

**“Me hoki whakamuri, kia haere whakamua”:
The 1886 Tarawera Eruption through a Māori lens**



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Abstract

The 1886 eruption of Mount Tarawera near Rotorua, New Zealand is one of the most significant disasters in the country's history. The eruption made profound geological and human impacts on the area, devastating what was once a prosperous tourism industry. Māori in particular suffered many casualties as well as a severe loss of their livelihoods. Many academic literatures on Tarawera examine the eruption based on scientific knowledge, i.e. focused technical, geological or volcanological perspectives, which are already well established. These perspective do not typically consider the human dimensions of the Tarawera eruption. Māori indigenous knowledge comprises rich details about the disaster, but this knowledge has been relatively unexplored in an academic context. This dissertation uses Te Ao Māori (Māori world-view) to inform wider understandings of the Tarawera eruption. It employs a unique secondary dataset consisting of archival, digital and published materials, as well as artworks to demonstrate the role of indigenous knowledge in disaster research. The findings suggest that a Te Ao Māori framework does indeed enrich overall understanding of the Tarawera eruption. Findings also demonstrate that the framework is able to present indigenous knowledge in a meaningful way. The discussion offers wider insights into systematic and conceptual nuances of indigenous knowledge, as well as the underlying power relations which at present limit the extent that indigenous knowledge is realised.

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Ko Rakautapu te maunga

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Ko Te Rarawa te iwi

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The photograph on the front cover page is of Hinemihi, Te Wairoa, prior to the eruption (Te Ara; original photograph from the Alexander Turnbull Library, PA7-19-19)	

Introduction

This dissertation investigates the role of two distinct knowledge forms in the context of disasters. Scientific knowledge is technocratic in nature, with roots in Western approaches. Indigenous knowledge on the other hand is comparatively esoteric and grounded in indigenous epistemology. Scientific knowledge has therefore typically received more attention in disaster research, leaving the value of indigenous knowledge to yet be fully realised. In New Zealand, Māori indigenous knowledge plays an important role in piecing together interpretations about past disasters and natural hazard events (King et al., 2007). In order to understand the nature these interpretations, they must be examined through the appropriate world-view and framework.

Western approaches to disaster are generally facilitated through top-down initiatives, with individuals or stakeholders in their role as experts given decision-making power (Gaillard & Mercer, 2012). Such approaches are inherently limited by the experts imposing their knowledge and decisions on locals (i.e. indigenous people), who become marginalised as their own knowledges and capacities are not acknowledged. These knowledges are made up of a range of different forms. Folklore is a component of the rich tapestry of indigenous knowledge. Hazard and disaster events in New Zealand are shrouded in Māori folklore (King et al., 2007). In the case of the Tarawera eruption, a Te Ao Māori (Māori world-view) lens would make this a worthy investigation into demystifying this folklore and grounding it in a conceptual understanding.

Both scientific and indigenous knowledge have their own merits. Indigenous knowledge cannot be examined through the same means as scientific knowledge because it is constructed, facilitated and transferred through a distinct indigenous epistemology. It therefore must be examined through a proper lens or world-view. This dissertation focuses on Māori indigenous knowledge, utilising a framework devised by Kenney & Phibbs (2015) as a means of incorporating Māori concepts in disaster research. Mātauranga (knowledge), tikanga (cultural practices¹) and kaupapa (values and principles¹) Māori are concepts embodied within the broader frame of Te Ao Māori.

With this in mind, the dissertation specifically seeks to understand how Te Ao Māori informs a wider understanding of the 1886 Tarawera eruption. To answer this question, the research

¹ As defined in Kenney & Phibbs (2015)

will identify the current scientific knowledge available for the eruption. The scientific knowledge on Tarawera will serve as one part of the overall knowledge available for the eruption. It will examine how mātauranga, tikanga and kaupapa Māori (based on Kenney & Phibbs' (2015) conceptual framework) manifest themselves through our understanding of the eruption. It will further investigate ways that new mātauranga can be created following a disaster. Ultimately the dissertation will consider how an indigenous knowledge dataset aligns with the current scientific knowledge in the context of the eruption.

The 1886 Tarawera eruption is one of the most significant disasters in New Zealand history and has been the subject of various media publications and general interest literature. The events of the eruption are documented in various materials from a range of different sources. However, most of the academic literature on Tarawera focuses on scientific knowledge, through geological and volcanological perspectives (Walker et al., 1984; Houghton et al., 2004; Sable et al., 2009). These perspectives are valuable in understanding the technical nature of the eruption, but without consideration of the social perspectives cannot fully encapsulate the multidimensional nature that is characteristic of disasters. These perspectives are important particularly with concern to Māori because they help recognise the role that indigenous knowledge has in disaster research.

In order to meet the research objectives, the dissertation employs an indigenous knowledge dataset, pulling together a range of secondary data from sources such as archives, digital repositories and published materials. Within these sources, diverse materials as manuscripts, letters and artworks are considered. The diversity and extent of the dataset makes for a broad and unique approach into enhancing the understanding of the Tarawera eruption through a Te Ao Māori lens. The dataset findings are then classified according to Kenney & Phibbs' (2015) conceptual framework. This research approach is able to explore the value and nuances at stake in the Te Ao Māori framework. The overall discussion will consider the objectives, giving particular attention to the final objective, aligning the findings with the conceptual framework and the reviewed literature, seeking to 'synthesise' both knowledge paradigms; not in a competitive sense, but to explore the nuances and consider how they both contribute to a wholesome overview of the Tarawera eruption.

Māori terms will be used throughout this dissertation. Some of them have already been translated above. Other terms which are used sporadically will be translated as they appear. It is important to acknowledge that some of the terms either have multiple definitions, or that in

some instances the translation does not fully encompass the intended meaning of the term. For the sake of simplicity, the definitions provided will be the basis of this dissertation's discussion. The key Māori terms are again: Mātauranga (knowledge), tikanga (cultural practices), kaupapa (values and principles) and Te Ao Māori (Māori world-view).

Chapter 1: Literature Review

1.1. Knowledge at large in disaster research: Te Ao Whānui

Knowledge in disaster research is reflected in the actions and practices of the people involved. For insiders, this includes factors such as their capacities and responses to vulnerabilities and hazards. For outsiders, this can include their ability to assist in disaster risk reduction and post-disaster recovery (Gaillard & Mercer, 2013). Effective disaster management entails recognising and incorporating different avenues of knowledge in both policy and practice (Kelman, Gaillard & Mercer, 2013). However, engaging with these avenues on a platform that is widely understood is subject to tensions. These tensions are reflected in McHoul & Grace (1997) who present Foucault's writings on how the discovery and acquisition of knowledge intertwines with power relations. Conventional knowledge forms are based on science and scientific methods because it is easy to identify the 'truth' underpinning such knowledge. In Western frameworks, the scientific method based on hypotheses, deduction, and quantifiable data is the typical way of conducting an experiment and generating meaningful results. McHoul & Grace again bring out Foucault's assertions that knowledge discourse should move beyond the conventional 'scientific method' mindset and pull together considerations about "human nature, human potential, human endeavour and the future of the human condition in general" (p. 58). This is imperative in understanding the multidimensional nature of disasters

As a further preamble to the following sections, it is important to note that many of the literature are written from a 'contemporary' perspective drawing on recent (i.e. last 20 years) case studies. Historical contexts and disasters that occurred many decades or centuries ago can complicate the issue; there are more nuances and uncertainties based on the accessibility and reliability of the information at hand. In any case, the literature review will make the best attempt to establish a common understanding of scientific and indigenous knowledges and their roles in disaster research.

1.2. Scientific knowledge (SK) in disaster research: Te Ao Pūtaiao

Conventional disaster research has typically utilised scientific knowledge (hereafter referred to as SK), which is technical in nature and grounded in Western research approaches. These approaches focus on top-down initiatives which are facilitated by individuals, groups or stakeholders deemed to be expert in the relevant field and on the issues at stake (Agrawal, 1995; Mercer et al., 2009; Gaillard & Mercer, 2013). This active, decision-making power is

often at the hands of governments, non-governmental organisations and other authorities with significant financial or academic backing, thus establishing a formal means of creating and facilitating SK (Gaillard & Mercer, 2012). The formal nature of SK is important as the knowledge is subject to academic scrutiny and rigorous criteria before it becomes ‘officially’ recognised. This ensures that both the creation and development of SK is carried out in a credible and reliable manner.

To this end, SK is valuable in disaster research because it provides reliable details about natural hazards and their associated processes. Seismology for instance provides SK in relation to earthquakes. In New Zealand, seismological research is especially pertinent because of New Zealand’s geological situation on two active fault lines. For example, seismology literature on Wellington (Van Dissen & Berryman, 1996), Christchurch (Gledhill et al., 2010; Bradley & Cubrinovski, 2011) and the Taupo Volcanic Zone (Bibby et al., 1995) all provide reliable technical details on earthquakes in both historical context and for assessing the implications that future hazard events may have on the geology of the respective study sites. In such instances, the top-down nature of SK is beneficial; the information expressed is technical but it is presented in a way that would make it understood by academics specifically seeking this information for their own research purposes or to develop on it themselves. The SK is also a boon for financing further academic research because funding is typically offered on the basis of credible SK, or at least credible evidence that such knowledge could be developed in the scope and timeframe of a specific research.

The requirements and aspirations for ‘credibility’ ensure that SK is constantly being developed and progressed. The understanding of SK and concepts continue to improve, but the top-down nature remains an inherent shortcoming. It is typically sufficient for an academic audience, but knowledge recognition in disaster research at large should also value the understanding of those whom the knowledge directly impacts – in this case, not the scientists, academics and experts, but the people at risk of disaster themselves. The manner in which SK is typically presented (i.e. technical reports, academic articles) is inadequate for contributing to locals’ understanding. Hikuroa et al. (2011) assert that SK often contains jargon that is poorly understood, where Western ‘science’ is the recognised paradigm for decision-making and implemented initiatives, but not catering towards the locals who will either benefit or suffer from such proposals. Gaillard & Mercer (2013) similarly suggest that locals have a poor understanding of scientific concepts as they are elucidated through conventional Western approaches. This shortcoming suggests a need to rethink the underlying power relations of

knowledge creation and facilitation on a broad scale. This cannot be done through the conventional approach, which is by and large, knowledge produced ‘by experts, for experts’. SK’s progression in disaster is also heavily influenced by where the financial and academic backing is deemed necessary (Gaillard & Mercer, 2013). This is an institutionalised approach that does not usually consider the needs and aspirations of those directly affected by the disaster.

1.3. Indigenous knowledge (IK) in disaster research: Te Ao ‘Hou’?

Indigenous knowledge (hereafter referred to as IK) in this context therefore is the antithesis to SK. IK does not have a specific definition because it depends on the indigenous group in question (Howitt, Havnen & Veland, 2012; Kelman, Mercer & Gaillard, 2012). By nature, IK is free from the academic rigours of SK because it is constructed through the geographies, principles and experiences of the indigenous peoples themselves. The emphasis is now on relatable experiences of various events and phenomena under a common world-view, rather than technocratic processes and conventional scientific concepts (Pardo et al., 2015). IK therefore usually predates SK in that it provides valuable historical groundings of events that occurred centuries ago. This is important in disaster research where SK, although able to give a technical account of hazard processes and other features, it does not address the finer nature of ‘what happened’ during a disaster at large; i.e. among other pertinent thoughts, the broader aspects of who was affected by a disaster, how it affected these peoples’ livelihoods and how they utilised their knowledge in recovering from the disaster.

Blong (1982) was one of the earliest noted examples of IK used in disaster research. Legends and folklore were used to create a rich overview of historic volcanic eruptions in Papua New Guinea. Blong noted the challenge at the time was having this IK recognised alongside the conventional geomorphological perspective used to examine this event. This again represents power contestations where SK as the established norm is being favoured over the empirical IK. The earthquake and tsunami of 26 December 2004 which affected many parts of South-East Asia and South Asia is a more recent example of IK coming to fruition in disaster response. Simeulue Island, located 150 kilometres off the West Coast of Sumatra, Indonesia, was close to the epicentre of the earthquake and was badly struck, suffering significant structural damage (McAdoo et al., 2006). However, Simeulue’s coastal communities suffered only a handful of fatalities from a population of about 80,000 (Gaillard et al., 2008). The exact number of casualties is contested but is generally reported to number only 6 or 7 (McAdoo et al., 2006;

Lauer, 2012). Most of the population were able to move to higher ground in time to avoid the tsunami. This action is attributed to the 'island folklore' and phenomenon known as 'smong', stipulating that a receding tide following an earthquake signifies an impending tsunami (Gaillard et al., 2008; Lauer, 2012). The case studies from Papua New Guinea and Indonesia ultimately reflect the intrinsic value of IK in disaster research where traditional folklore has persisted and been able to make a meaningful impact on indigenous peoples' livelihoods and survival in disaster response. Rich folklores and mythologies have also been documented in Polynesian and Melanesian societies (Taylor, 1995).

The grounding of IK in a specific context or epistemology is important in understanding the interpretations it provides, as they are typically metaphorical in nature. They represent the interrelation between indigenous peoples and the underlying meanings within cultural landscapes (Louis, 2007). This can make accessibility and outsiders' understanding of the knowledge and its intricacies a challenge. The knowledge is embodied within a wider world-view – an understanding of values, customs, relationships and practices in both society and environment (Agrawal, 1995). The latter understanding is particularly valuable to disaster studies, as indigenous peoples' relationships with the environment offer insightful context that would not be recognised through SK. An IK construct is deep and unique; its 'persistence' relies on the act of passing down such information from one generation to another (Kelman, Mercer & Gaillard, 2012). In disaster this knowledge entails indigenous accounts of historic disasters and natural hazard events, taking forms such as artworks, songs, poems and stories. The main pitfall of having such diverse forms is that they can be overlooked or dismissed as 'anecdotal evidence' because IK lacks scientific foundation (Hikuroa et al., 2011).

1.4. Māori IK in disaster research: Te Ao Māori

Mātauranga Māori is the main component of IK in New Zealand. It is an empirically-based knowledge system that manifests itself in forms such as waiata (song), pūrākau (legend), whakataukī (proverb) and karakia (prayer) (King et al., 2007). These forms, as with IK in general, are metaphorical. Their association with historic events and phenomena is not immediately obvious without a contextual understanding for their deeper meaning to be understood (Williams, 2002; Pardo et al., 2015). This means that an 'outsider' (i.e. non-Māori) would typically be unfamiliar with mātauranga unless they have been told about it by an insider or experienced it themselves. Mātauranga Māori has been used in disaster research to make sense of hazard risk and management (King & Goff, 2010). Effective understanding in this

regard involves understanding the experiences that have ‘built’ such knowledge. King et al. (2007) state that mātauranga Māori reflects the ongoing association that Māori have with the environment, and that such a relationship has been pivotal in developing a detailed history of environmental features and processes. This relationship is reflected in the principle of kaitiakitanga (stewardship) which obliges Māori a duty of care towards the environment (Crawford, 2009).

As mātauranga Māori is typically oral in nature, its survival is dependent on the continued passing down (orally, and to a lesser extent, written) of the knowledge. Traditional Māori maintained this practice as they lived in close proximity to each other; to a marae as a site for communal gathering for various occasions, i.e. hui (meeting), tangi (funeral) and wānanga (discussions). This setting facilitated a deep cultural immersion, enabling Māori to acquire a deep and spiritual understanding of personal relationships, their environment and the history behind it (Marsden, 2003; King et al., 2007; Tipa & Nelson, 2008; Pardo et al., 2015). In contemporary disaster risk reduction, marae continue to be used as a site of community of engagement. They are ideal settings because of their size, accessibility, facilities and relative ease to prepare them for disaster response (Hudson & Hughes, 2007). In this situation, they also foster psychological and social well-being through increased social networks. Whanaungatanga (kinship) is also considered in maintaining these networks (Panelli & Tipa, 2007).

Māori cultural being is innate within whakapapa (genealogy), which plays a pivotal role in maintaining access and understanding of mātauranga. Mead (2003) describes whakapapa as “a fundamental attribute [to being Māori] and a gift of birth ... provides an identity within a tribal structure” (p.42). Kaumātua (elders) are tasked with passing on mātauranga to the next generations through oral histories and retelling folklore. The ‘mantle’ of knowledge passes on to the next generations upon whom the impetus is placed to continue this practice. In New Zealand’s diverse contemporary society this process is under threat (Williams, 2009). Māori in contemporary society are comparatively fragmented, with many residing in urban areas not near a marae (Marsden, 1992). More importantly, Māori who have little to no knowledge of their whakapapa do not have that same immersion in a culturally intimate setting.

When considering IK at large in New Zealand, mātauranga Māori is only a single component of Te Ao Māori – the Māori world-view. Te Ao Māori is holistic and represents the intrinsic nature of traditional Māori knowledge, values and practices (Marsden & Henare, 1992).

Marsden in his later work (2003) expands on his own perception of Te Ao Māori, describing it as a ‘woven universe’, a central means of understanding of what it means to be and live as Māori. It is not possible to reveal the entire extent of Te Ao Māori’s holism in the scope of this dissertation, but it is important to develop a conceptual understanding of it in relation to disaster research. Hence, Te Ao Māori can be classified into three main components: mātauranga (already discussed), tikanga and kaupapa (Marsden, 2003). Tikanga and kaupapa’s definitions vary slightly depending on the discipline from which they are viewed. Some of these definitions will be discussed here to better grasp the nuances and intricacies at stake.

Tikanga is derived from the Māori root word tika, meaning ‘correct’ (Marsden, 2003). Tikanga has many definitions. Mead (2003) describes tikanga as meaning Māori ‘ethics’, i.e. a set of rules by which Māori should aspire to live their lives. Tikanga influences the transfer and salience of IK. Kaupapa on the other hand is usually defined as ‘Māori approach’ or a ‘Māori way’ (Bishop, 1994; Barnes, 2000; Pene & Henry, 2001). Kaupapa may also refer to the desire to locate Māori values and practices within wider research frameworks (Pihama, Cram & Walker, 2002). These desires receive markedly little attention compared to Western approaches.

In keeping with this dissertation’s topic, mātauranga, tikanga and kaupapa Māori will be focused upon in the context of disaster studies using a proposed conceptual framework by Kenney & Phibbs (2015). The framework (Figure 1) is termed as a ‘cultural technologies approach’. It is presented as a holistic and adaptive means of incorporating mātauranga, tikanga and kaupapa in disaster research. Kenney & Phibbs present the framework in light of the 2010-11 Christchurch earthquakes. Whakaoranga iwi whānui (community recovery, restoration resilience; Figure 1) symbolises the intersection between mātauranga, tikanga and kaupapa. It has relevant application for contemporary disaster researches. The concepts are influenced and developed by peoples’ own experiences.

Note that the original diagram as it was presented in Kenney & Phibbs did not have the Te Ao Māori ‘ring’ enclosing the concepts. This ring was included in Figure 1 (p. 10) to better visualise that mātauranga, tikanga and kaupapa fall under the Te Ao Māori framework. For the purposes of this dissertation, ‘Māori IK’ hereafter refers to mātauranga, tikanga and kaupapa Māori as they are defined in Kenney & Phibbs’ framework.

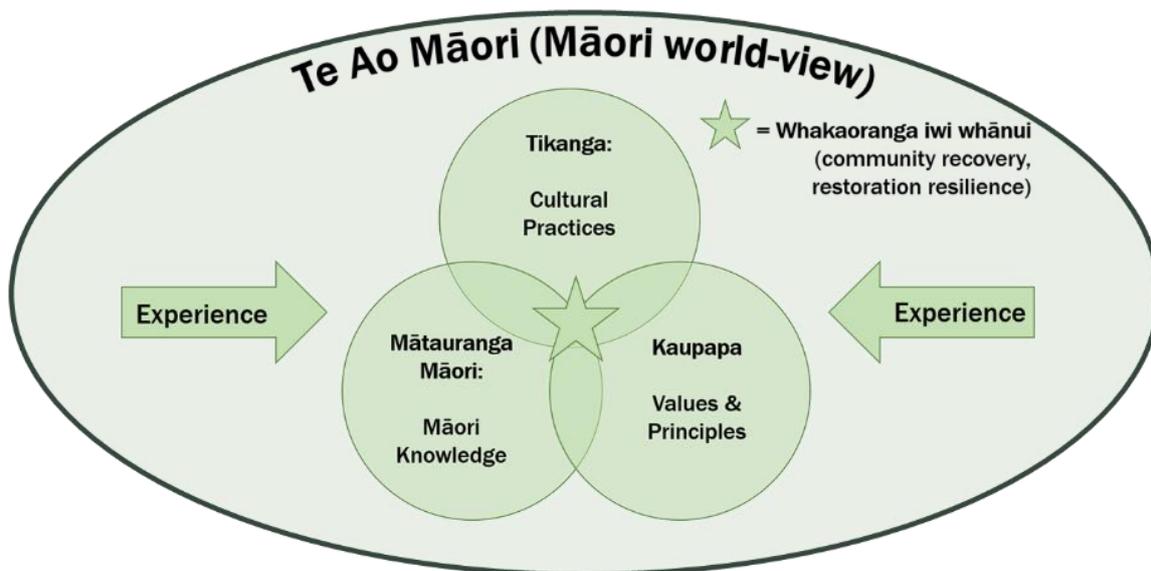


Figure 1. Māori conceptual approach to disaster risk reduction incorporating Māori values within a Te Ao Māori framework. (Kenney & Phibbs, 2015) N.B. the Te Ao Māori 'ring' is not present in the original diagram

1.5. Bringing SK and IK together: 'He waka eke noa'

The manner in which SK and IK have been presented above, may at first suggest that one knowledge is more favourable than the other. This is a contentious process and the literatures are not unanimous in what exactly this approach should entail. Moller (2009) and Agrawal (1995) both argue that Western and indigenous epistemologies should not be integrated but it is important they do interface in order to recognise the value that both systems have in contributing to wider environmental research. On the other hand, Crawford (2009) King & Goff (2010) consider the possibility that IK and SK might be 'combined'. This is not, however explicit, and may only a semantical difference. Ultimately:

- 1) SK and IK can and do co-exist in disaster contexts
- 2) SK underpins the conventional Western approach to disaster research (Gaillard & Mercer, 2013)
- 3) Their co-existence also represents the underlying power relations where SK is the established norm; IK is the emergent system seeking to achieve wider recognition (Bishop, 1999; Cunningham, 1998)
- 4) Both knowledges are grounded in distinct epistemologies which must serve the basis for their examination (Agrawal, 1995; Smith, 1999)

Table 1 provides a series of considerations in light of both knowledges, not as a contestation but merely to summarise the preceding literature review.

1.6. SK ‘vs.’ IK: He Whakatauritenga Tāpiri

Table 1. Summarising the values and roles of scientific and indigenous knowledge. (Source: Author’s own)

Prevailing considerations	Scientific knowledge (SK)	Indigenous knowledge (IK)
Who creates the knowledge?	Experts i.e. scientists, governments, authorities all of whom are generally outsiders	Indigenous people as insiders in their own environment
Who is the knowledge for?	Variable depending on the form it takes, but it is not always presented in a way that is widely understood (Hikuroa et al., 2011; Gaillard & Mercer, 2013)	‘Knowledge by indigenous people, for indigenous people’ (Smith, 1999; Barnes, 2000)
What is the balance of power reflected in the knowledge?	Top-down, expert-driven	Bottom-up, facilitated by indigenous people as insiders (Gaillard & Mercer, 2013)
How is the knowledge transmitted?	Various means of transmission, SK-specific means include technical reports, academic articles (Hikuroa et al., 2011)	Oral, word of mouth, various metaphorical forms e.g. artworks, songs, mythological stories, preserved through the written word (King et al., 2007; King & Goff, 2010)
To what extent is the knowledge typically incorporated in wider disaster research?	Used to understand the technical nature of disasters, hazard events and processes (Bibby et al., 1995)	Not widely incorporated compared to SK, but initiatives being taken to redress this (Gaillard & Mercer, 2013)
How is the knowledge standardised/regulated?	Peer review, academic rigour	No unified standardisation; legitimacy of IK depends on the indigenous peoples themselves

Chapter 2: Case study: Tarawera – He Kete Tautuhi

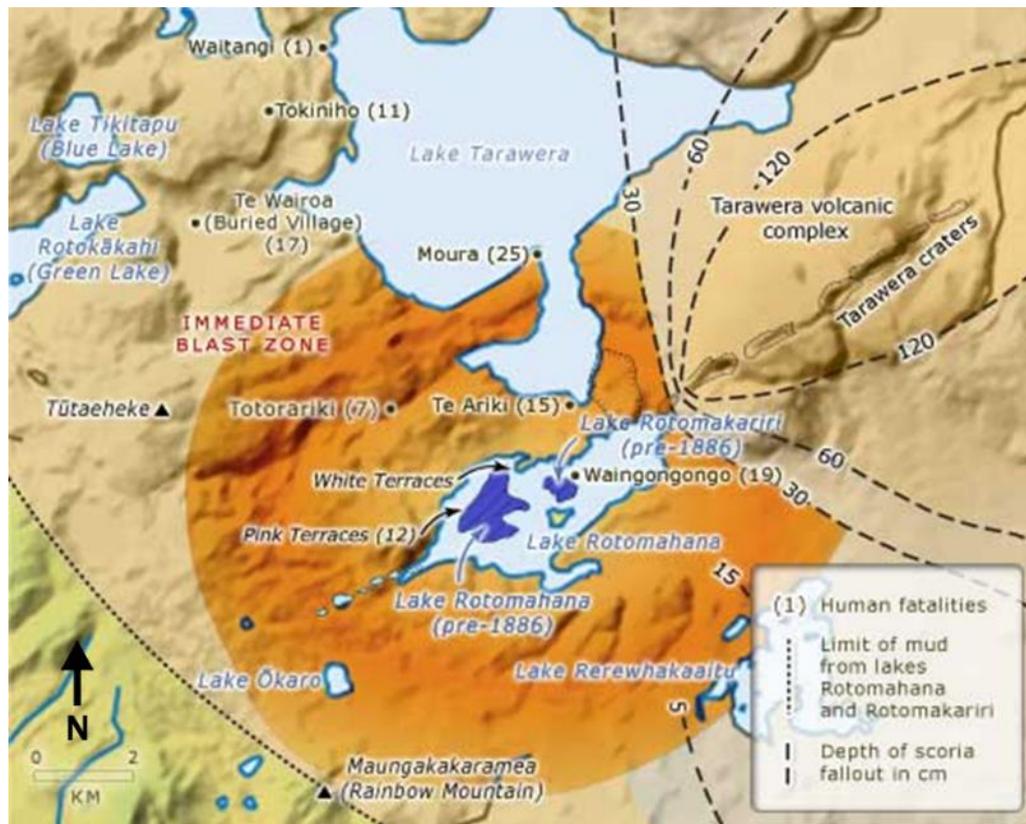


Figure 2. Isopach map depicting the extent of the Tarawera eruption, 10 June 1886. (Source: Te Ara Encyclopedia)

Mount Tarawera is a volcano in the Okataina Volcanic Centre, which is part of the Taupo Volcanic Zone (TVZ) in the North Island of New Zealand. The TVZ is the site of New Zealand's 'youngest' (last ~340 thousand years in geological terms) active volcanism (Wilson et al., 1995). These records indicate infrequent, but large and voluminous eruptions in the TVZ (Bibby et al., 1995; Wilson et al., 1995). Tarawera's last recorded eruption prior to the 1886 event occurred in ~AD 1305. It was a rhyolitic episode, typical of other volcanic events within the TVZ (Leonard et al. 2002). Rhyolitic magma is highly viscous and gaseous, the latter characteristic generally produces explosive but slow-moving eruptions. Basaltic magma on the other hand has a lower viscosity and is not as gaseous, hence it typically produces gentler eruptions with pyroclastic flows at a faster rate.

The Pink and White Terraces were a prominent attraction in the Tarawera geothermal area. They were heralded for their natural beauty and were an early example of eco-tourism (Keam, 2016). They stood imperiously on the shores of Lake Rotomahana, whose waters were well-regarded for their therapeutic qualities. Māori considered the Pink and White Terraces as taonga and developed a close affinity with them in their duty of care (kaitiakitanga) (Keam,

2016). Such was the beauty of the Pink and White Terraces and the surrounding geothermal area that the tourism industry flourished. The village of Te Wairoa was the main site from which the tourism industry operated. Māori charged for conducting sightseeing tours, photographs and commissioning artworks (Smith, 1971).

The 1886 eruption of Mount Tarawera in the early morning of Thursday 10 June was geologically unusual for two reasons. Firstly, it was a basaltic episode which was unlike the AD 1305 event and atypical of other volcanoes in the TVZ. Secondly, the eruption was highly explosive, a characteristic usually seen in rhyolitic events (Houghton et al., 2004). Such was the extent of the 1886 event that it is classified as a basaltic plinian type eruption, having been compared to the catastrophic episode of Mount Vesuvius in 79 A.D. (Walker et al., 1984). There were no indicators of an impending disaster in the days before the eruption. Local Māori were used to minor tremors and slight fluctuations in geothermal activity (Sable et al., 2009). The only abnormalities were a series of earthquakes that began at about 12.30 a.m on the Thursday morning. The earthquakes lasted until about 2.30 a.m. At this point, Tarawera's three peaks, Ruawahia, Wahanga and Tarawera, erupted, depositing $\sim 7 \text{ m}^3$ of basaltic lava, ash and tephra into the air (Walker et al., 1984).

The isopach map (Figure 2) represents the extent of the eruption. The immediate blast zone was $\sim 6 \text{ km}$ in radius. The eruption caused a great deal of structural damage to surrounding settlements and villages. Te Wairoa is the most prominent example of the eruption's devastation as mud falls and ash buried much of the village (Walker et al., 1984). Numbers in brackets (Figure 2) indicate the estimated number of fatalities in each area. There is no certain death toll from the Tarawera eruption (Lowe, Keam & Lee, 2001), but estimated figures suggest at least 100 casualties, ranging from, i.e. 108 (Keam, 1988a) to 153 (Waaka, 1986), the majority of whom were Māori.

Although IK concerning the Tarawera eruption exists, it has received little attention in an academic context compared to the conventional SK. Lowe, Newnham & McCraw (2002), and Cashman & Cronin (2009) are two principal examples of IK interacting with volcanism. Newnham & McCraw (2002) suggest that empirical observations through IK are crucial in understand indigenous peoples' response to volcanic hazards. Cashman & Cronin (2009) state that IK presents narratives embedded with metaphorical and mythical elements which depict volcanism in a story-like manner. These articles are promising in recognising the value of IK, but an applicable framework and methodology is needed to truly capture its understanding.

Chapter 3: Research Methodology

A series of considerations were made in developing this dissertation's methodology: 1) the dataset should capture the holistic nature of Te Ao Māori and be grounded in indigenous epistemology (Smith, 1999; Wilson, 2004); 2) the dissertation should draw on power relations that IK at large seeks to achieve (Smith, 1999); 3) 'Māori IK typically encompasses oral histories, thus primary data through interviews and wānanga kanoahi ki te kanoahi (face to face discussions) would have been an ideal approach for informing understanding of the Tarawera eruption; 4) however, the scope and timeframe of the dissertation did not allow for primary data collection; 5) the dissertation would therefore require a secondary dataset that is extensive and robust in order to capture the multi-dimensional nature of IK; 6) the SK presented in the previous section serves as a standalone knowledge paradigm for the Tarawera eruption.

To elaborate on the first two considerations, Smith (1999) asserts that Western research frameworks are by and large inadequate in addressing the needs, aspirations and concerns of indigenous people. Western framework dominance has resulted in the disempowerment of indigenous research, and that the way forward would be to invoke an approach that deeply considers the knowledges, practices, principles and customs of indigenous peoples (Smith, 1999; Barnes, 2000; Wilson, 2004). This is a committed approach that must be completely free from the shroud of colonisation, thus requiring an open mind on the part of the researcher. The entire indigenous 'system' must be considered rather than individual components. Such an approach would do well not only in raising awareness of IKs' potential value in disaster research, but as an empowering practice it would be a positive step for indigenous research at large. Challenging the prevailing balance of power currently in favour of Western frameworks is a necessary means of realising and re-'locating' indigenous people in disaster research (Bishop, 1998; Smith, 1999).

The dissertation's collected data is termed as an 'IK dataset', named so to acknowledge the salience of IK in various stages throughout a vast range of materials. This includes but is not limited to sources such as general interest books on Tarawera, which would not immediately come to mind when considering IK. Constructing the dataset entailed an extensive material search. At first this may seem to contradict Smith's (1999) assertions that indigenous methodologies should empower the people for whom they are applied. After all, drawing on IK that has the possibility of being fragmented, lost its original meaning or being reproduced by non-indigenous i.e. Pākehā is not exactly empowering. However, for the purposes of the

dissertation it is important to show the methodology's strengths as well as shortcomings in order to encapsulate the role of Te Ao Māori in disaster research.

Kenney & Phibbs' (2015) conceptual framework (Figure 1) is an appropriate platform to present the dataset in accordance with Te Ao Māori, and to explore the role of mātauranga, tikanga and kaupapa Māori in disaster research. The IK dataset comprises secondary data, specifically unpublished archival material, digital material, and published (archival and non-archival) material. The physical materials were viewed and collected from various sources, such as the Alexander Turnbull Library in Wellington, various Public Libraries throughout Auckland and Wellington and The University of Auckland Libraries. Fragile materials, such as original archival manuscripts could not be issued; in these cases photographs of the materials were taken for later reference. Digital materials were viewed at online websites such as NZ On Screen and the University of Auckland's TV and Radio Archive.

The IK dataset materials specifically include:

- Archival material: letters, manuscripts, miscellaneous data (e.g. waiata)
- Digital material: television documentaries on the Tarawera eruption
- Published material: published/general interest books on the Tarawera eruption
- Miscellaneous material: paintings

The research initially began with a focus on archival material. Such material is usually unpublished and subsequently not widely explored. In examining archival material the research seeks to identify manifestations of IK in letters, personal journals, diaries and other writings. In some instances, hand-written archival documents were illegible or in such poor condition that they were unable to be used. Digital material portrays how IK has permeated through the media and more contemporary sources. The Tarawera eruption has been the subject of television documentaries and this methodology deemed it appropriate to search for digital items which were publicly available to view. Published material such as general interest books demonstrate how IK has been transferred and filtered down to different extents. It also portrays how much IK can deviate from its original context. This is also the case with paintings; reproducing IK in visual form is complicated by the artworks' inherent subjectivity. Ultimately the IK dataset represents a unique approach that has never been explored in the context of the Tarawera eruption.

3.1. Methodological scope

Although this dissertation makes the best attempt to construct a robust and extensive methodology, two principal limitations that must be acknowledged. Firstly, the secondary dataset is not exhaustive; there is no certainty of how much archival material will be available or relevant to the study before the research process actually begins. The use of different materials (i.e. archival, digital) is an attempt to overcome this shortcoming. The second limitation to be considered elaborates on this idea through the overall relevance of archival material. There is the possibility of this material being incorrectly classified, inaccessible or incomplete. Again the diverse dataset is an attempt to mitigate this issue. Ultimately, the dissertation does not consider these shortcomings being preclusive to poor or insubstantial results. Rather they will make for a wholesome discussion in considering the strengths and challenges of this overall research, and how well the dissertation's objectives were met.

Chapter 4: Findings

4.1. Findings preamble

As the concepts of mātauranga, tikanga and kaupapa Māori in Kenney & Phibbs' (2015) framework are inter-connected, it is necessary to provide a brief interpretation and discussion of the research findings as they are presented. A more detailed discussion of the findings will be given in the next section. The findings have been classified into overarching IK themes. Their linkages to mātauranga, tikanga and kaupapa will be explained. At the end of this section is a table that visualises how the findings represent mātauranga, tikanga and kaupapa Māori (Table 2).

4.2. Values and consequences of IK

The television documentary 'Tarawera' (Riddiford, 2000) noted that Māori had amassed approximately 500 years' worth of geothermal knowledge on the Tarawera volcanic area prior to the eruption. By comparison, European geothermal observation was approximately 50 years old at the time. The documentary did not go into detail on the specifics of the Māori geothermal knowledge, though it did suggest that there were no geological indicators of an impending eruption.

One of the documentary's more pertinent recollections touches on the events precluding the eruption, explained through the experiences of Tuhoto Ariki, a well-known tohunga (appointed person/'chosen one') and tangata makutu ('sorcerer'). He lived in solitude at Te Wairoa, for his power was so formidable that many in the village ostracised him. Tarawera's burgeoning tourism industry saw a rise in economic prosperity and ribald behaviour. The local Māori enjoyed the fruits of their labour and would be seen consuming alcohol with the tourists (Riddiford, 2000). Tuhoto became worried that this behaviour and the exploitation of the natural landmarks would offend the gods. He was informed of the phantom with 13 occupants donning dogs' heads and feathered hats – an ominous premonition. Tuhoto voiced his concerns of impending danger to the people of Te Wairoa, but they fell upon deaf ears as the ribaldry continued.

Te Paea (Sophia) Hinerangi was a tour guide responsible for showing visitors round the Tarawera area. Her IK was thus present both by virtue of her being Māori as well as her occupation. 'Sophia's story' contains written her recollections of the events (Hinerangi, 1886). There are multiple versions of 'Sophia's story' (Keam, 1988b); it is not known what edition

this particular manuscript was. She also observed that Lake Tarawera was higher than usual: “[it] was higher than I had ever seen it, I should think about two feet higher than usual. This made me apprehensive of some approaching calamity” (Hinerangi, 1886; p. 1).

Sophia’s concerns were aggravated further as she too, spotted the phantom waka:

I said [to the party of tourists she was accompanying] ‘That was a phantom canoe and a warning that something dreadful is going to happen.’ I thought of the old chief [Tuhoto Ariki] who had warned us that God would punish Wairoa for its wickedness – he said that all the Māoris would be killed excepting me. He tapued [protected] my whare (Hinerangi, 1886; p. 1)

Sophia states that the eruption happened on the night she saw the phantom waka. This differs from accounts in Riddiford (2000) that the waka was seen 11 days before the eruption. Sophia, while facing a series of dangerous hazards (i.e. ash clouds, mud flows) was able to make her way back to her whare (house) in Te Wairoa; in doing so she accompanied the tourists who were travelling with her at the time of the eruption. Upon their return to Te Wairoa they found it nearly completely buried, except for Sophia’s whare, and Hinemihi, the whare tupuna (ancestral house) of Ngāti Hinemihi hapū. Both whare provided shelter for those caught in the eruption (Riddiford, 2000). This response suggests Sophia’s own knowledge of the area was vital to her and her tourist party being able to return to safety; at the same time an eerie reckoning of Tuhoto’s previous warning to Sophia. Ash, mud and lava flows had devastated the area. The value of mātauranga Māori came to a somewhat vain fruition in that Māori-style whare with their steep ridgepoles and timber construction (i.e. Hinemihi, Sophia’s whare) fared better European-style buildings with flat-pitched, corrugated iron roofs.

Tuhoto was thought to have succumbed in the eruption, but five days later he was found alive beneath the debris in Te Wairoa (Riddiford, 2000). Māori refused to rescue him because they thought it was he who brought the eruption upon them. He was rescued by Pākehā settlers who took him to a sanatorium in Rotorua. Riddiford’s documentary tells of how he was essentially exiled by Māori, and suffered the ultimate humiliation of having his head shaved. In Māori the head is tapu and interfering with the head in any way by, i.e. forcible shaving of the head, interferes with the tapu. Tuhoto protested, saying that he would grow weak and die – and so he did. Though it is not certain that shaving the head led to his demise; he was reportedly over 100 years old and had been badly injured in the eruption. The way in which Tuhoto was treated

by Māori, even before the eruption, was chiefly due to perceptions that he brought about misfortune in his role as tangata makutu.

Keam (1988b) tells of a wave of illnesses throughout villages in the Tarawera area that predominantly struck Māori in the months before the eruption. Pākehā doctors were astonished to hear of the deaths and were attributing them to disease. Māori on the other hand were concerned that the loss of their number was more ominous; i.e. that the gods were displeased with the ribald behaviour..

An interesting but obscure case of possible IK concerning the eruption is a handwritten waiata ('Ma wai e kai', n.d.) found in an archival collection of documents on Tarawera. It is undated and there is no author. Its words (and English translation) as follows:

<i>Ma wai e kai</i>	Who will eat
<i>Ma wai e kai</i>	Who will eat
<i>E nga ika pakapaka?</i>	The dried fish?
<i>Te korokoro a na na</i>	The lamprey of
<i>Ki Mokoia pa</i>	Mokoia village
<i>Ki te umu tahunga nui</i>	To the large empty oven
<i>Kia kinaki ai ki te kumara</i>	To add to the kumara
<i>Ara ka rekareka</i>	To become delicious

The waiata's exact origins or specific relevance to the Tarawera eruption are not known, but with a contextual understanding of mātauranga Māori and IK at large, three possibilities are offered:

- 1) The paper on which the waiata is written has been misplaced. Is it not meant to be in the archival collection relating to Tarawera. This is a possibility with archival material particularly if it is of an obscure nature;
- 2) The waiata is a metaphorical account of a previous event or phenomenon which occurred in the Rotorua region;
- 3) The waiata may be a lament to the loss of food stories (i.e. the dried fish and kumara) in the aftermath of the eruption.

It is difficult to identify which of these possibilities is plausible without any further context. To attribute the waiata to only one possibility would be too speculative. Given the subject of dried fish and reference to umu tahunga nui (large empty oven) the waiata in any case makes reference to traditional mahinga kai (food cultivation) entailing traditional Māori methods of growing and storing food. Large hazard events do destroy mahinga kai productions and their loss would seriously affect the livelihoods of the Māori that depend upon them. Waiata are recorded and passed down to emphasise feelings and rouse emotions during significant events.

4.3. IK transfer and mobility

One of the foremost considerations about mātauranga Māori and IK in general is how the knowledge is transferred, what happens to it when it is transferred and whether it is appropriate for the knowledge to be transferred in the first place. Gilbert Mair's 'The Relief of Tarawera' (1886) represents the transferability of Māori IK at large through language, folklore and customs. Gilbert Mair himself was Pākehā, but immersed himself in Māori culture, learning the language and becoming familiar with Māori social and cultural customs. Thus his letter, 'The Relief of Tarawera' (1886) was a heartfelt appeal "addressed to all the Māori people of Aotearoa" in the aftermath of the eruption. He originally wrote the letter in Te Reo Māori and it was translated later into English. Mair eloquently details the loss of livelihood Māori suffered from the eruption, as well as the devastation that the eruption had on the environment:

Ko tera maunga o Tarawera, he maunga nui tonu [...] Ahe wahi tapu taua maunga, kei reira nga whakatupuranga maha e takoto ana. Mai ano ia Apumoana [tupuna o Te Arawa]

The Tarawera mountain is a great craggy rock [...] a very sacred spot in the estimation of the Arawa natives, and the bones of many generations rest there; even from the time of Apumoana [ancestor of Te Arawa] (p.1)

Mair recognised and emphasised the valuable wahi tapu of Te Arawa that was located on Mount Tarawera itself. A wāhi tapu being disturbed would concern Māori, so it showed good foresight on Mair's part as a Pākehā to mention it. Further on, he vividly tells of the fatalities; Māori who succumbed to the eruption as their villages were buried from the ash and mud flows e.g.:

... ko Ngati Hinewai me Ngati Rangitihi, ko Niheta, Kaipara Mokonui-a-Rangi tona Rangitira, e 40 ratou i Moura e noho ana, poto atu ki te po.

The Ngatihinewai and Ngatirangitihi, forty in number, residing at Moura, with Niheta Kaipara Mokonuiarangi, their chief, have every one descended into the dark valley of death. (p. 1)

Near the end of the letter, Mair's poignantly reassures Māori:

Ehara hoki ra tenei Aitua i te mea kimi na ratou ake engari, he mate pa whakahaere tonu mai, mate ta ta.

It should be borne in mind that this calamity is not one that they [Māori affected in the eruption] would have averted or foreseen and they are in no way blamable. (p. 3)

In light of concerns over the phantom waka premonition and that the devastation was an act of the gods, Mair's reassurance was a progressive effort to dispel Māori fears that they were somehow to blame for the eruption. He appeals to Māori throughout New Zealand for donations of clothing, food and money to aid the relief effort.

Some pedagogical observations: Mair uses 'Aitua' (Death) as the Māori word for disaster. His overall written expression is eloquent, full of pathos, reads well in Māori (i.e. use of metaphors and expressed in a way that the profound impacts of the disaster were very telling in Te Reo). It also translates well in English, presented in lofty, flowing expressions albeit dated by today's standards. At the end of the letter, a handwritten amendment on the original manuscript states: "This appeal was most generously responded to by the Māori people. Several thousand pounds in money, food, clothing etc was collected." (p.3)

Ultimately Mair's letter represents a strong social cohesion between Māori throughout New Zealand in the face of disaster; it emphasises the sense of loss Māori suffered and need for pragmatism in response to a devastating event (whanaungatanga). It is a positive reflection on the mobility of IK, and somewhat telling that such a well-met initiative on the part of Māori was facilitated by a Pākehā.

4.4. How IK ‘makes sense of the sublime’



Figure 3. 'The Phantom Canoe: a legend of Lake Tarawera' by Kennett Watkins (1888). One of the stylised interpretations of the phantom waka sighting 11 days before to the eruption (Image source: Te Ara Encyclopedia)

The transfer and mobility of IK also has shortcomings – it can become fragmented or its original meaning distorted. This is a difficult contention particularly if the material is in visual form because there are no strict standards to which IK must abide. This is the case with Kennett Watkins' 'The Phantom Canoe: a legend of Lake Tarawera' (1888), a representation of the phantom waka seen by Māori and European alike prior to the eruption. Understanding how or indeed if the painting represents IK is a challenge because peoples' opinions and interpretations of artworks are inherently subjective. However, 'The Phantom Canoe' is a fragmentation of IK in its purest sense principally because Watkins, a Pākehā artist, presented a version of significant Māori mythology from his own, stylised narrative:

Although the spectre was seen in broad daylight, Watkins presents it in a dramatic nocturnal setting illuminated by a full moon amidst billowing clouds, foreshadowing the volcanic blast to come. Conforming to European conventions for the sublime landscape, a lone, fearful spectator in the foreground witnesses the vast canoe passing under the looming peak. (Blackley et al., 2001, as cited in Auckland Art Gallery, n.d.)

However, this material could also be considered from a positive perspective; such a painting raises awareness about the availability of IK. The dramatisation makes it attractive. In this

sense, the painting could act as a potential catalyst for people to discover further information about the Tarawera eruption if they wish. It is a manifestation, though stylised and dramatised, of a phenomenon deeply embedded in the overall IK of the eruption.

4.5. Tarawera and Te Ao Māori

Mātauranga Māori pertaining to the Tarawera eruption is diverse and ranges from the obvious, i.e. Māori-style whare better withstanding the eruption than the European-style buildings; to the obscure, i.e. the ‘Ma wai e kai’ waiata (n.d.). In short the findings show that mātauranga represented through secondary data provides valuable indigenous insights and perspectives the Tarawera eruption, but its exact origins are not always clear (Waiata: ‘Ma wai e kai’?, n.d.)

The practice of whanaungatanga as a component of tikanga Māori was prevalent throughout the findings. Sophia’s (Hinerangi, 1886) hospitality and concern towards her tourist party demonstrated whanaungatanga during the tense situation of fleeing from danger. Mair’s (1886) letter revealed the extent of whanaungatanga as Māori throughout New Zealand made generous and substantial donations.

Kaitiakitanga was contested due to the ribald behaviour brought about by the prosperous tourism industry. There were spiritual concerns that the gods would be angered by such behaviour because it was not tikanga. A more pragmatic example of tikanga was expressed in the ‘Ma wai e kai’ waiata. Although not known if it is directly relevant to the Tarawera eruption, mahinga kai was still in practice at the time and there almost certainly would have been mahinga kai stores within the eruption’s vicinity.

Watkins’ ‘The Phantom Canoe’ painting (1888) represents a fundamental concern of tikanga, i.e. whether or not reproducing IK in this nature is appropriate. This can be perceived as a disentanglement of IK from its original context. Keam (1988b) also notes a necessary distinction between Māori and Pākehā perceptions of sublime; in Te Ao Māori, IK which is ‘sublime’ is a metaphor

Kaupapa was the most challenging component of the framework to classify, as evidenced by fewer details in Table 2 (p. 23). The intrinsic ‘value’ of IK is not something that can easily be measured. Though the findings do show that whanaungatanga in both practice and principle is a crucial component into understanding the nature of the Tarawera eruption through the Te Ao Māori framework.

Table 2. A summarised table of findings classifying material from the IK dataset within the conceptual framework by Kenney & Phibbs (2015); i.e. how the findings align with mātauranga, tikanga and kaupapa Māori (Author's own)

Material	Material type	Mātauranga (knowledge)	Tikanga (cultural practices)	Kaupapa (values and principles)
'Sophia's story' (Hinerangi, 1886)	Unpublished material (archival)	<ul style="list-style-type: none"> Sophia as a tour guide had valuable local knowledge of the Tarawera area Recalled Lake Tarawera was "about two feet higher than usual" on day of eruption 	<ul style="list-style-type: none"> <u>Whanaungatanga in practice</u>: After the eruption, Sophia took in survivors at her whare 	<ul style="list-style-type: none"> <u>Whanaungatanga in principle</u>: Sophia was well-regarded among Māori and Pākehā for her role as a guide and during the eruption
'The Relief of Tarawera' (Mair, 1886)	Unpublished material (archival)	<ul style="list-style-type: none"> Mair, a Pākehā, immersed himself in Māori culture and became fluent in Te Reo His letter addressed "to all the Māori people of Aotearoa" was written in eloquent Māori and translated to English 	<ul style="list-style-type: none"> Appealed to Māori for donations towards the relief effort following the eruption <u>Whanaungatanga in practice</u>: "several thousand pounds in money, food, clothing etc" collected in response 	<ul style="list-style-type: none"> <u>Whanaungatanga in principle</u>: Mair was able to facilitate a strong social cohesion between Māori through Aotearoa in time of disaster
Waiata: 'Ma wai e kai?' (n.d.)	Unpublished material (archival)	<ul style="list-style-type: none"> Exact origin uncertain, but may represent mātauranga as: 1) a metaphorical account of a previous event i.e. preceding the eruption 2) a lament for the loss of food stores and livelihoods after the eruption 	<ul style="list-style-type: none"> Demonstrated the practice of mahinga kai and traditional Māori cooking, central to traditional Māori livelihoods 	<ul style="list-style-type: none"> Waiata used to rouse emotions e.g. happiness, fear, sadness

<p>‘Tarawera’ documentary (Riddiford, 2000)</p>	<p>Digital material (documentary)</p>	<ul style="list-style-type: none"> • Māori had accumulated ~500 years’ worth of geothermal knowledge on Tarawera • Tuhoto Ariki: had deep knowledge about Māori spirituality as a tohunga/tangata makutu and was concerned about the ribald behaviour brought by tourism; his warnings of impending danger was largely ignored 	<ul style="list-style-type: none"> • <u>Kaitiakitanga threatened?</u> Concerns that natural features i.e. Pink and White Terraces were being exploited through tourism and ribald behaviour in the villages • Tuhoto Ariki: his head was shaved by Pākehā; interfering with the head disturbs the tapu with which the head is imbued. He died shortly afterwards 	<ul style="list-style-type: none"> • Tuhoto Ariki: Māori blamed him for the eruption
<p>‘The Phantom Canoe: a legend of Lake Tarawera’ (1888) artwork by Kennett Watkins</p>	<p>Misc. material (painting)</p>	<ul style="list-style-type: none"> • <u>Mātauranga (the phantom waka as an ominous premonition):</u> presented through a stylised, fragmented perspective in the eyes of a Pākehā 	<ul style="list-style-type: none"> • Brings into question how appropriate the transfer of IK is i.e. how appropriate it is for a Pākehā to be reproducing IK embedded in Māori mythology 	<ul style="list-style-type: none"> • ‘Distorted’ insight into Te Ao Māori? Well-meaning?
<p>‘Tarawera: The Volcanic Eruption of 10 June 1886’ (Keam, 1988b)</p>	<p>Published material (book)</p>	<ul style="list-style-type: none"> • <u>A wave of illnesses struck Māori in the months before the eruption:</u> traditional Māori health care practices were being used to treat them with mixed outcomes 	<ul style="list-style-type: none"> • <u>Why Māori were falling ill:</u> The illnesses were thought to be a punishment for uncouth behaviour stemming from the tourism industry 	<ul style="list-style-type: none"> • Intersection between Māori and Pākehā livelihoods, as some sickly folk went back and forth between medical practitioners (i.e. Pākehā doctor or traditional Māori medicine)

Chapter 5: Discussion

The themes presented in the findings offer a fascinating insight into the Tarawera eruption while at the same time demonstrating the value of IK in disaster research. It is evident that IK is valuable for understanding human and social linkages to disasters from the perspective of the indigenous people themselves. Using a Te Ao Māori framework to investigate the Tarawera eruption does well to bring out the inter-relation of knowledge, practices and principles (i.e. mātauranga, tikanga and kaupapa), making salient the histories and interpretations behind the eruption. The following discussion presents further challenges and considerations to exploring the Tarawera eruption through a Māori lens. These will be discussed in relation to the dissertation's objectives.

5.1. SK on the Tarawera eruption

The SK on Tarawera is highly detailed in providing accounts and evaluations of the geological processes concerning the eruption. This knowledge has been developed in parallel with increased technological advances that further improve the potential of such research. The SK is characteristically technical, as it is presented to a technical audience i.e. governments, institutions, academics and research organisations generally having expertise on the matters at hand. Although this limits the broader understanding of the knowledge, it is necessarily technical because it adds an element of credibility to the knowledge, thus becoming better recognised. This in turn presents further research and developmental opportunities to be made based on recognised and credible data. The SK on Tarawera is subject to academic rigours which are apparent when observing how the articles are formative, i.e. they build upon each other (Cole, 1970; Walker, 1984; Sable et al., 2002). Quantitative geological information presented through SK also provides meaningful pathways for decision-making in disaster research and response, a pertinent consideration in light of New Zealand's active volcanic setting.

Such knowledge is inherently constrained to the top end of power relations. Tarawera's SK is very much reminiscent of Smith's (1999) assertions that the prevalence of Western knowledge in turn constrains the recognition of indigenous approaches. However, rather than contest different epistemologies it is important to realise the value that they both offer in creating a wider perspective of disaster. This echoes Agrawal's (1995) argument that research and development at large should move beyond the 'scientific vs. indigenous dichotomy' and move

towards a greater realisation of indigenous peoples, their knowledges and world-views. From there the challenge would be to create an effective and worthwhile dialogue that considers both epistemologies and the values inherent within their own distinctive frameworks.

5.2. Te Ao Māori framework and the systematical nuances at play

Incorporating Kenney & Phibbs' (2015) Te Ao Māori framework by and large illustrated the holistic nature of Te Ao Māori, and that social and mythological dimensions of Māori IK are necessary to better understand the livelihoods of the Māori who were affected by the eruption. Conventional SK identified in the case study section did not and could not report this. From the findings, the examples of mātauranga, tikanga and kaupapa are essential in constructing an overall picture of what happened in the eruption through a Māori perspective. In a broad sense, incorporating the Te Ao Māori framework in such a research also aligns with Foucault's calls to redress the power relations in knowledge production, i.e. considering "human condition, human nature and human endeavour" (McHoul & Grace, 1997). An understanding of human nature is particularly important in disaster research because disasters affect many dimensions of peoples' livelihoods. Without due consideration to these dimensions, the rich folklore and mythologies of IK would not be recognised. Realising these factors and manifestations is step towards indigenous autonomy (Agrawal, 1995; Cunningham, 1998).

One of the challenges struck with using the Te Ao Māori framework was aligning the findings according to how mātauranga, tikanga and kaupapa as Kenney & Phibbs had explicitly defined them. The dissertation initially established that such terms were nuanced and had slightly different definitions depending on the perspective from which they were viewed. Hence, constraining these terms to a single definition on hand allowed for a succinct representation of the findings, but on the other hand it somewhat limited realising the full extent of such complex and intricate Māori terms. Kaupapa in particular was challenging to illustrate in the context of the framework as shown by the less detailed findings (Table 2). This is why the findings were presented as a series of overarching themes – an attempt to express them in a meaningful way rather than providing a limited interpretation on them as singular components. Encapsulating the wider extent of Te Ao Māori could entail, i.e. further developing Kenney & Phibbs' framework through a wider interpretation of mātauranga, tikanga and kaupapa. Or, as the framework is only a recent initiative, incorporating it within further disaster research to test its rigour and better understand the intricacies at play in Te Ao Māori.

This challenge is further compounded by the nature of this dissertation's dataset. Secondary data is inherently limited in that it does not give first-hand accounts of peoples' experiences in the face of disaster. The secondary dataset is also not exhaustive, as illustrated by the waiata. Gaillard & Mercer (2013) state that a direct level of engagement is crucial to understanding the multidimensional nature of disasters and fostering relationships between 'facilitators' and insiders, in order to encourage continued interaction that promotes disaster risk reduction. In the case of Tarawera, this would involve engaging with descendants to gain a deeper insight into the experiences and actions of their ancestors. Establishing this contact in the first instance requires a host of ethical and logistical considerations that go beyond the scope of this dissertation. Effective engagement would culminate in a relationship built on trust, and facilitated on the terms of the indigenous peoples themselves (Gaillard & Mercer, 2013).

Another pertinent consideration underpinning this dissertation is the question of what exactly constitutes IK. This is a contention that was first encountered with respect the findings being a product of an 'IK dataset'. The appropriateness of this term was questioned for three principal reasons. Firstly, IK can be reproduced without the need for verification. As it is reproduced there is the possibility of its original meaning being lost or disentangled. Kennett Watkins' 'The Phantom Canoe' (Figure 3) is a good example of this. This particular artwork is well-featured, being available online whilst the original painting is presently the property of the Auckland Art Gallery. This is a transmission of IK through a dramatised interpretation. It fundamentally represents a convergence of Māori mythology (the phantom waka itself) and a European idea of the sublime (the dramatisation of the painting). Therefore, Watkins' artwork does not represent IK as a whole, but it does demonstrate the ways in which IK filters down as it is reproduced. It was important the findings showed this in order to illustrate the reality that IK and indeed knowledge at large can be complicated by a range a factors, interests and interpretations.

The second consideration with regards to what constitutes IK lies in the process of demystifying such knowledge and whether or not this is appropriate to do. Metaphors and folklore contribute to the intricacy of mātauranga Māori. They are a necessary element of representing the way in which mātauranga is created and transferred. Deeply examining IK or placing it in a specific context should be done with careful thought and consideration to its original meaning and authenticity (Agrawal, 1995; Cunningham, 1998; Gaillard & Mercer, 2013). This dissertation tried to take caution in presenting the knowledge accurately enough so that its original context was retained, but at the same time presenting it in a meaningful way so

that it might be more widely understood in an academic context. The Tarawera eruption is well-known enough to warrant a deeper investigation into the role that IK and Te Ao Māori play in shaping peoples' understanding of the disaster. For other disasters, however, it remains an inherently complex matter that researchers should tread carefully and take on a case-by-case basis.

The third consideration with what constitutes IK again relates back to Kenney & Phibbs' Te Ao Māori framework. In this dissertation's context, tikanga and kaupapa are tied in with mātauranga to establish the term 'IK'. This consideration emphasises that the term 'IK' is open for interpretation and its essence is contextual (Agrawal, 1995; Mercer et al., 2009; Gaillard & Mercer, 2013). At a conceptual level, it also demonstrates that 'mātauranga' alone is not adequate in truly realising the value of Māori IK – it is inherently linked with tikanga and kaupapa. In short, IK is part of a wider system or paradigm that operates within its own world-view, as opposed to being a distinct, standalone component. Te Ao Māori after all is holistic.

5.3. Te Ao Māori and Tarawera's legacy: the relocation of Hinemihi

This section is included in the discussion rather than the findings because it was not considered in the original dataset of the dissertation. Contemporary Western society enjoys a level of connectedness and accessibility that can somewhat complicate and shroud the legitimacy of all knowledges (Sully, Raymond & Hoete, 2013). This raises the possibility of IK becoming removed or disentangled from its original context (similar to paintings). An example of this occurring is Hinemihi, which along with Sophia's whare was one of the few buildings in Te Wairoa that withstood the eruption. In 1892, Hinemihi was relocated to Clandon Park, Surrey, England. Since 1956 it has been under the operation of the National Trust UK, serving as a cultural outpost and a reminder of how Māori IK has been manifested both physically and metaphorically (National Trust UK, n.d.). To Ngāti Hinemihi descendants, the whare is equally a reminder of the actions taken and the hardship suffered by their ancestors during the eruption.

Hinemihi's current setting gives light to the dissertation's third objective on the ways that new mātauranga manifests itself following a disaster. There are legitimate arguments both for and against such a development. For: Establishing Hinemihi as a Māori cultural outpost in England has in turn established a specific community known as 'Hinemihi's people', comprising specifically of:

The descendants of the originating community in New Zealand; Ngati Hinemihi and associated iwi (Te Arawa, Ngati Tuhourangi, Kereopa whanau (Descendants of Tene Waitere).

The British Public; National Trust visitors, volunteers and staff, academic staff and students, The Onslow family and local residents living in and around Clandon.

The British Māori and Polynesian community; Ngati Ranana (London Māori Club), Te Kohanga Reo o Ranana (The London Māori language school), Maramara Totara (London Māori weaponry school), Matariki & Manaia (Māori Cultural Groups) and Beats of Polynesia (Polynesian Cultural Group).

Te Maru o Hinemihi (In the embrace of Hinemihi), a volunteer group formed in March 2012 has been working in partnership with the National Trust to create effective proposals for Hinemihi's future use and care. (Te Maru o Hinemihi, 2012; p. 2)

This is a highly diverse community, which would in principle facilitate a rich dialogue, bringing together various perspectives and expertise. Māori teach traditional marae-based practices of raranga and tukutuku (weaving), the knowledge of which helps create a sense of belonging between Hinemihi and her people. Māori also hold pōwhiri (welcoming ceremony) to build engagement and familiarity with Māori culture. The result is a level of immersion that was typical of the traditional Māori communities that existed at the time of the eruption. It affirms the legitimacy and value of IK which Māori themselves are able to control and assert.

On a broader scale Hinemihi promotes awareness of IK at large and the extent to which it can reveal more about indigenous peoples' livelihoods in both the past and present. It again realises Foucault's arguments for the need to better acknowledge the likes of human nature and human endeavour (McHoul & Grace, 1997). Doing so here highlights the remarkable mobility of IK, i.e. physically in that the very same whare which, 130 years ago refuted survivors in time of disaster is now established in a different part of the world; metaphorically in that the cultural affinities which characterised traditional Māori settings have been re-established in a contemporary setting through the co-operative efforts of a diverse interest group (Te Maru o Hinemihi, 2012; Sully, Raymond & Hoete, 2013). Ultimately Hinemihi in its current setting is a progressive indicator of the outcomes that effective inter-cultural engagement can bring in realising the value of IK, knowledge recovery and indigenous world-views.

Conclusion

While SK is a valuable and recognised way of understanding the technical nature of disasters and natural hazards, it is equally important to consider the human dimensions underpinning these events. This entails considering different knowledges, their role in disasters and their interactions between each other. This dissertation explored the role of both SK and IK in a disaster context. The 1886 Tarawera eruption was a suitable case study for this dissertation because it is a significant, notable and publicised disaster event in New Zealand's history. SK on Tarawera is well-documented in understanding the geological and volcanological processes relating to the eruption, necessary to keep in mind in New Zealand's active volcanic setting. The disaster's impact on Māori and the wealth of information available made it a worthwhile case study to consider IK.

Avenues of further study should develop upon these factors of IK as they were discussed in this dissertation. Arguably the best way forward would be to collect primary data via first-hand interviews, so that the true value of oral transmission within IK is recognised. This would also do well to mitigate the uncertainties that can arise with secondary datasets, particularly with archival material. However, first-hand data collection entails a series of logistical and ethical considerations that can limit research opportunities. The secondary dataset of this dissertation offered a unique approach in gaining insight into IK and the various ways it manifests itself. It should be noted that although the best attempt was made to ensure that the dataset was robust and extensive enough within the scope and timeframe of this dissertation, a secondary dataset will be inherently limited. This was a fascinating process to contend with and experience.

Kenney & Phibbs' Te Ao Māori framework was able to present the findings of this dissertation in culturally appropriate and meaningful way. This reflects the robustness of the framework and that it may possibly be worthwhile in other disaster studies to do with Māori throughout New Zealand. Further applications such as these would be beneficial when there is IK to be discovered or made sense of. Presenting IK in a meaningful way would be an initial step in realising the value of IK in disaster research at large. The Te Ao Māori framework is suitable because it brings together the three main concepts (mātauranga, kaupapa and tikanga) into a common grounding. It is also easy to see the concepts' inter-relations and nuances that underlie Te Ao Māori's holistic nature.

The dissertation has also been able to demonstrate the need for collaborative engagement between knowledges rather than contestations and arguments over perceived dichotomies. The discussion of Hinemihi being relocated was the best example of this point. It operates as a collaborative initiative facilitated by Māori upon which they have a platform to produce, share and recognise the value of IK. Hinemihi remains a legacy of the Tarawera eruption through its spiritual manifestations and reminders to her descendants of the people that went before them.

Finally, adding IK alongside SK to the overall knowledge of the Tarawera eruption presents a range of perspectives and pathways that may serve to assist in encapsulating perspectives of other disasters throughout New Zealand in the past, present and future. This narrative has underpinned the prevailing outlook and whakataukī in support of this dissertation:

“Me hoki whakamauri, me haere whakamua”

Look to the past, to move to the future

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