MĀORI INTERACTIONS WITH CLIMATE CHANGE

by

KYLIE LOUTIT

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Ronald Mitchell

Anthropogenic climate change is an international issue that will disproportionately affect marginalized groups, such as Māori people of New Zealand. This paper examines the contributing factors to Māori vulnerability and resilience to climate change, and how Māori people are, and may continue to be, affected by climate change due to these factors. The historic and current marginalization of Māori people has had, and will continue to have, profound effects on their culture. The unprecedented impacts of climate change are expected to exacerbate the social vulnerabilities of Māori. However, climate change may also provide a venue for Māori empowerment and advocacy of Māori worldviews through involvement in climate discussions. Empowerment and cultural understanding will contribute to Māori resilience against climate change.

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I. Introduction

Climate change is a worldwide problem that has disproportionately affected marginalized groups, such as Māori people of New Zealand, and will continue to do so in the future. This paper examines how Māori people have been and will be impacted by climate change and the opportunities they have to adapt more effectively to those impacts and improve the resilience of their people and their culture. I accomplish this by examining the historic and current context that influences Māori vulnerability, as well as the role that Traditional Ecological Knowledge (TEK) plays in fostering their resilience. I also examine the components of vulnerability and resilience, and how Māori are interacting or addressing each component.

Global climate change is happening (Cubasch *et al*. 2013:121; EPA 2014). Climate change refers to any major changes regarding climate (i.e. temperature, precipitation, wind), which last for an extended period of time (EPA 2014). Climate change differs from climate variability in that climate change, as used here, refers to the part of climate variability that is caused by humans or "anthropogenic." Vulnerable populations and indigenous people, such as the Māori people, face risks that are disproportionate to the relatively small contributions they make to greenhouse gas emissions. Current impacts from climate change include a rising average global temperature, changed precipitation patterns resulting in severe droughts and floods, oceanic warming and acidification, ice cap melting, and rising sea levels (EPA 2014). These changes will have considerable effects on people and cultures around the globe; however, less powerful, marginalized, and disenfranchised people are likely to experience more of these negative impacts than others (Macchi *et al*. 2008).

The negative impacts of climate change may be greater among socially vulnerable groups, such as the Māori people. Social vulnerability is the product of social inequalities (Cutter *et al*. 2003:243). Social vulnerability differs from biophysical vulnerability in that social vulnerability considers the social conditions of a society to determine its vulnerability, instead of examining only the physical aspects, such as location. Certain social factors, such as access to financial resources, awareness and communication of risk, and available social networks, influence and shape the susceptibility of groups to harm and exposure, and influence both the impacts they experience before they respond as well as their ability to respond (Cutter *et al*. 2003:243). Indigenous groups tend to fall within the category of the socially vulnerable (Macchi *et al*. 2008). This is often due to historical social, political and economic exclusion and dismissal (Macchi *et al*. 2008:18). Marginalization arises from a people's consistent exclusion from access to power, information, technology, and other resources, and is often the consequence of past social, political or economic rejection (Macchi *et al*. 2008:18). Such deprivation can, and often does, result in a reduced quality of life, or at least a drastic change in way of life, which in turn can make people in such marginalized groups more vulnerable to a wide range of forces, including those predicted to occur due to climate change.

The consequences of such marginalization are long lasting and historical marginalization still affects many indigenous communities today. Marginalization of such groups has not only created vulnerability, but also ensured vulnerability, by continuing to determine how Māori, as well as other indigenous groups, will deal with climate change. Māori society provides an example of how historical marginalization

created, and continues to increase, the vulnerability of marginalized groups to climate change.

However, indigenous groups also have a profound knowledge base of traditional ecological knowledge (TEK) that may offer them certain opportunities and strengths that can offset the negative effects of marginalization. TEK is uniquely defined by each individual tribe, but can refer to a system of knowledge built up over long periods from generation to generation by traditional societies about their environment (Nakashima *et al*. 2012:42). TEK stems from the unique, mutual relationships many indigenous groups have with their specific environment. Berkes *et al*. (2000:1252) describes TEK as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings with one another and their environment." TEK is contextual and is shaped by specific and unique environments, but it is not static. It is a process, rather than content (Berkes *et al*. 2000:1252). This understanding derives from a close connection with the environment, which leads to ongoing observations and discoveries. Some argue that TEK may help indigenous communities reduce their vulnerability, while also increasing resilience (Berkes *et al*. 2000:1259; Hennessy *et al*. 2007:522; Nakashima *et al*. 2012:43).

The resilience of most indigenous groups is intertwined with TEK. The IPCC (2012) defines resilience as "the ability of a system to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely manner, including ensuring the preservation, restoration, or improvement of its essential basic structures and functions" (5). Resilience reflects a community's ability to "return to an earlier (meta-

)stable state after a perturbation" (Fussel 2007:161). I define resilience against climate change as the ability of a community to absorb climate impacts and continue to exist. TEK offers opportunities to offset some of the effects of the Māori's social vulnerability, but not all of them. This thesis examines the extent to which TEK can help Māori be more resilient in the face of climate change, despite their social vulnerabilities. In order to achieve this, I provide a brief introduction to the Māori people and Māori culture, including historical and current context and how TEK influences Māori way of life. From there, threats of climate change in New Zealand are outlined and vulnerability to climate change in New Zealand is discussed, including contributing factors to Māori vulnerability. Resilience of Māori to climate change, and its contributing factors, are also reviewed. Māori social vulnerabilities will be exacerbated by climate change, but climate change may also provide an avenue for Māori to teach their worldviews to other New Zealanders and become more involved with governmental and climatic discussions.

II. An Introduction to Māori

To understand what makes Māori vulnerable to climate change, one must first comprehend the evolution of Māori culture. Māori are the indigenous peoples of Aotearoa (New Zealand). Each Māori individual, *iwi* (tribe), *hapu* (clans or descent groups) and *whānau* (extended families) is unique in their perspective on climate change and their cultural understandings. Each iwi faces different circumstances and challenges regarding climate change. Māori society is not homogeneous. However, that being said, "no Māori individual, group, community or business enterprise exists in isolation" (King *et al*. 2010:103). Māori society influences New Zealand society and vice versa. Despite this, Māori are a distinct interest group within New Zealand due to their unique cultural history.

Evolution of Māori TEK

Māori environmental knowledge (MEK) is Māori TEK. Māori and Māori culture evolved with the land, so their knowledge and understanding of themselves is intertwined with their surroundings. MEK consists of several key elements. It is impossible to define MEK in general; it is different for every *iwi* and individual Māori. It involves a deep and complex kinship with the earth, which makes it difficult to describe or explain in simple terms. According to traditional Māori knowledge, everything in the world is believed to be related; "the natural world forms a cosmic family… the weather, birds, fish and trees, sun and moon are related to each other, and to the people of the land" (Te Ara, "Te Taiao" 2010:8). Whakapapa (genealogies) are recited to explain these relationships and to help people understand the world, and "how to act within these relationships" (Te Ara, "Te Taiao" 2010:9). The world is seen as a

complex whānau (extended family), with humans being considered as children of the earth and the sky (Te Ara, "Te Taiao" 2010:8). Many Māori embrace the concept of kaitiakitanga, or guardianship and protection, which provides guidance for human interactions with the environment based on the Māori worldview (Te Ara, "Te Taiao" 2010:47). Within the larger system of MEK, Māori have developed local weather and climate knowledge to help make important decisions about the best time to fish, dive, plant, harvest and hunt (King *et al*. 2008:393). This system includes detailed discourse on types of wind, precipitation, clouds, etc. Current day MEK, or *Mātauranga Taiao*, includes both traditional and non-traditional knowledge, by combining the lessons learned from incorporating traditional and modern practices of agriculture, fishing, medicine, education and conservation (King *et al*. 2008:385). Non-traditional knowledge entails what is commonly referred to as "Western science". This includes statistics, data collection and in situ experiments.

Anthropogenic climate change has and will continue to shape and influence MEK. Because MEK is so closely linked to the environment, rapid climate change forces MEK to evolve quickly. As stated earlier, ecological knowledge is flexible and ever changing. While climate change presents unforeseen challenges, Māori also have developed unique relationships with, and understanding of, the environment in which they live over thousands of years. These relationships may help Māori respond and adapt in innovative ways to the challenges presented by climate change. The concept of guardianship is extremely important in MEK, so many Māori have been very vocal about systematic responses to climate change. Despite the vulnerabilities facing Māori today, MEK provides Māori with resilience against climate change

Foundations of Marginalization of Māori

The first people to arrive in New Zealand are believed to have come from East Polynesia in the 13th century (Wilson 2014). European contact began in 1642, with the exploration by Dutchman Able Tasman, but did not being colonization New Zealand until the last 18th century (Wilson 2014). Early interactions were mostly peaceful and involved traders or missionaries (Wilson 2014). However, inter-tribal wars over resources and European-introduced diseases caused widespread casualties of Māori (Wilson 2014). In the 1830s, Great Britain increased its interest in New Zealand in order to protect trading access and had numerous Northern chiefs sign a declaration of independence in 1835 (Wilson 2014). On February 6, 1840, all Māori chiefs were invited to sign a treaty with the British Crown; eventually more than 500 chiefs signed the Treaty of Waitangi (Wilson 2014). Under the treaty, Māori ceded powers to the British government in return for guaranteed possession of their lands (Wilson 2014). However, differences in interpretations between English and Māori led to confiscation of large amounts of Māori land for settlement and government use (Figure 1) (Wilson 2014).

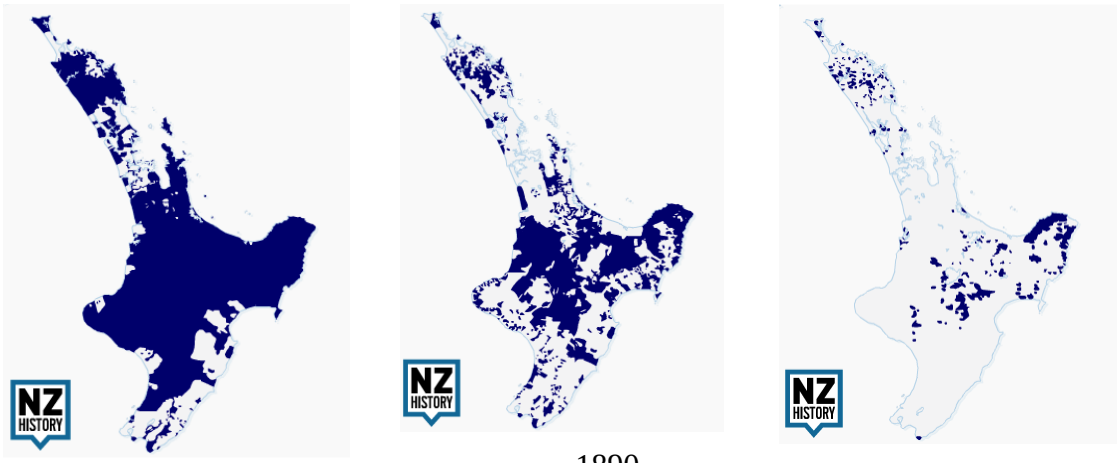

Figure 1: Māori land 1860; 1890; 2000. By 1890, Māori held about 40% (11.6 million acres) of the land in the North Island. By 2000, Māori held about 4% of their original land. By 1865, the Crown and the New Zealand Company purchased nearly 99% of the South Island. Adapted from www.NZhistory.net.nz.

Early Māori-European interactions also began marginalizing Māori people and Māori culture in other ways. For example, the Tohunga Suppression Act of 1907 outlawed traditional medicine and spiritual knowledge, further threatening the loss of traditional knowledge and practice (King *et al*. 2008:388). The cultural divide between Māori and Pākehā (non-Māori New Zealanders) continued to expand, resulting in racism and socioeconomic disparities, which are still present today (Henare *et al*. 2011; Te Ara "Maori Tribes of New Zealand" 2010; Michell 2009). The history of Māori marginalization makes it unlikely to change quickly, and therefore is likely to continue to determine the ways in which Māori will deal with future climate change. Marginalization of Māori has the potential to make Māori especially vulnerable to climate change, vulnerabilities that are discussed later.

Current context of Māori

Historical oppression and the current geographic and cultural situation of Māori people contribute to their vulnerability to the likely impacts of climate change. Māori comprise about 15% of the New Zealand population (Statistics New Zealand, 2005a as cited in Hennessy *et al*. 2007:522). Most Māori continued to live in remote rural areas until the Second World War, due to the growing demand for labor in cities (Te Ara, "Maori Tribes of New Zealand" 2010:92). This mass migration from rural communities to cities proved difficult for some Māori individuals because they were far from home and felt disconnected from their support systems (Te Ara, "Maori Tribes of New Zealand" 2010:92). This major migration has also had a severe impact on Māori communities as a whole. Migration to urban environments strains the traditional connection with MEK, which otherwise might help protect Māori from climate change. It also reduces the individuals' access to traditional resources that are known to facilitate resilience to changes expected to arise due to climate change.

Racism was, and still is, a prevalent issue; Māori are significantly more likely to experience discrimination than Pākehā (Ministry of Social Development 2010:81). The mass migration of Māori to urban cities combined with continued economic deprivation and loss of land negatively impacted race relations (Wilson 2014). Continued racism and degradation of Māori has contributed to Māori vulnerability to climate change. Many Māori continue to struggle from marginal health, as well as subpar land and limited financial resources.

However a cultural renaissance, which is still underway, may combat some of this historical marginalization. A renaissance of Māori culture began in the 1980's

(Wilson 2014). In 1975 the Waitangi Tribunal was set up to consider alleged breaches of the Treaty of Waitangi; ten years later, the tribunal was empowered to look at breaches of the treaty since 1840 (Wilson 2014). Due to efforts of the Waitangi Tribunal, the Māori language was made an official language of New Zealand in 1987; this is just one of the many examples of acceptance and empowerment of Māori society in current times (Wilson 2014). There are about 75 Māori tribes in New Zealand today, most of which are situated on the North Island, and these tribes have been experiencing increasing revitalization in recent decades ("Maori Tribes of New Zealand"). Many Māori are becoming more involved with climate change discussions through their personal understandings of TEK (Ministry for the Environment 2007). Nevertheless, continued racism results in less access to a wide range of financial and educational resources that could help Māori communities respond more effectively to climate change.

Role of TEK in Understanding Climate Change

A growing number of tribal leaders, scholars, and others are increasingly expressing concerns with the fast-paced changes associated with climate change affecting the legitimacy or effectiveness of TEK in understanding the environment (Nakashima *et al*. 2012:6; Williams and Hardison 2013). However, it is important to make clear that Māori environmental knowledge is more than a simple source of climate knowledge to analyze. As stated earlier, *kaitiakitanga* embodies the concept of environmental stewardship and protection. One participant at a climate change consultation said, "if we don't look after the climate, we are not looking after all life species" (Ministry of Environment 2007: 19). By not addressing climate change, we are not doing our part as

protectors of the land. Te Aho (2007:147) explains that Māori agree that climate change is a real and important issue: "it will affect their lands, waterways, flora and fauna and food sources, and consequently their rights and responsibilities in relation to rangatiratanga[1] and kaitiakitanga."

Cultural Implications of Climate Change for Māori

The hazards and exposure to climate change have impacted, and will continue to impact, traditional Māori culture. The negative implications for Māori could threaten their resilience and their culture as a whole. "Many rural Māori rely on the use of public and private land and coastal areas for hunting and fishing to supplement household food supplies, recreation and the collection of firewood and cultural resources" (Hennessy *et al*. 2007:522). A changing climate will put additional stress on traditional ways of life that are already stretched due to resource restrictions. For example, Ariana Eilleen Rene from Ngati Toa Rangatira on the north coast of the South Island states:

> People who came to Takapuwahia always expected to be served with kina, paua, mussels or pipis because of close association with the sea. It was usual for Ngati Toa to have all those sorts of things on the table. But over the years all those kinds of food diminished and all these restrictions were put on us – we couldn't serve up those kinds of delicacies that Māori used to look forward to. That was very hard. You either had to go out of your traditional fishing areas to get seafood or try to buy it. Usually there wasn't enough money to buy it, so you just had to make do with what you had. That was a bit degrading for Ngati Toa because once we used to provide those delicacies profusely…
>
> (Rene 2003: 17).

[1] The right for Māori to be self-determining and self-sustaining

Climate change also threatens the habitat of regionally distinct plants used in traditional medicine or art, greatly impacting social aspects of Māori society (Packman *et al*. 2001; Hodgson 2001). Maintaining their unique cultural identity has been a proud accomplishment of many Māori, so the loss of key cultural components (such as kauri - a large tree used for building and carving) could have profound effects on traditional practices. Tradition requires Māori to discuss important decisions with members of their hapū, which can "make decision-making processes complex, making it difficult to reach consensus and implement costly or non-traditional adaptation measures" (Hennessy *et al*. 2007:522). Other necessary resources, such as water and electricity, are also an issue of concern for many Māori due to increased costs in a context of low and slow-growing incomes that arise from their marginalization in the New Zealand economy. According to Packman *et al*. (2001:13), Māori have raised concern about "how they will be able to absorb any general price increases, especially on basic commodities such as food and energy, which could increase as a consequence of ratification of the Kyoto Protocol." The specific impacts and implications of climate change are explored further in the remainder of this paper.

III. Threats of Climate Change

Physical Threats of Climate Change in New Zealand

New Zealanders have already begun observing and experiencing what appears to be early indicators of global climate change (Hennessy *et al*. 2007:514). Mean air temperatures have increased by 0.4 °C and a sea level rise of about 70 mm since 1950 (Hennessy *et al*. 2007:510). There has been "reduced frost frequency over most of New Zealand", "retreat of many South Island glaciers and snowlines", and "reduced alpine snow mass" (Ministry for the Environment 2014).

Expected climate impacts include "higher temperatures, especially in the North Island", "rising sea levels", "more frequent extreme weather events such as droughts especially in the east of New Zealand and floods", and "changes in rainfall patterns, with higher rainfall in the west and less in the east" (Ministry for the Environment 2009). Temperatures are expected to rise even more quickly in the future, with the best estimates of temperatures predicting increases of about 1°C by 2040 and 2°C by 2090 (Mullan *et al*. 2008). Increases in average temperature are expected to be accompanied by increases in extremes as well (Figure 2).

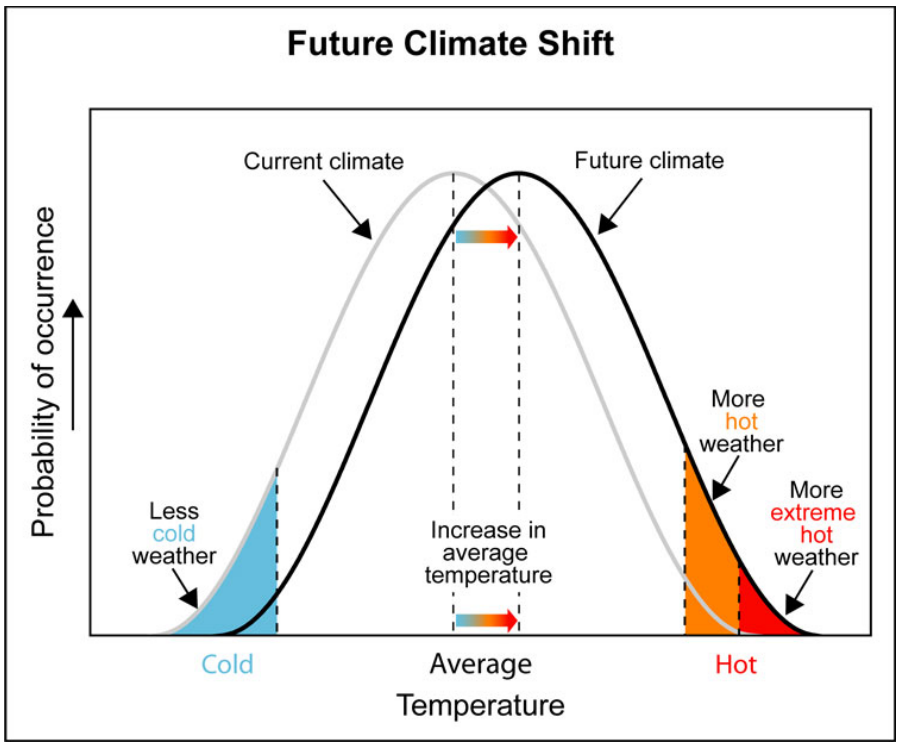

Figure 2: Effect of climate change on average and extreme temperatures (Mullan *et al.* 2008:11).

Rainfall patterns are expected to change; annual average rainfall in the west may increase by about 5% by 2040 and 10% by 2090 and decrease in the east and north by more than 5% by 2090 (Mullan *et al*. 2008:8). These changes will likely result in more frequent floods and droughts (Rudkin *et al*. 2010:22). Further sea-level rise will increase rates of salinization and salt water intrusion of coastal land and freshwater (Rudkin *et al*. 2010:33).

Climate-change-related hazards in New Zealand are not specific to Māori. Non-Māori citizens will have to cope with many of the same hazards. However, as discussed in the next section, Māori society is physically more susceptible to these hazards than non-Māori society due to their location and their infrastructure.

Location

The location of many Māori communities predisposes Māori to the hazards of climate change. Most traditional Māori communities remain located on the North Island of New Zealand. According to Vaithianathan (1995) and Sin and Stillman (2005), iwi-affiliation and ties to one's rohe (territory of tribal groups) potentially make Māori less mobile than non-Māori; "40% of Māori living in areas local to their iwi are 1-3% less mobile than Europeans in the same area" (74). Māori that did not migrate to urban cities after World War II are now less mobile than Pākehā. Cultural ties to the land and the value many Māori place on their unique understanding of a certain local environment make some Māori reluctant to leave their traditional lands and residences, especially after the hard work it took to keep ownership of such land, despite the Treaty. This is an example of how the marginalization of Māori is still contributing to their vulnerabilities. "Māori settlements are often still located in the rural landscape close to natural resources, including rivers, streams, lakes, and wetlands… Resources in these landscapes have gradually degraded and are already stretched in some regions" (Rudkin *et al*. 2010:33). As stated earlier, Māori-owned lands tend to be concentrated in less productive areas due to the Treaty of Waitangi; these lands may be more prone to erosion and invasion and subtropical grasses (Packman *et al*. 2001:10).

Many Māori communities are likely to be disproportionately affected by climatic changes because of the physical location of valued infrastructure and places on exposed, erosion-prone coastal lands. Due to the Māori people's close connection with the land, they are less mobile and therefore less likely to leave hazardous areas. This is one way in which MEK may lead Māori to be more vulnerable than non-Māori because

they do not want to leave their rohe, which could become more exposed to hazards due to climate change. On the other hand, being tied to the land may also ensure the usefulness and relevance of MEK. Strong connections with the land may lead to useful knowledge during extreme conditions, such as where to find water during a drought or where to seek shelter during a flood.

Vulnerability to Climate Change

The IPCC (2007:6) defines vulnerability as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate vulnerability and extremes." Susceptibility to exposure is a common theme among the majority of the definitions (IPCC 2007; Adger 2006; Nakashima *et al*. 2012: 41). However, vulnerability differs for every community because each group is exposed to different hazards for different reasons. Ford (2004) provides a mathematical formula for vulnerability as a function of exposure and adaptive capacity: (V = f(E x A)) (393). Fussel (2007:158) discusses the need for specifics in order to define vulnerability properly, because it is case specific. He provides a framework for defining a community's vulnerability: system, attribute of concern, hazard and temporal reference (Fussel 2007:157).

This section synthesizes the available literature to expand on the contributing factors of climate vulnerability, and links how Māori will be specifically impacted by each of these factors. Social vulnerability is different from biophysical vulnerability in that it considers the social conditions of a society to determine its vulnerability, while biophysical vulnerability derives from "an exposure model" (Cutter *et al.* 2003:243). This distinction allows us to focus on the social components of vulnerability that tend to

stem from social marginalization. "Social vulnerability is partially the product of social inequalities – those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond" (Cutter *et al.* 2003:243). The societal factors of vulnerability identified in this synthesis are: access to financial resources, which dictates health and political conditions/power; awareness and communication of risk; and social networks and group size.

Contributing Factors of Vulnerability

Access to Financial Resources

Impoverished and marginalized groups bear a greater portion of environmental degradation than wealthier communities because they have few economic alternatives (Macchi *et al*. 2008:49). This stems from deeply seated societal structures, structures that will magnify the effects of climate change for these groups. Lack of financial resources increases vulnerability (Barrett 2013; Hulme 2009); "People are vulnerable to climate change because they are poor; they are not poor because of climate change" (Hulme, 2009: 268). Confalonieri *et al*. (2007:412) provides a summary of the importance of financial resources with regards to vulnerability: "particularly vulnerable populations and regions are more likely to suffer harm, have less ability to respond to stresses imposed by climate variability and change, and have exhibited limited progress in reducing current vulnerabilities. For example, all persons living in a flood plain are at risk during a flood, but those with lowered ability to escape floodwaters and their consequences (such as children and the infirm, or those living in sub-standard housing) are at higher risk."

New Zealand is a developed nation with a high adaptive capacity with regards to climate change, but poverty remains a significant issue, leaving a large portion of society more susceptible to climate change than others (Fitzharris 2007). Hennessy *et al*. (2007:522) states that Māori response to climate change is limited by access to funds. In a study examining child poverty rates, the Pākehā poverty rate was 11% lower than the Māori rate (Fletcher and Dwyer 2008). This lack of financial resources has profound consequences for Māori families. "Poor communities, including rural Māori communities, are highly vulnerable since they tend to have limited adaptive capacity and are more dependent on climate-sensitive resources such as local water and food supplies" (Fitzharris 2007:166).

The general lack of resources among Māori can be, at least partially, attributed to New Zealand's history of racism and marginalization against Māori. In turn, marginalization and lack of financial resources has affected Māori health and Māori representation in government.

Health

Confalonieri *et al*. (2007:394) lists several expected health impacts from climate change: increased risk of mortality and morbidity due to an increase in the frequency and intensity of heat waves; death and injury due to increased climate extremes; health impacts due to economic dislocation and population displacement; vector-borne infections due to climate changes and variability; undernourishment; morbidity and mortality due to increased exposure to ozone and other air pollutants.

These expected health impacts are predicted to particularly affect marginalized groups, such as the urban poor (Confalonieri *et al*. 2007: 393). This is why Barrett

(2013) includes access to medical support as a factor of vulnerability. "Ill health increases vulnerability and reduces the capacity of individuals and groups to adapt to climate change… Populations with high rates of disease and debility cope less successfully with stresses of all kinds, including those related to climate change" (Confalonieri *et al*. 2007: 393). Having access to health care, clean water and a reliable food supply greatly impacts human health and having financial resources makes these necessities more attainable.

King *et al*. (2009) suggest that a connection exists between positive self-image and self-determination and mental and physical health. As previously mentioned, Pākehā suppressed Māori culture for many years, and the effects of this are still reflected in overall Māori health. Addiction and psychiatric disorders can be linked to the chronic stressors many Indigenous people experience, such as "racism, poverty, poor education, unemployment, family instability, and residential instability" which relate back to the rapid culture change and marginalization many indigenous cultures have undergone (King *et al*. 2009: 79). Furthermore, Nicholls *et al*. (2006) suggests a relationship between drought and severe mental health impacts in rural communities. Climate change will only increase the likelihood of mental health disorders, since some Māori may be more inclined to develop such illnesses under stressful conditions, such as those that will be caused by climate change.

Racism and suppression dating back to European colonization continue to marginalize general Māori health, making them more susceptible to diseases and health issues associated with climate change. According to Ajwani *et al*. (2003), the gap between Māori health and the health of the remainder of the population is substantial.

Male non-Māori life expectancy increased almost five years during 1980 to 1999, while male Māori life expectancy only increased 1.2 years during the same time period (Ellison-Loschmann and Pearce 2006: 614). Female life expectancies followed similar trends. Rates of cause-specific mortality, including deaths from respiratory diseases, infectious diseases, cardiovascular diseases, diabetes, cancer, and unintentional injuries, were higher among Māori than non-Māori (Ajwani *et al*. 2003: 29-30). Socioeconomic factors have been cited as a source for these health discrepancies; however, Māori mortality rates have been shown to be persistently higher even after control for social class (Ellison-Loschmann and Pearce 2006: 614). Smith and Pearce (1984:105) found that about 20% of the difference between Māori and non-Māori male mortality rates was attributable to differences in socioeconomic status, whereas 15% was linked to cigarette smoking; 10% to alcohol consumption; 5% to obesity; 17% to accidents; and 35% were due to diseases for which effective health care was available. Consequently, Maori are at greater risk of health problems related to climate variability and climate change. Marginal health makes Māori more susceptible to diseases and health problems linked to climate change, such as malaria and heat stroke. Healthier individuals are less susceptible to diseases and more likely to recover faster. An example is the lack of water supplies in the East Cape of the North Island, an area in which the population is predominantly Māori; in many cases, residents cannot afford to truck in water in times of drought (Hennessy *et al*. 2007:517). Lack of resources, such as water and nutritional food, also makes people more susceptible to disease and health ailments due to decreased energy and overall general health.

Political Conditions and Power

Political conditions can make exposure to the impacts of climate change unsafe or challenging (Bogardi 2004; Ford and Smit 2004; Fussel 2007:156; Lazrus 2012). Carey (2010:148) also mentions power imbalances as a key component of vulnerability. Inequality and power are very closely related. Power in political situations allows for advocacy of certain changes. Vulnerable groups often lack strong political proponents and are less able to advocate for themselves. Citing poverty and racism as the only attributing factors to vulnerability can overlook the role marginalized populations play in the decision-making processes affecting their livelihoods and community relations (Carey 2010). The Amazonian Kayapo tribe shows that involvement and relations with political figures can decrease vulnerability because they are better able to express and address their needs on a national scale (Brown 2014:49).

When the Crown unveiled its policy framework on climate change in February 2007, its lead Ministries embarked on a consultation process with as many *iwi* as possible in order to fulfill its responsibilities under the Treaty of Waitangi (Te Aho 2007:138). Māori make up ten percent of governmental delegates, while New Zealand's population is eighteen percent Māori (Te Aho 2007:138). Despite being somewhat underrepresented in government, Māori possess a relatively strong standing in major decisions. This is mostly due to the Treaty of Waitangi, which outlines the right for Māori to be self-determining and self-sustaining (Te Aho 2007:138). During a governmental dialogue with Māori regarding climate change, at least two hapū groups identified climate change as a key issue in their hapū management plans submitted to local government (Hodgson 2001). However, many Māori are still concerned about

bearing a disproportionate amount of the burden of adaptation policies, because many of their lands are carbon neutral, due to old growth forests (Te Aho, 2007: 149). Hennessy (2007:522) cites "the unclear role of local authorities with regard to rules, regulations and strategies for adaptation" as a pressure on Māori vulnerability. Further efforts to work closely and effectively with Māori authority need to be made to fulfill the Treaty requirements.

Māori political power is important with regards to Māori marginalization because without political power, Māori will be less likely to achieve equity and will be less able to prompt the political system to help them adapt and respond to the impacts of climate change. As more people acknowledge MEK as a reliable and necessary source of knowledge, Māori will gain more power with regards to climate change and environmental policy.

Awareness and Communication

Understanding and awareness of risk greatly affect a group's vulnerability. Hulme (2009) and Carey (2010) both discuss the importance of understanding risk when making decisions regarding climate change. Increased awareness of personal and community risks enables people to make safer and more logical decisions. Safety and predictability are in jeopardy due to climate change (Berkes and Jolly 2001), so fully understanding risks can reduce vulnerability. People with greater knowledge of the causes and risks of climate change are more likely to support policy interventions (Zahran *et al*. 2006:782). The IPCC recommends appropriate and timely risk communication for effective adaptation and disaster risk management; this entails exchanging, sharing, and integrating knowledge about climate-related risks among all

stakeholder groups (Field *et al*. 2012). Local residents may have a better understanding of their own vulnerabilities because they experience changes first hand and understand the details (Hulme 2009). However, as Bogardi (2004) observes, even the affected people themselves may not be able to access their own vulnerability. Rising awareness through communication and spatially targeted education programs can decrease vulnerability, as there tends to be a disconnect between the most vulnerable and those who perceive risk and knowledgeable about the causes of climate change (Zahran *et al*. 2006: 785).

To address this issue, Barrett (2013) took a bottom-up approach by asking communities to determine their own sensitivities and exposures for his study. This is something echoed by Hulme (2009), as it can provide a different perspective on climate issues on a community basis. Then the specific needs of the community can be better addressed. The other, more commonly used approach, is a top-down approach, which is often influenced by politics and networking.

According to King *et al*. (2008:402), "many elders from Te Whānau-a-Apanui do not actually receive contemporary weather and climate information, and for those who do, they do not use it" because contemporary information is "often not detailed enough and often fails to be specific to their localities." For example, Hori Elkington from Ngati Koata on the north coast of the South Island states:

> "When we were growing up our old people could tell three weeks in advance what the weather was going to be like, from the cycles of the moon and from the appearance of the moon and sun. We had other methods of knowing weather patterns. For example, when we gutted blue cod, if they had stones in their belly, we knew that bad weather was coming. The cod swallowed stones to give them ballast so they would not be thrown around as much by the swell… I can still tell the weather using the old ways but with far less reliability. It was easier when we

> were growing up because the weather was far more settled then than it is now and we were more observant and had closer links with nature" (Elkington 2003: 5).

However, increased climate variability presents a challenge to MEK because traditional indicators are no longer reliable predictors as they were in the past, potentially increasing Māori exposure to no-longer-predictable climate hazards. Sole reliance on MEK to provide information about climate could prove detrimental to Māori. King *et al*. (2008:402) advocate for scientists to view TEK as a reliable additional source for climate change knowledge. However, in order to keep MEK relevant, Māori also may need to consider utilizing Western science as an additional source of knowledge. Because climate change presents an unprecedented challenge, incorporating modern sources about climate change as supplemental knowledge may be the next evolution of TEK.

At each Hui (meeting) with the Ministries of the Crown, it became clear that "for Māori, this conversation has come quite late because climate change has been part of Māori awareness for a long time" (Te Aho 2007:146). In numerous Hui involving 75 Māori participants, "Māori expressed the need for increased general awareness of climate change, and awareness of how people could take personal responsibility within the collective responsibility" (Hodgson 2001:3). It was also stated "dollars would be better spent on education about climate change and on action-focused programs rather than on consultation… Future stakeholders – school children – need to come on board now… More environmental education is needed" (Ministry for the Environment 2007:12). Another common theme of the Hui was the desire for "further and better information about the economic impacts and opportunities that might flow from the

proposed policies on climate change" (Te Aho, 2007: 149). These are direct accounts from consultations with Māori, which clearly display a desire to be involved and knowledgeable about climate change and climate change policy. Many Māori representatives are aware of the risks involved with climate change and are now focused on how to reduce their vulnerabilities (Te Aho, 2007: 152).

MEK and Māori language provides a detailed discourse for climate change: rain types, cloud types, wind types, etc. Māori oral communication also provides natural hazard histories and community monitoring, as well as insight into how Māori adjusted to past weather events.

Social Networks

Ford and Smit (2004:393) cite the presence and strength of social networks as being a determinant of vulnerability. Field *et al*. (2012) discuss the extensive research on differential vulnerability of social groups, raising corresponding concerns about disproportionate effects of climate change. Race/ethnicity, gender, and age are contributing factors to vulnerability, as minorities, women, young children, and older adults are considered marginalized groups (Field *et al*. 2012). Networks between families, community members and communities provide an emotional outlet or support during difficult situations. Intangibles such as confidence, trust, fear and apathy all play a role in a community's vulnerability (Bogardi, 2004). Networks and strong social bonds can help actors who lack other financial and political resources to respond more effectively than they might otherwise. Education and communication also tie in with networks, because people are better able to connect their ideas and make well-rounded, systematic decisions.

However, close connections may not always prove beneficial in the face of climate change threats. Group size can also increase vulnerability. Berkes and Jolly (2001) cite group size as a factor in adaptive capacity, for example, with it being easier for a small group to relocate or find a sustainable food supply. As Nicholls *et al*. (2006:1089) note, areas with high population density or excessive population growth tend to be more vulnerable; "a world with higher population growth and lower economic growth will tend to be more vulnerable to coastal flooding and vice versa." Resource distribution is extremely difficult in large groups, especially during natural disasters. On the other hand, Nakashima *et al*. (2012:58) argue that small population sizes actually make island communities more vulnerable. This is an example of how case-specific vulnerability can be. Depending on the other factors contributing to vulnerability as well as the exposure of the group, certain components may be an advantage or disadvantage.

King *et al*. (2009:77) point out "connections, relations, and family, are among the many essential components of wellbeing." Through communication and idea-sharing, people and groups are better able to adapt to challenging circumstances. King *et al*. (2010:103) state "Each iwi, hapu, Māori business or community must assess and address climate change from their own perspective and exposure, but in order to do so effectively, must collaborate with others to understand and interpret the issues they face." Iwi, such as Ngāi Tahu, frequently hold Hui, inviting anyone who is interested in the specific topic to join; such regional Hui have resulted in cooperative adaptation efforts amongst multiple iwi ("Te Runanga O Ngai Tahu"). However, some Māori are

finding it increasingly difficult to rely solely on TEK to understand climate change. Mass migrations to urban areas have had profound effects on Māori culture:

> When we lived in Te Tau Ihu there was no division between the iwi. We didn't feel like different iwi, we were all related, to us we were all one family… Back then we didn't feel as if we were separated from everyone. Things have changed now. I think it may be because the younger generations don't understand the relationships between the iwi as well (Rene 2003: 18).

"Traditional channels of oral communication are increasingly being disrupted as children and adults spend more time away from their communities" (King *et al*. 2008: 388). Close oral communication is an essential part of wellbeing within many indigenous communities. However, due to mass migrations of Māori to urban areas, this benefit is being jeopardized. Close connections make a group more resilient, and without this communication, Māori may become more vulnerable to climate change.

Iwi membership is growing steadily as Māori culture resurges and people revitalize their pride of their heritage; "more than 49,500 registered Ngāi Tahu trace their whakapapa (genealogy) back to at least one of these kaumātua (tribal elders/founders)" ("Te Runanga o Ngai Tahu"). As Māori disperse from the tribal territory and the number of registered affiliates increases, so does the difficulty of keeping all members informed and adherent to iwi beliefs and understandings. This could make implementing new climate policies difficult, reducing Māori resilience.

Role of TEK in Understanding Climate Vulnerability

Indigenous groups are generally more vulnerable to the effects of climate change due to their close relationship with their surroundings (IPCC 2012; Macchi *et al*. 2008; Vinyeta and Lynn 2013). This is one of the often-ignored aspects of TEK. TEK

embodies a close connection with one's environment, so climate change threatens this relationship as variability and severity of events change. 'Papaki tu ana nga tai ki Te Reinga' is a phrase often used in chants, describing the meeting of the two seas at Cape Reinga, at the tip of the North Island, where the waves clap together (Te Ara, "Te Taiao" 2010:77). This is an important place in Māori culture – many believe it is where the spirits of the newly deceased depart (Te Ara, "Te Taiao" 2010:77). Coastal erosion due to sea level rise affiliated with climate change threatens this area and therefore threatens an aspect of Māori culture. Climate change already has and will continue to result in rapid environmental changes, which could render TEK less useful. Within Māori language regarding environment or climate, many words imply reactions. For example, there are specific names for different nights of the month. The Ngāti Kahungunu iwi provide a list of thirty names including Okoro, which means "a pleasing day in the afternoon; good for eeling at night" and Tangaroa-kiokio, which means, "an excellent day for fishing, a misty aspect prevails on land" (Te Ara, "Te Taiao" 2010:20). However, it also provides an alternative to Western scientific understandings of climate change, potentially increasing Māori awareness and understanding. Many Māori elders can use clouds to predict weather or certain events. For instance, clouds with sharply defined points are known as 'pipipi o te rangi' (pipipi means 'the wind will come') can be used to predict which way the wind will come from and the weather that will accompany the wind (Te Ara, "Te Taiao" 2010:32). While this knowledge can be produced using modern weather technologies, MEK is a major part of Māori culture and tradition is essential in keeping this culture alive.

According to the Hennessy *et al*. (2007:522), "the capacity of the Māori people to plan and respond to threats of climate change to their assets (i.e., buildings, farms, forests, native forest, coastal resources, businesses) varies greatly." Each *iwi* possess a unique knowledge and deep relationship with its land, which could provide both insight and impairment with regards to climate change. TEK is location specific and each Māori individual and *iwi* is part of a unique relationship with the land and environment.

IV. Resilience to Climate Change

Contributing Factors to Resilience

Ability/Willingness

Māori resilience will depend in part on their ability and willingness to adapt to climate change. Yet, the ability and willingness to adapt is not universal; some groups are more willing to and open to adaptation strategies (O'Connor *et al*. 1999). Citizen willingness to absorb the costs (this differs from willingness to adapt and mitigate) of adaptation and mitigation policies may correspond with place-specific effects (Zahran *et al*. 2006: 772). The risks of doing nothing to mitigate or adapt to climatic changes are higher in some regions than others (Zahran *et al*. 2006: 772). Physically vulnerable areas, such as coastal Māori territories, are at a much higher risk, requiring Māori to be more open to adaption opportunities. However, lack of financial resources may affect Māori ability to act on these opportunities. O'Connor *et al*. (1999) found that those with higher education are disproportionately among supports of government policies. Māori leaders want to be involved in climate discussions, but in order to be innovative and effective, they are requesting "further and better Māori-specific information" (Te Aho 2007: 149). This information includes reports on the economic impacts and opportunities from the proposed climate change policies and reports on how policies may impact Māori land (Te Aho 2007:149). Adger (2003:387) states "Adaptation is a dynamic social process: the ability of societies to adapt is determined, in part, by the ability to act collectively." Familial and communal networking provides more social capital and channels for communication that can foster adaptation and resilience (Adger 2003: 393). Māori

leaders rely heavily on the input of their *iwi* members when making important decisions, in order to come to a decision that benefits the maximum number of people (Katene 2010).

Disaster costs are trending upward due to increasingly extreme natural disasters (National Research Council 2010: 22). The globalization of economic activity and its increasing reliance on critical infrastructure also play a role; disruption of the economy competes with damage to structures as the main economic loss from a natural disaster (National Research Council 2010: 23). Limited access to financial resources restricts one's ability to rebound after a natural disaster. Not being able to pay for the costs of rebuilding a community after a climate change disaster completely destroys the possibility of a community continuing on as before.

Financial resources enable communities and individuals to take risks regarding climate adaptation. However, having access to money does not imply the ability or willingness to take adaptation risks. According to Berkes and Jolly (2001), adaptive capacity depends on the ability to learn and reorganize. A strong desire to experiment and innovate assists in increasing a community's adaptive capacity (Newman *et al*. 2009). Hulme (2009:364) states "[Climate change will] teach and empower us to embark on different projects from those that come easily to us." Past experiences with climate hazards may promote creative adaptations (Ford and Smit 2004). Communities know what has and has not worked in the past, so developing new socioecological configurations that can function effectively under new conditions is essential (Chapin 2006). Many Māori leaders have embraced this concept and pursued new outlets for climate change communications (Te Aho 2007: 148). New approaches or techniques

may be risky, as the outcomes are unknown; attempting to withstand a natural disaster, for example, greatly increases the likelihood of death. Despite this, the ability to take risks is an essential part of adaptive capacity (Panda *et al*. 2013).

Flexibility is essential during a hazard. Resource diversification ensures that a community will always have at least some resources, in the case that part of their supply is wiped out (Berkes and Jolly 2001). Newman *et al*. (2009:89) illuminate the importance of diversification of transport and land-use systems, as well as multiple sources of renewable power. Many Māori *iwi* understand the importance of diversification of resources and income, and are working with the New Zealand government to expand their resources. This way there is an increased likelihood of still having transportation and power in the case of an extreme weather event. Continued access to resources reduces vulnerability, as discussed earlier. Communities can respond and adjust faster to hazards when there is access to at least some resources.

Cultural Values and Empowerment

Pride and understanding of one's culture ensures an individual's drive to enable the culture to persist. Resilience is dependent on the continuance of cultural values (Berkes and Jolly 2001). The Kayapo tribe provides an example of how important cultural pride is, with regards to resilience. They have worked diligently with outsiders to teach an understanding of the forest and why it is important to protect it, which has enabled them to maintain their traditional lifestyles while also assisting the environment (Brown 2014).

The renaissance of Māori culture that began in the 1980's has been essential in teaching and reestablishing Māori values as part of New Zealand culture. Climate

change has provided a venue for Māori to share their worldview with the rest of New Zealand. Crown consultations with Māori leaders have called for the prioritization of Māori values and Māori worldview: "Strong feelings that a Māori world view in relation to climate change is not being adequately considered, and that the proposed policies do not go far enough to protect the environment were a recurring message" (Te Aho 2007:146-7).

Resilience cannot be achieved without opportunity. To be resilient, a community must develop and maintain relationships and trust between itself and other nations (Hulme 2009: 319). Through trust comes empowerment, which entails equity for all involved parties. This can stem from many sources; Carey (2010:151) cites data transparency and availability as being an important aspect of resilience. When all involved parties have equal access to information, they are better able to contribute with one another and support the at-risk group.

The New Zealand government has made legitimate attempts to include and involve Māori leaders in climate change discussions. The Hui Reports and meetings provide an example of these efforts. Te Aho (2007:147) points out that "the Treaty of Waitangi obliges the Crown to protect Māori people in the use of their resources to the fullest extent practicable, and to protect them especially from the consequences of the settlement and development of the land." In order to do so, Te Aho (2007:148) summarizes some suggestions were made to enhance the ongoing engagement of Māori in relation to climate change:

1. Māori have input through to and beyond the papers and recommendations to the Ministers and Cabinet

2. There be a further consultation round on the actual policies prior to legislative confirmation
3. Māori reference groups that relate to natural resources be combined

MEK has allowed Māori people to be resilient against marginalization and anthropogenic climate change. Their unique views and understanding for their environment have made Māori an important part of climate change discussions in New Zealand. They have worked to empower themselves, and to empower other New Zealanders to join them as guardians of the land, in attempting to mitigate and adapt to climate change.

Role of TEK in Understanding Climate Resilience

Māori and Māori culture are based on resilience; the Māori people have overcome many obstacles and burdens to remain in New Zealand. Knowledge is gathered and accumulated through the resilience of Māori people. Anthropogenic climate change is causing new, unforeseen changes. In order to address such changes, Māori embody their systematic worldview of guardianship and familial connections with the land. Māori advocated for a tikanga[2] approach to climate change: "philosophical concepts, in this policy development, embodying family and culture and thereby aiding people's abilities to see themselves within these principles of kaitakitanga" (Ministry for the Environment 2007: 15).

[2] "the Māori way of doing things"

V. Conclusion

Historic marginalization and suppression of Māori culture for almost 300 years has impacted present-day Māori vulnerability, specifically social vulnerability, to anthropogenic climate change. Factors such as access to financial resources, health, political power, awareness of climate change, communication and social networks all play important roles in Māori vulnerability. The effects of marginalization can be seen through each of these factors, as previously discussed. Māori resilience to climate change is influenced by Māori willingness and ability to mitigate and adapt to climate change and Māori empowerment and cultural values. TEK and MEK play an important role in understanding vulnerability, resilience and climate change in general. Māori understand that climate change is anthropogenic and are now striving to help mitigate human impacts. Many Māori have unique and close relationships with the land, and strive to embody the concept of kaitiakitanga and be guardians of the land. This worldview is what encourages some Māori to increase involvement in climate change discussions and empower their *iwi* and culture. Māori empowerment would help address disparities in equity between Māori and Pākehā. Though the negative impacts of climate change may worsen Māori vulnerability, it may also provide an avenue for Māori empowerment and understanding in New Zealand. By addressing social vulnerabilities, Māori would increase their resilience.

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