your *whakapapa*—your lineage, because the Māori identified early on that your genetic makeup described your characteristics. For example, if you had a grandfather who was a great orator or a father who was a great orator, you probably had the ability to become a great orator. The intergenerational transfer of knowledge was critical. This is but one example of the high regard that Māori placed on knowledge, which they diligently protected.

Dr. Ataria further explained that “knowledge was held in very, very high respect. We had definite structures and institutions, knowledge institutions and different forms of knowledge.” He uses ‘creation stories’ as an example of one form of knowledge. “The notion of our origin narratives provides a nice way to transfer stories to our children and to their children and so forth. But you can actually drill down into these narratives, and the further you drill down, the deeper you get into the actual knowledge itself and what knowledge is.”

Knowledge, and especially *tapu*, is also to be protected and out of reach from those who might abuse or misuse either. As defined by New Zealand’s Intellectual Property Office, *tapu* is the strongest force in Māori life. *Tapu* can be interpreted as 'sacred', or defined as 'spiritual restriction,' containing a strong imposition of rules and prohibitions. As introduced earlier by Dr. Ataria, the role of the *tohunga* was that of ensuring that communities and individuals keep safe from a spiritual perspective. He offered, “... so I think if you talk about hazards and risks to Māori, if you talk about things like *tapu*, these are terms are sort of like sacred. English has a very poor way of describing what it means. We believe in a continuum, from absolutely prohibited through to absolutely usable, something that's usable and has no issue with its use. So, an object can actually move along that continuum. One thing could be usable in one instance, and then you apply incantation to it, and it becomes absolutely non-usable.”

Disaster Risk Reduction and the Māori Experience

Despite these recent advances, mainstream disaster management institutions often ignore or marginalize traditional knowledge as it relates to risk reduction. Compounding the problem is the disappearance of many successful local practices as a result of Western/colonial influence. Social, political, economic and cultural changes stemming from colonialism, and later globalization, have also led to the loss of Indigenous DRR knowledge and have subsequently increased vulnerability. Harmsworth provides several examples in New Zealand: the change from well-managed subsistence gardening to widespread commercial cash cropping and the raising of livestock which has, in many cases, led to heavy land erosion, which in turn, has resulted in widespread destruction from flooding. Land that has been cleared to make way for larger plantations has removed stabilizing vegetation that was previously protected under traditional Māori environmental management schemes. Moreover, the wider use of formal education and the exposure to other (Western) models, standards and values has contributed to a breakdown of traditional communication networks. This has also resulted in the undermining of the importance of elders within the society, allowing their knowledge to die with them.

Work in the fields of disaster risk reduction and planning, Harmsworth further notes, is undertaken with a view toward the distant future, unlike how planning is conducted in other countries. As he states, “a lot of the work we're doing now is to plan ahead for a hundred years to a thousand years. We're not really just engaging for the next five years or ten years, we're actually starting to look at how all these communities look. How will their land look? How will they be adapting to a different sort of climate?”

As mentioned earlier, the professional disaster risk management community uses several terms that are not in common use or well-understood outside that community. Among them, ‘hazard,’ ‘risk’ and ‘vulnerability.’ In an attempt to ensure that the concepts represented by these and similar terms are appreciated by the community, and in order that DRM professionals and non-professional community can understand what each other is trying to communicate, Dr. Shaun Awatere and his colleagues have developed a set of qualitative/metaphysical data measurement tools—essentially layman’s terminology—based on narrative *korero* (discussions) of values and aspirations, quality of life and well-being. These tools will be used in assessments of a community’s understanding of risk as well as its feeling of well-being after an event.

For example, employing common terminology in the scale of measurement, where *Pai Rawa* = excellent; *Pai* = good; *Ahua Pai* = okay; *Pohara* = poor and *Aue* = very poor, community members are asked the following questions to measure the quality of their feeling of inclusion in the process of recovery from an event:

***Kia mahi ngātahi* (collaborative communities)**

- *Iwi/hapū* (tribe/clan) are full active partners in recovery, *marae* are fully supported in recovery operations and *whanaungtanga* is flourishing

- *Iwi/hapū* are moderately active partners in recovery, *marae* are mostly supported in recovery operations and *whanaungtanga* is engaged
- *Iwi* are occasionally partners in recovery, *marae* are sometimes supported in recovery operations and *whanaungtanga* is awakened
- *Iwi* are almost never partners in recovery, *marae* are rarely supported in recovery operations and *whanaungtanga* is awakened
- *Iwi* are not active partners in recovery, *marae* are not supported in recovery operations and *whanaungtanga* is dormant

Kei te ora te mauri (mauri/life force is vibrant)

- Your gut feeling, hearing, smell, sight, and taste are invigorated when returning to rebuilt *kainga*/homes/town/city
- Your gut feeling, hearing, smell, sight, and taste are engaged when returning to rebuilt *kainga* /homes/town/city
- Your gut feeling, hearing, smell, sight, and taste are awakened when returning to rebuilt *kainga* /homes/town/city
- Your gut feeling, hearing, smell, sight, and taste are dormant when returning to rebuilt *kainga* /homes/town/city

Traditional knowledge often begins as locally specific information. However, as it is shared, it becomes more and more integrated into mainstream thinking. Dr. Ataria notes, “when you start to look at some of this local knowledge, there's a lot of commonality amongst what people were doing in other regions and locations.” He continues, “once it's into the public domain, then there's acceptance; that the knowledge is out there and can be documented. It's when you're actually going back to local communities and working with them at a very specific level, maybe doing one-on-one individual interviews with older people, it's that knowledge you really have to capture and be very careful the way you use it. But I think that by doing those interviews and capturing that knowledge, a lot of the time people will actually allow that knowledge to be released at some point in the future. There are many ways to document that information and actually get it released out there into the public domain. Again, we see a continuum around the intellectual property—from the IP that's owned by an individual and the way it moves through a community and then moves into the public domain, at which time becomes released across the country and beyond and into various forms.

A final word, here, on TIK: Indigenous (and other) communities may simultaneously exhibit vulnerability and resilience. The resilience is often from ‘learned strength’ (as distinct from TIK). That is, individuals and communities, through adversity, are becoming stronger than they originally were, simply as a means to survive daily emergencies and struggles. It's a useful view, as it gets away from the assumption that Indigenous Peoples are resilient through some sort of cultural ‘magic’, that DNA and culture do not confer resilience. It's also worth noting that use of the terms Traditional Indigenous Knowledge and Traditional Ecological Knowledge is being replaced by Indigenous Knowledge (IK) and, in the long run, will be replaced by more relevant specific cultural descriptors, such as *Mātauranga Māori*, which is described in this paper.

Readers wishing to further explore TIK may look at the several definitions of the topic compiled by the National Aboriginal Forestry Association of Canada http://nafaforestry.org/forest_home/documents/TKdefs-FH-19dec06.pdf.

Māori Perspectives on Hazards, Risk Reduction, and Risk Management

The tendency of Western disaster professionals is to speak about hazards, risk, vulnerability and resilience in the context of their impact on humans. A hazard, for example, particularly a natural hazard, putting aside human-induced challenges to the environment, is something that presents potential danger or threat to humans.

From an Indigenous perspective, though, Dr. James Ataria tells us, “I don’t think we actually have Māori words for those terms. “[Your questions has] gotten me thinking, what is the language that we use to describe those types of things? And I guess what comes to mind when you talk about risk and risk reduction, are some basic Māori values, things like *manaakitanga*, which is the notion of the responsibility for caring for things, both animate and inanimate things. It comes with things like *kaitiakitanga*, which is often referred to as stewardship of natural resources and for the notion of creating benefit and wellbeing for your community, for your people, for your families.”

In Western terms, the threat is most often thought of in terms of its implications to lives and livelihoods. Less frequently considered are the cultural implications of the threat, which may be as impactful to Indigenous Peoples who don’t necessarily separate themselves from non-human communities, including other species, ecosystems and landscape features, mountains, waterways, rocks, and land.⁴

Māori Proverbs

The following Māori proverbs (*whakatauki*) are often used to express Indigenous perspectives in Māori planning and policy documents.

E tangi ana nga reanga o uta, e mahara ana nga reanga a taima ta aha ra e whakamahana taku ora kia tina
When the land, river and sea creatures are in distress, then I have nothing to be proud of. (Ngāti Wai)

He kawenga ki te whenua, ki ngā uri o ngā ātua –
The ethic of responsibility toward the natural environment. (Ngāti Wai and Ngāti Whatua)

Ko ahau te taiao, ko te taiao, ko ahau
The ecosystem defines my quality of life. (Ngāti Wai and Ngāti Whatua)

Whakarongo, whakarongo, whakarongo ki te tangi o te manu e karanga nei; tui, tui, tui, tui, tuia – Listen to the cry of the birds calling for unity.

⁴ H. Gabrielsen, J. Procter, H. Rainforth, T. Black, G. Harmsworth and N. Pardo, *Reflections from an Indigenous Community on Volcanic Event Management, Communications and Resilience*

In thinking about the term ‘disaster,’ Dr. Ocean Mercier, of the School of Māori Studies at Victoria University, reflects on the work of Dr. Daniel Hikuroa⁵, in which he makes the argument that in traditional times, disasters were measured not necessarily by loss of life, damage to crops, destruction of housing, but by the loss of *mana* (prestige or leadership authority) that results from a disaster. For example, she continues, “if a disaster, say a flood, comes through and takes out all of the crops, then that leader is no longer able to provide for the wider community and may have to [humble himself] and ask other communities to help out. That might be interpreted as a loss of *mana*. That's quite a radical shift away from thinking just in terms of the loss of lives or physical assets.”

The most common natural hazards in New Zealand are earthquakes, volcanoes, and tsunamis. Yet during these interviews, when Māori were asked to define or elaborate on the concepts of hazards, vulnerability and risk, their responses led to a broader and deeper understanding of the issues facing Māori communities. These include, for example, land ownership and land use, which lead to poor water quality, which in turn affects sustainable agriculture and changes to the social and cultural make-up of a community. Mismanagement, Dr. Shaun Awatere explained, exacerbates natural events such as tropical cyclones, heavy rains and swollen mountain streams. He gave as an example, from earlier times (pre [colonial] impact), when land use planning was better, Indigenous trees did a better job of controlling erosion along streams. Post-impact, other species less suited to the environment but more lucrative were substituted. The result is that trees were removed along the streambeds and streams have become shallower and wider because of erosion.

“One of the greatest risks facing the Māori, one on which we have been living on the edge for many years, is the whole issue around being Indigenous people in a society that is not based on Indigenous values. So it's almost like we exist as human beings, clinging to an extinct identity in a world that does not support it to flourish.”

Dr. Adreanne Ormond. Personal interview.

As the Māori see it, land is one of their most significant natural resources. As Dr. Adreanne Ormond recounted, “[Māori] are always fighting a battle to keep the land we have, keeping the right to occupy it so it will survive.” The Māori, she explains, are constantly striving to maintain their identity, and this identity is linked to natural resources and the environment. “But with the changes in the national and global economy, we are coming up against issues around localism, oil drilling, the marketing of fish waterways, and pollution. You also have people shifting from the cities out to the rural areas and rural areas hadn’t planned for this—the infrastructure, pollution, noise, people, resources.”

As explained earlier, to determine actual disaster risk, one must consider hazards in relation to vulnerability. Dr. Ormond talked about vulnerability in a Māori community and its impact on their risk from a different perspective. Her narrative stems from decisions that were made that resulted in the pollution of a stream in one community. A group of young community

⁵ Dr. Daniel (Dan) Hikuroa is an Earth Systems Scientists and an expert on integrating mātauranga Māori (Māori knowledge) and science.

members felt it needed to engage in civil disobedience to make their case. In Dr. Ormond's opinion, this caused them to be more vulnerable and at risk for breaking the law. She explained:

At home, the peninsula has two sides—a wilderness side, which is largely Māori farming communities and the tourist side (beach communities). Five or six years ago, the beach communities began to grow and with growth came problems related to unplanned development. A case in point: tidal surges were causing flooding in newly developed areas of the beach communities that caused unwanted sewage runoff. The local council came up with the solution of piping this sewage runoff over the hill and into the main river on the Māori side. The council was, for the most part, made up of non-Māori men, and so it was passed and soon the sewage began to flow into the Whanganui River.

What really troubled me was what happened to the community in the face of this vulnerability: the reaction on how to deal with this situation split the community and made me realize that one of the main ways that we are vulnerable is in our understanding of our culture. We had some Māori agreeing to adopt the proposed solution while the majority said no. And so, it caused a whole fracture in the relationships among the Māori and across the five Maraes.⁶ To this day we don't talk about the pollution of that river because it fractured us culturally, and in our relationships, and caused a group of people to go underground and organize protests. So, in addition to the pollutants being dumped in the river, Māori people were made vulnerable because they were put in the position of having to leave the safety of their communities in order for their voices to be heard and breaking the law to uphold their beliefs. The issue of vulnerability was twofold: the pollution of the river and the spiritual loss being suffered by their land. It caused many Māori to ask themselves: "When did it become okay for us to give permission to put sewage into ancestral lands? When did we change who we are as Māori and will some in our community to be okay with that?"

Dr. Ormand went on to explain that for Māori, spiritual risk is absolutely key and many of their processes are designed around spiritual risk, particularly at the community level. As an example, in Māori communities, "families traditionally had different roles and responsibilities; one family might have been responsible for a particular part of the shoreline, another family might have been responsible for looking after a forest. So, a lot of things like risk and hazard can actually go back to those families and those people who had that responsibility to look after those particular assets."

From many personal accounts told by the Māori, it becomes apparent that their worldview does have an impact on disaster risk reduction. It serves as a filter through which their exposure to natural hazards and other environmental threats passes. When science and technology are filtered through traditional experience or worldview, it impacts their actions and decisions and—positively or negatively—affects risk reduction strategies.

⁶ The **marae** (meeting grounds) is the focal point of Māori communities throughout New Zealand. A **marae** is a fenced-in complex of carved buildings and grounds that belongs to a particular iwi (tribe), hapū (sub tribe) or whānau (family).

In terms of how the Māori perceive what constitutes a disaster, Dr. Mercier tells us there is a broad spectrum of how these events are viewed or considered. "... off-hand, my thoughts would turn to an earthquake, but is it also a disaster when a canoe overturns and four fishermen from a small community drown? My work tends to focus the earthquakes, but I'm not sure that's reasonable without appreciating that earthquakes occur infrequently; other things happen more frequently, and the community's perception of risk and about whether or how to prepare for something is informed by how they prepare for and respond to more everyday kinds of things. So for example, a big flood might be a disaster, like a deluge that results from a typhoon. But recurrent flooding happens, and people prepare for that and respond to that in incremental ways. So theoretically, when the big one happens, they already have had enough experience with the smaller ones that they take action. It's a matter of scalability. Because all of New Zealand is very earthquake prone, earthquakes are very fresh in people's minds. On New Zealand's South Island, it's an important hazard. The Christchurch earthquake is still fresh in people's memory, and so they might, in terms of perceptions of what constitutes a disaster, earthquakes are rated quite highly."

Dr. Ataria tells this story of the Christchurch earthquake in 2011 as it relates to disaster risk management in one Māori community:

In the aftermath of the Christchurch earthquake, Dr. Jamie Ataria, together with friends, neighbors and colleagues, began planning a *Pa Wananga*. This decision came about in part because the earthquake had taught them that the community needed to be more self-sufficient, but also because of the importance of passing on traditions that would make their children resilient to natural hazards.

The idea of establishing the Pa Wananga actually began before the Christchurch earthquake. A group of Māori parents, unsatisfied with the educational options for Māori in the mainstream Christchurch educational system, were considering establishing a community school. As Dr. Jamie Ataria explained, the notion of risk, recently heightened by the earthquake, prompted their determination and shaped their thinking about how the school would look and what its focus would be. "New Zealand, he continued, formed between two tectonics plates, and consequently, earthquakes have and will always be a feature of their lives. Parents realized their families live in a hazardous environment and 2011 was only the most recent illustration.

Pa Wananga

In Māori culture, a *wananga* is an innovative learning village or environment that has a Māori worldview as its guiding philosophy. Today, a *wananga* is a publicly owned tertiary institution in New Zealand that provides education in a Māori cultural context.

At the time of the earthquake Dr. Ataria was doing fieldwork on the southern part of the South Island. Listening to the radio while driving home, he heard parents calling into the station, saying, 'Oh, my child ... I can't reach him because the roads are jammed everywhere'. Parents were calling trying get word about their children, "Does anyone know Johnny? He goes to such and such school. He's tall. Can someone just look after him until I can get there?" This vulnerability, as Dr. Ataria characterized it, prompted parents to think about how they could mitigate future risk.

Dr. Ataria continued, saying that the notion they came up with looked back at their traditional ways of education, saying, "Actually, we used to educate as a community. Our community was really tight. Then, education was part and parcel of just what that community did. So they determined they needed to form a *pa wānanga*, a traditional Māori community, that would be focused around the school, with all the necessary things that might be needed to enable that community to live in isolation if need be, things like water storage, gardens and cooking facilities, making sure buildings are able to generate electricity and not be solely dependent on the energy grid, enough space to accommodate community members unable to return to their homes, even establishing a radio station to share information. The *pa wananga* would also need to withstand seismic activity. This was the plan, then, of having that support in a school that is integrated into the community. They had found that, particularly in Christchurch, schools became the main focus for the communities. Parents and extended family went to the school because the kids were there. The schools, then, served as the local point for food and emergency supplies."

The *pa wānanga*' is in its third year of development and the parent-advocates are presently negotiating with the New Zealand ministry of education to find a site. Once we get that site, that's the vision, is actually we create this community, and this community with probably quite a lot of in-built resilience.

An Emphasis on Climate Change

All communities are subjected to the physical conditions of their particular geographical location and the natural hazards they face. The very attributes of a community's location - on a seacoast, river or fertile valley, near valued natural resources, or at the crossroads of commerce – will impact the threat of potential risks to the wellbeing of its citizens. While leaders do attempt to anticipate natural hazard risks as they have been experienced or told about through stories passed through generations, climate change is an existential risk that is materializing so rapidly that its causes and effects have been largely out of the control of Māori.

New Zealand's Ministry for the Environment acknowledges that changes in climate – such as temperature and rainfall – are already occurring. These changes will occur to differing extents in different parts of New Zealand throughout this century and beyond. Based on the latest climate projections, by the end of this century New Zealand is likely to experience:

- higher temperatures – greater increases in the North Island than the South, with the greatest warming in the northeast (although the amount of warming in New Zealand is likely to be lower than the global average);
- rising sea levels;
- more frequent extreme weather events – such as droughts (especially in the east of New Zealand) and floods; and

- a change in rainfall patterns – with increased summer rainfall in the north and east of the North Island and increased winter rainfall in many parts of the South Island.⁷

When asked for an example of traditional knowledge in the context of climate change, Dr. Garth Harmsworth elaborated as follows. “In terms of climate change, you’ll find in New Zealand that a lot of Māori actually still speak a generic Māori language that has basically come through from the past. [This language] has been explored in terms of its relationship to, for example, climate change. Māori used certain indicators to actually tell them about seasonal change and seasonal climates and climate change itself.” Harmsworth cites examples of information and Māori knowledge from long ago that continues to present day: “Like the flaring of trees, and when those trees and those plants flare out at a certain time of the year they actually told the old people quite a lot about how the climate was actually changing and which season they’re moving into.”

When asked the same question, Dr. Atari offered his thoughts that “...earthquakes, obviously, are very raw and very fresh in people's mind (having recently gone through the Christchurch earthquake), so earthquakes are an important hazard living in the South Island.” But the whole of New Zealand is effectively an earthquake- prone country. He went on to say that as the recent memory of Christchurch recedes, climate change and how Māori adapt to it will be the significant concern for the future. Many Māori communities are on the coast, he explained “...climate change, drought, which is driving water shortages, which is manifesting in a whole lot of things downstream...[including] erosion with increasing sea level rise.” He suspects that if certain river and coastal species would be affected by climate change, such that they were not available in the supermarket, *Pākehā* (European, non-Māori) would likely just look for something else. Māori, on the other hand would have more of a cultural tie to specific foods, and therefore take the loss harder. He cited Paua (abalone), crayfish, oysters, as examples that have cultural significance to Māori. Particularly hard hit would be those people and families who have guardianship over particular areas. As discussed earlier, the Māori cultural concepts of *manaakitanga* and *kaitiakitanga* would likely come into play and the potential loss of *mana* might result in a perceived failing on their behalf to actually protect the resources and would manifest as embarrassment about not being able to put that food, that delicacy that you are well known for in your area, on the table to feed your guests.

For another perspective, we consulted Pauline Harris, PhD, an astrophysicist and currently a research fellow in the Faculty of Sciences at Victoria University of Wellington, New Zealand. She is also Principle Investigator of a project called "Ngā Takahuringā ō te ao: The effect of climate change on traditional Māori calendars", funded by Royal Society Te Apārangi, New Zealand. It’s a collaborative effort between the Society of Māori Astronomy Research and Traditions (SMART), of which Dr. Harris is Chair.

Dr. Harris explained that *maramataka* (Māori traditional calendars) contain a wealth of traditional ecological knowledge, in addition to environmental, cultural and spiritual knowledge.

⁷ <http://www.mfe.govt.nz/climate-change/likely-impacts-of-climate-change/overview-of-likely-climate-change-impacts>. Retrieved 16 September 2018.

Indigenous communities around the world, including Māori, have observed ecological and environmental changes that have been attributed to pollution, human encroachment and climate change. She explained that “...the Māori traditional calendar system is based on *tohu*, or signs in the environment, and the sea, and the sky, and the weather, that indicate certain seasons or when it's time to plant, or fish, and harvest.”

To further explain the concept of *tohu*, during an interview with Dr. Darren King, an environmental scientist with the National Institute of Water and Atmospheric Research, in Auckland, he explained that, “Based on long-term association with the land and its resources, Māori developed a detailed knowledge of local environmental features and processes. This environmental knowledge included observing and recording changes in the physical environment, naming and classifying areas of risk and predicting environmental disturbances.” Dr. King shared a chart from an excellent publication that he and his colleague, James Goff and Apanui Skpper, authored, “Environmental Knowledge in Natural Hazards Management and Mitigation”

Table 2: Selection of environmental indicators to forewarn of weather and climatic hazards.

Name	Indicator	Expected Outcome	Iwi / Region
Pukeko (Swamp hen)	Pukeko head for higher ground	Imminent storm and flooding	Ngāti Wai: NE North Island
Kaka (Native parrot)	Kakas begin acting up, twisting and squawking above the forest	A storm is on its way	Ngāti Pare NE North Island
Nga ngaru (Waves)	The booming sound of waves across the land	A storm is coming	Te Whanau a Apanui E North Island
Whakaari (White Island)	The plume flattens and the end breaks off	Watch out extreme weather is expected	Te Whanau a Apanui E North Island
Matuku (Bittern)	The continuing cry of the bittern as it moves around at night	Floods are likely	Ngāti Ruanui: SW North Island
Rawaru (Blue Cod)	Stones in the belly of the rawaru	Bad weather is coming	Ngāti Koata: N South Island
Kōtuku (Heron)	The heron are plentiful in summer	Gales and a heavy winter will follow	Ngāti Apa: N South Island
Rā (Sun)	A vivid halo encircles the sun	A storm is approaching	Kai Tahu: E South Island

As scientists endeavor to predict and mitigate climate change, the fusion, to use Mr. Harmsworth's term, with traditional environmental knowledge is becoming more important and the work of Drs. Harris and King and their colleagues will likely be increasingly sought after to add a contemporary set of information to inform predictions and policies leading to reduction of risk to natural hazards including climate change.

Annex 1. List of Interviewees and Participants

Aotearoa/New Zealand

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Pauline Harris, PhD

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Jamie Ataria

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Dr. Darren King

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Garth Harmsworth

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