Integrating Mātauranga Māori into Community Resilience Frameworks for the Built Environment

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Ezra Dunlop

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Abstract

Efforts to improve community resilience have seen universal efforts to grow capabilities in disaster management for the built environment. Although comprehensive frameworks exist, the perspective used to derive these frameworks fails to address marginalised communities' vulnerabilities, including the Indigenous Māori people. Colonisation and socio-economic deprivation of Māori mean community response frameworks fail to reflect their values and specific needs when preparing and responding to natural disasters.

The nature of Māori culture and values presents an opportunity to reimagine the scope of community resilience for an inclusive framework. The Māori history has resilient practices weaved into the very fabric of their culture through the oral transmission of waiata, whakataukī, whakairo, and pūrākau. The practice of community resilience amongst ancient Māori was not consigned to singular events but is a holistic perspective bound to their manner of living. Sourcing and qualifying this information from people aligned and immersed in nature is the knowledge required to improve the frameworks to respond to natural disasters while expanding the literature on community resilience.

This study collaborated with Ngāti Toa to represent the Māori worldview using tikanga Māori and Kaupapa Māori methodology in an action-based participatory research approach. The research analyzed traditional Māori resilience through wānanga and korero kanohi-ki-te-kanohi and evaluated various mātauranga, tikanga, and kaupapa that relate to the resilient nature of Ngāti Toa. Modern Māori perspectives of community resilience were compared to this information using a realistic earthquake scenario in the Wellington region. This led to expanding community resilience to be more inclusive of Māori communities and informed measures to enhance their resilience and address their unique needs following a disaster.

This study found that the Ngāti Toa community employs traditional resilience practices dating back to their migration to Aotearoa from Hawaiki. These practices are community-led and grounded in unity, with resilience being viewed as a collective responsibility. The study identified various Te Ao Māori resilience principles by translating traditional resilience principles into corresponding Te Ao Māori principles. A response and recovery plan was developed for Ngāti Toa in response to a realistic earthquake scenario. This plan includes a vulnerability matrix and a community resilience calculator to inform Ngāti Toa of their vulnerability level and needs following a disaster.

The community resilience frameworks developed for the Wellington region in response to the 7.5 magnitude earthquake were found to be economically dependent and did not utilize the response capabilities and strengths of Ngāti Toa. The frameworks lacked proper representation from Ngāti Toa and failed to address the needs of the Māori community in Wellington, resulting in inequitable outcomes. To rectify this,

community resilience frameworks for Māori should adopt a principle-based approach that supports collaborative engagement and integrates Māori cultural values. Unity is a crucial strength underpinning Māori resilience. Technological mediums such as retrofitting Marae should be developed to enhance Māori response capabilities and harness the strengths of Te Ao Māori resilience.

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Chapter 1 – Introduction

1.1 Background

Extensive research has been conducted to ensure comprehensive community resilience frameworks are created to meet the needs of a community and reduce the related risks of their vulnerabilities. However, these frameworks fail to address the vulnerabilities of marginalized communities (like the Indigenous Māori people) and provide equitable solutions to help them participate (Saja et al., 2018). The current frameworks derived for Māori fail to reflect their values and specific needs when responding to natural disasters. Still, more importantly, they fail to provide the tools required to participate actively by neglecting their level of capability and existing perspectives of resilience. Therefore, marginalized groups (often ill-prepared for disasters) living in resilient communities remain vulnerable and unable to adequately prepare for disasters as the existing frameworks are neither equitable nor inclusive (Rendon et al., 2021). To begin understanding how best to accommodate vulnerable groups within communities and provide equitable community resilience frameworks, consulting with those vulnerable groups is critical (Norris et al., 2008). The nature of Māori culture and values presents an opportunity to reimagine the scope of community resilience for an inclusive framework. The Māori history has resilient practices weaved into the very fabric of their culture, which knowledge has survived through the oral transmission of waiata, whakataukī, whakairo, and pūrākau. The practice of community resilience amongst ancient Māori was not consigned to singular events but is a holistic perspective bound to their manner of living. Sourcing and quantifying this information from people aligned and immersed in nature is the knowledge required to improve the frameworks to respond to natural disasters while expanding the literature on community resilience.

1.2 Aim of the Research

This research aims to conduct a critical examination of the historical and current perspectives of resilience among the local Iwi Ngāti Toa, which will yield insights into the future of Te Ao Māori resilience by informing how mātauranga, tikanga, and kaupapa Māori can be integrated into community resilience frameworks.

To meet this aim, this study will address the following research questions:

- What are the vulnerabilities and community resilience principles utilised within Porirua, a city in the Wellington region of New Zealand? (Chapter 2, Chapter 3, Chapter 4, and Chapter 6)
- What were the historical Te Ao Māori resilience processes employed by Ngāti Toa? (Chapter 4 and Chapter 5)

- What are the existing community resilience perspectives and processes used within Ngāti Toa? (Chapter 6 and Chapter 7)
- What measures should be taken to optimise the community resilience of Ngāti Toa? (Chapter 7, Chapter 8 and Chapter 9)

1.3 Methods

Qualitative research methods were adopted for this study. They were conducted following tikanga Māori and Kaupapa Māori methodology – research by Māori, for Māori and with Māori, using an actioned based participatory research method. The research methodology included wānanga (traditional style meeting and discussions) and korero kanohi-ki-te-kanohi (face-to-face talk at home). The Wānanga was held at the Te Rūnanga O Toa Rangatira head office, and kōrero was held at the homes of kaumatua.

1.4 Scope of Thesis

This research outlines the possibility of integrating mātauranga Māori into existing community resilience for the built environment. A comprehensive analysis of the historical resilience of Māori was conducted by evaluating a variety of waiata, whakataukī, whakairo, and pūrākau specific to Ngāti Toa. This was obtained through interviews with kaumatua of Ngāti Toa and informed the researcher of the traditional Te Ao Māori processes employed by Ngāti Toa to address their vulnerabilities and needs in a constantly changing environment (natural and built). An evaluation of existing risk assessments and resilience frameworks on Wellington to an earthquake hazard was conducted. It was identified that these frameworks were insufficient to address the specific needs and vulnerabilities of Ngāti Toa to this earthquake hazard. To mitigate this, a realistic earthquake scenario of the Wellington region was posed to Ngāti Toa to obtain their current perspectives of community resilience and develop a community response plan that addresses their needs and vulnerabilities. This evaluation of the historical and contemporary perceptions of Ngāti Toa community resilience informed the measures required to address their needs and vulnerabilities in an earthquake. This information will expand the scope of community resilience and improve disaster response frameworks to be more inclusive, safe, sustainable, and resilient for Māori communities.

1.5 Outline of Thesis

This thesis is constructed using the following nine chapters:

Chapter One introduces the limitations of traditional community resilience frameworks for indigenous communities, specifically Māori. It covers the opportunity of integrating Te Ao Māori resilience into existing frameworks to address their unique needs and vulnerabilities. It specifies the aim of this research and the research questions to be addressed.

Chapter two contains the background information gained through reviewing various pieces of literature. The key definitions of community resilience used for this research are discussed. It discusses the main factors influencing community resilience, highlighting the primary processes required to measure and build it. The limitations of these processes to Māori were evaluated in the context of the Wellington region in Aotearoa.

Chapter three briefly outlines the vulnerabilities in the Wellington region to earthquake hazards. Frameworks derived to address these vulnerabilities are evaluated in their effectiveness in response to an earthquake hazard and address the needs of the Wellington community, especially the Māori populace.

Chapter four contains the existing literature on Te Ao Māori community resilience. This includes evaluating the processes embedded in the mātauranga, tikanga, and kaupapa of Māori, which is the foundation of their worldview from which all Te Ao Maori principles are derived. How these have been implemented in Aotearoa is also discussed.

Chapter five outlines the historical Te Ao Māori community resilience principles employed by the iwi Ngāti Toa. A variety of waiata, whakataukī, whakairo, and pūrākau specific to Ngāti Toa was evaluated to depict how community resilience was practised during the pre-colonial and early post-colonial era of Aotearoa.

In Chapter Six, a realistic earthquake scenario was presented to the iwi Ngāti Toa to assess their current perspectives on community resilience and to develop a comprehensive community response plan that addresses their unique needs and vulnerabilities across all four phases of a disaster: mitigation, preparation, response, and recovery. It focuses on the information received from wānanga, which was used to expand on the literature discussed in chapter two but contextualises it from a Te Ao Māori worldview to highlight how traditional community resilience can be utilised for Māori.

Chapter seven outlines the measures Ngāti Toa desires to employ to improve their future resilience. A vulnerability matrix was constructed to assess the vulnerability level of a community to an earthquake hazard. A community resilience calculator was also built to determine the household resilience of Ngāti Toa by providing information on how they are vulnerable and a simplified plan to address these needs.

Chapter eight reflects the opinions of Ngāti Toa participants to address their vulnerabilities to an earthquake and how to enhance their resilience. It highlights the barriers preventing resilience from effectively being developed within Māori communities. Also, it discusses how Te Ao Māori resilience can be integrated into community resilience frameworks to address their needs.

Chapter Nine summarises the outcomes achieved by researching the opportunities and challenges of building resilience within Māori communities. It evaluates the key findings of this research against the research questions. It includes several suggestions for integrating Te Ao Māori into community resilience

frameworks to address the unique needs and vulnerabilities of Māori. It provides a guideline on the opportunities for further research on improving Māori community resilience.

Chapter 2 – Community Resilience in Aotearoa

The purpose of this chapter is to provide a comprehensive literature review of community resilience within both a traditional academic context and through a Te Ao Māori perspective. This chapter will explore different theoretical models and frameworks of community resilience. This review will clearly define community resilience, the key components influencing it, how to build it, and the processes used to measure it.

2.1 Defining Community Resilience

The research recognises that community resilience is a complex and multifaceted concept. The definition of community resilience that will be used for this study is proposed by Norris et al. (2008). Community resilience is a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance or adversity. By this definition, community resilience is understood as the ability of a community to withstand and recover from disruptive events, such as natural disasters or social upheavals, while maintaining its essential functions, structures, and identity. The different components that influence the community's response capacity are implemented through different disaster cycle phases, a model describing the various stages of disaster management (Coetzee, 2010). Each phase within the cycle is vital in managing disasters and reducing their impact on individuals, communities, and infrastructure. Ensuring resilience features are distributed amongst these phases is essential to building resilience.

2.2 Disaster Management Cycle

Australian emergency management scholar Dr John Handmer first proposed the Disaster Management Cycle. The model uses the four phases to classify disaster management. These phases include the following:

- Mitigation: The mitigation phase involves taking action to prevent or reduce the impact of disasters (Coetzee, 2010). Mitigation efforts can include building infrastructure that can withstand disasters, developing emergency plans, and implementing early warning systems. This phase aims to reduce the number of casualties and the severity of the disasters in the community.
- Preparation: The preparation phase involves preparing individuals, communities, and infrastructure for potential disasters (Coetzee, 2010). Preparation includes developing emergency plans, conducting drills and exercises, stockpiling supplies, and training emergency personnel. This phase aims to minimize the impact of disasters and ensure that individuals and communities can respond effectively.
- Response: The response phase is the immediate and long-term action following a disaster. Coetzee (2010) describes the response phase as the coordination of resources (including personnel, supplies and equipment) to help restore personal and environmental safety while minimizing the risk of any

further damage to property through the removal of ongoing hazards caused by the disaster. This phase aims to save lives, reduce suffering, and minimize damage to infrastructure. The response phase evaluates the efficiency of initial mitigation, preparation, and recovery strategies. If a community inadequately prepares for a disaster, its response strategy will reflect this.

- Recovery: The recovery phase is rebuilding and restoring infrastructure, communities, and individual lives after a disaster. Recovery includes providing financial assistance, rebuilding infrastructure, and offering counselling and mental health support to those affected by the disaster. The recovery phase aims to restore affected individuals and communities to their pre-disaster or better-prepared state to handle future disasters.

Figure 1: Disaster Management Cycle (AkitaBox, 2020)

Although the disaster management cycle is often depicted as a linear model, it is essential to note that these phases can overlap and interact. For example, recovery efforts may begin before response efforts are completed, and mitigation efforts may continue during the recovery phase to prevent future disasters. Each stage is vital in managing disasters and reducing their impact on individuals, communities, and infrastructure. Effective disaster management requires collaboration and coordination among individuals, communities, and government agencies at all cycle phases. Defining this model is essential for this study as the proposed methodology uses this cycle to derive Te Ao Māori perspectives of community resilience.

Defining the disaster management cycle is vital as it highlights the different stages of managing and responding to disasters. The disaster management cycle emphasizes the importance of a coordinated and integrated approach to disaster management, recognizing that different phases require different skills, resources, and strategies to mitigate, prepare for, respond to, and recover from disasters (Coetzee, 2010). Since the disaster management cycle has been defined, the following section will describe the primary factors influencing community resilience.

2.3 Factors Influencing Community Resilience

Several theoretical models and frameworks explain the components that influence community resilience. Bronfenbrenner (1979) proposed the Social-Ecological Model posits that community resilience is influenced by multiple factors at different levels, such as individual, family, community, and society. The Community Resilience Framework (Norris et al., 2008) emphasizes the role of community resources, networks, and social capital in promoting resilience, while the Resilience-Informed Framework (Masten et al., 2014) highlights the importance of developmental processes and adaptive systems in building resilience. The main components influencing communities' resilience include demographic factors, social capital, cultural elements, environmental influences, and general vulnerabilities.

2.3.1 Vulnerability

Vulnerability refers to the susceptibility of a community or a system to be adversely affected by external or internal stressors or hazards. It is a complex concept shaped by various social, economic, political, and environmental factors. Vulnerability is critical to a community's ability to prepare for, respond to, and recover from disruptive events. A community's resilience depends on the vulnerability level and the strategies employed to mitigate them. By addressing the underlying drivers of vulnerability, a community can build resilience and better prepare for, respond to, and recover from disruptive events.

2.3.2 Demographic Factors

A community's demographic can either improve the resilience level of the community or increase its vulnerability. Chandra et al. (2010) claim that the demographic characteristics of a community, such as age, gender, race, ethnicity, and socioeconomic status, can influence the community's ability to respond to various stressors and shocks. Kimhi et al. (2010) support this claim as older adults exhibit higher levels of resilience than the elderly and younger adults. Additionally, individuals with higher education and income levels tend to be more resilient in the face of adversity (Karademas, 2006). Understanding the community's demographic will determine what processes and interventions are needed to meet its needs and provide adequate support or interventions to improve its resilience.

2.3.3 Social Capital

Social capital is a crucial feature that influences a community's resilience and sustainability. High levels of social capital are the most influential factor influencing resilience (Cutter et al., 2014). Norris et al. (2008) define social capital as the resources and networks individuals and communities can draw upon in times of need. Critical components of social capital include:

- Information sharing & communication: Sharing disaster risk reduction information is essential to coordinating response efforts within a community during a disaster. Communities with substantial social capital are likelier to have well-connected individuals who can share information and resources quickly and effectively (Putnam, 2000).
- Collective action: Norris et al. (2008) claim that high levels of social capital improve a community's ability to coordinate and mobilize collective action in response to crises, as individuals are more likely to work together towards a shared goal.
- Trust: Trust within a community is essential for effective collaboration and communication during a crisis. It enables people to rely on each other and work together to solve problems (Chandra et al., 2010).
- Coping mechanism: Adger (2003) claims social capital provides emotional and practical support to individuals during times of stress, which can help to mitigate the impact of crises and reduce vulnerability.

Communities with high levels of social capital are better equipped to respond and recover from crises than those with low social capital, as initial emergency responders are likely to be the surrounding neighbours or community. Norris et al. (2008) emphasize this proposal as higher levels of social capital enable the community to be better equipped to organize and coordinate recovery efforts.

2.3.4 Cultural Factors

Cultural factors have a significant influence on community resilience. The cultural components of a community include the beliefs, values, and practices which affect the community's ability to adapt and recover from crises. Indigenous communities' cultural beliefs and practices have been found to promote resilience in the face of historical trauma and ongoing colonization (Wexler, 2014). A strong sense of cultural identity can also create a sense of belonging and connection within a community, promoting social cohesion during crises (Norris et al., 2008). Similarly, the cultural values of collectivism and family support have been found to promote resilience in communities (Ungar, 2011). Including culture also improves diversity, which can further influence community resilience by shaping social networks and relationships within communities. Putnam (2000) suggests that diverse communities may have stronger social ties and

more significant social capital, which can enhance resilience by facilitating cooperation, trust, and mutual support during times of stress. Including cultural values is vital to improving resilience as they reflect the needs of specific sub-sets of groups within a community. Identifying and incorporating these factors into disaster response and recovery efforts is essential for building more effective and resilient communities.

2.3.5 Environmental Factors:

Environmental factors influence community resilience as it shapes a community's ability to withstand and recover from natural disasters. These environmental factors can include both the natural and built environment. The natural environment is the geographical location of a community. This influences resilience as it measures the community's exposure to environmental hazards. Communities in high-risk environmental hazards must develop strategies that reflect their needs (Folke et al., 2010).

Furthermore, the built environment relates to the construction and design of infrastructure. Investment in resilient infrastructure increases a community's ability to withstand and recover from disasters (UNISDR, 2017). A community's resilience is directly influenced by its exposure to specific hazards and ability to withstand these disasters.

2.3.6 Overview

This section has outlined the primary factors that influence community resilience. This study utilises the following principles: community vulnerabilities, demographic factors, social capital, cultural factors, and environmental factors. Discussing these processes is crucial as it highlights the potential limitations in existing community resilience frameworks or how they can be improved. By defining these factors, the following section will describe ways to measure community resilience.

2.4 Measuring Community Resilience

Bruneau (2003) developed a framework to quantitatively assess and enhance the resilience of communities using four components: robustness, rapidity, resourcefulness, and redundancy. This method uses surveys and indices to assess community resilience in a systematic and standardized manner by measuring how effectively a community has implemented the components proposed by Bruneau (2003). Cutter et al. (2014) also proposed a model that emphasizes the role of adaptive capacity in reducing vulnerability to hazards. According to this model, communities with strong adaptive capacity can better respond to and recover from disasters. Therefore, adaptability was a crucial component in measuring a community's resilience. These principles were identified as the primary processes utilized to measure community resilience.

2.4.1 Robustness

Robustness refers to the ability of a community to withstand stress and bounce back after a disruption (Bruneau, 2003). The indicators used to measure the robustness include the availability of critical infrastructure, the diversity of the local economy, and the strength of social networks and institutions. This highlights that robustness is both physical and social. A physically robust community has infrastructure capable of withstanding and recovering from disasters. A socially robust community has strong social networks and effective communication systems that allow it to respond quickly and effectively to crises. Measuring robustness is crucial to assessing resilience as it measures the community's ability to withstand and recover from physical and social disruptions.

2.4.2 Redundancy

Redundancy refers to the availability of multiple, diverse resources, institutions, and social networks that can be used to respond to and recover from adverse events (Bruneau, 2003). Redundancy allows substituting one resource or network with another, reducing the risk of failure or disruption in the face of stressors or hazards. A community with redundant systems or components can maintain essential functions even if some systems or components fail or are disrupted. The presence of backup systems, the redundancies in critical infrastructure, the availability of multiple sources of essential resources, and the presence of multiple organizations that can provide essential services in times of need are all indicators of redundancy. By identifying redundant components of a community, its resilience can be measured, enabling the implementation of strategies that will enable the functioning of a community post-disaster despite potential disruptions or failures.

2.4.3 Rapidity

Rapidity refers to the speed and efficiency a community can respond to and recover from disruptions or disasters (Bruneau, 2003). This involves effective emergency response and recovery efforts, including the timely restoration of infrastructure and services. It also includes psychological and social recovery of the community. The indicators used to measure rapidity include the speed and effectiveness of emergency response systems, the availability of early warning systems and disaster preparedness plans, and community organizations and groups that can mobilize quickly in times of need. Measuring these components can help identify a community's resilience and help prepare them for future crises.

2.4.4 Resourcefulness

Resourcefulness refers to a community's ability to effectively identify or use available resources and mobilize additional resources following a disaster (Bruneau, 2003). It includes tangible and intangible resources, such as infrastructure, financial resources, social capital, and community knowledge. The

indicators used to measure resourcefulness include the availability of diverse resources, the ability of community members to access and utilize these resources, and the presence of community organizations and groups that can mobilize resources to address challenges. Measuring resourcefulness is crucial as a community must identify and mobilize resources to address challenges and strengthen its resilience.

2.4.5 Adaptability

Communities are complex and require adaptive systems that are subject to cycles of growth, collapse, and reorganization (Gunderson et al., 2002). To be resilient, communities must adapt to changing conditions and learn from past experiences (Cutter et al. 2014). Measuring adaptability is difficult as it is a complex and dynamic concept that is influenced by a wide range of factors. However, several indicators are used to measure adaptability, including the ability to anticipate and respond to emerging challenges, the capacity to learn from past experiences, and the presence of flexible and adaptive governance structures. Adaptability is crucial to develop community resilience. Communities need to be able to respond to changing conditions to maintain their ability to function and thrive. By measuring a community's adaptive capacity of a community, its resilience can be enhanced by preparing the community for a wide range of challenges, including natural disasters and social and economic disruptions.

2.4.6 Overview

This section has outlined the components required to measure community resilience. This study utilises the principles Bruneau (2003) proposed, which include robustness, redundancy, rapidity, and resourcefulness. Cutter et al. (2014) also emphasised the need for communities to adapt to changing conditions and learn from past experiences. Therefore, adaptability was also a critical component in measuring community resilience. Defining these processes is crucial as it will provide the necessary information to measure the community resilience of the study subjects and how it can be improved. Following identifying the processes required to measure resilience, the following section describes the methods required to build community resilience.

2.5 Building Community Resilience

Building community resilience or active participation within frameworks depends on a community's networked resources (Norris et al., 2007). This includes four principles: economic development, social capital, information & communication, and community competence. These principles were assumed as the primary processes required to build community resilience.

2.5.1 Economic Development

Economic development creates equity and stable livelihoods for the community through wealth generation (Norris et al., 2007). Building community resilience using economic development is crucial as it creates

conditions for communities to withstand and recover from disasters. The development of the components utilized to assess community resilience, as delineated by Bruneau (2003), is contingent upon financial resources. By fostering economic growth and stability, communities are better equipped to maintain essential services, support vulnerable populations, and adapt to changing circumstances.

2.5.2 Social Capital

Social capital is defined as individuals being connected and supporting each other (Norris et al., 2007). Aldrich and Meyer (2015) found that communities with higher levels of social capital were better able to respond to and recover from natural disasters, as they could mobilize resources, share information, and provide mutual support. Social capital is critical to building community resilience because it helps to strengthen social connections and networks, which are necessary for effective community response and recovery following a disaster. Social capital is concerned with developing relationships, networks, and norms of reciprocity and trust within a community. These resources can be utilized following a disaster to facilitate collective action and support those in need.

2.5.3 Information & Communication

Information & communication is defined as the system's ability to function in the face of unknowns and to distribute relevant information that individuals need (Norris et al., 2007). Information and communication are essential for building community resilience. Communicating reliable information increases a community's access to critical information, improves the coordination of response efforts, and provides effective communication following a disaster crisis. Using technology as a medium to communicate information further builds a community's resilience as the community will be provided with real-time data, early warning systems, and other resources to improve disaster preparedness and response.

2.5.4 Community Competence

Community competence is individuals' collective action, decision-making, and capabilities to respond to an unfolding disaster (Norris et al., 2007). Building competence is the development of skills, knowledge, and resources necessary to enhance community resilience. Improving the competence of the community increases its ability to mobilize resources and coordinate efforts that maximize its resilience. By building the capacity of the community, capacity-building strategies can increase the community's ability to respond to and recover from disruptive events.

2.5.5 Overview

This section has outlined the components required to build community resilience. This study utilises the principles Norris et al. (2007) proposed, including economic development, social capital, information and communication, and community competence. Defining these processes is essential as it will provide the

necessary information to build community resilience and the potential limitations of these theories. Following identifying the processes required to build resilience, the following section describes the limitations of all the prior principles discussed.

2.6 Limitations of Traditional Community Resilience

The concepts discussed represent the scope of literature that explains traditional community resilience. These frameworks have been developed to enhance communities' ability to prepare for, respond to, and recover from disasters. However, these frameworks are limited in their inclusiveness, especially for the indigenous Māori community, which will ultimately impact the effectiveness of their resilience-building efforts. The static and simplistic nature of these frameworks, overemphasis on technical solutions, and limited focus on equity and social justice are all factors that inhibit these frameworks' effectiveness in meeting the needs of Māori.

Traditional community resilience frameworks often rely on a static and simplistic understanding of communities, which can overlook the complex and dynamic social, economic, and environmental factors that influence community resilience. This limitation can hinder the ability of these frameworks to capture the nuances of community resilience adequately and may lead to overly simplistic and ineffective resilience-building strategies. Additionally, many traditional community resilience frameworks heavily emphasise technical solutions, such as infrastructure upgrades and emergency preparedness plans, while neglecting community resilience's social and cultural aspects. This overemphasis on technical solutions can limit the effectiveness of resilience-building efforts and fail to address the root causes of vulnerability. Finally, the principles explored fail to address equity and social justice issues essential for building resilience in vulnerable communities. This limitation can perpetuate existing inequalities and result in resilience-building efforts that only benefit specific population segments at the expense of others.

Another limitation is the rigid-based approach adopted by the frameworks previously discussed. A rigid-based approach prioritises strict adherence to established community resilience processes over adaptable and flexible. Following a disaster, rigidly adhering to rules may not be the most effective response approach as individual circumstances and needs vary greatly. When individuals are treated the same under strict rules, there may be a lack of consideration for individual needs and differences. In contrast, a principle-based society may be more adaptable to individual circumstances. The rigidity of the proposed concepts must be adapted to provide structure to response plans while allowing for flexibility by considering the community's governing principles. This process will create resilience frameworks more reflective of the community's needs.

While traditional community resilience frameworks have played a valuable role in advancing our understanding of community resilience, their limitations must be addressed to ensure the effectiveness of resilience-building efforts for Māori. A more nuanced and comprehensive approach to community resilience is needed where equity is achieved. Resilience frameworks for Māori must recognize the complex and dynamic nature of communities, prioritizes social and cultural aspects of resilience, and addresses issues of equity and social justice. The following section will describe the state of community resilience within the context of New Zealand.

Chapter 3 Community Resilience in Wellington, New Zealand

New Zealand is prone to various natural disasters and has experienced its share of devastating events, from earthquakes to floods and wildfires. In recent years, there have been increasing efforts to improve community resilience within New Zealand to mitigate the impact of disasters on the community. The devastating impacts of recent natural disasters, such as Cyclone Gabriel, the Auckland floods, and the Christchurch earthquake, have underscored the urgent need to enhance community resilience in New Zealand. This thesis will explore the state of community resilience in New Zealand by examining the factors contributing to its success and the challenges threatening its sustainability. By analysing New Zealand's experience, this thesis aims to contribute to the broader understanding of community resilience and inform strategies for building resilience in other contexts.

3.1.1 Wellington Risk Assessment and Earthquake Hazard

The geographical location of Wellington means the nation is prone to multiple disasters, including earthquakes, volcanic eruptions, floods, landslides, tsunamis, and severe weather events such as cyclones and storms. However, Graham et al. (2016) claim the biggest natural disaster threat to Wellington is earthquakes, as the region sits on the boundary of the Pacific and Australian tectonic plates. This is supported by the recent Christchurch earthquakes in 2010 and 2011, which resulted in 185 fatalities and billions of dollars in damages (Graham et al. 2016). This section will provide an in-depth analysis of the current state of community resilience in Wellington concerning earthquake hazards. This chapter aims to evaluate the vulnerabilities of Wellington to earthquake hazards and the effectiveness of the resilience frameworks currently to mitigate this risk. This chapter will identify gaps in preparedness and response strategies for earthquake disasters by analysing the existing resilience measures. Through this analysis, the chapter will provide recommendations for enhancing community resilience and minimising the impact of future earthquakes in New Zealand.

3.1.1.1 Porirua Earthquake Vulnerability Assessment

The research subjects for this thesis are in Porirua, a city located in the Wellington region of New Zealand. A range of documents and reports have been evaluated to determine the various vulnerabilities of the city to earthquake hazards. Through this review, the critical vulnerabilities and risk factors associated with earthquake hazards in Porirua will enable an analysis of existing frameworks constructed to enhance the city's resilience to earthquakes. The vulnerabilities of Porirua have been collated in Table 1.

Table 1: Summary of the Porirua Earthquake Vulnerabilities

Type	**Vulnerability**	**Description**
Topography	Environmental	Wellington comprises steep hillsides, which will cause landslides and rockfalls following an earthquake (GNS Science, 2019).
Fault line	Environmental	The Wellington Fault can produce a 7.5 magnitude earthquake as the fault line directly runs under the city – see Appendix J (GNS Science, 2019).
Liquefaction	Environmental	There is a high risk of liquefaction risk (see Appendix J), which will cause significant damage to buildings and infrastructure (GNS Science, 2019).
Low-lying Coastal City	Environmental	Most of the Wellington region is located on the coast in red and orange zones on the Wellington evacuation zones (see Appendix K). Following an earthquake, a major tsunami is expected to follow (Porirua City Council, 2022).
Ground Shaking	Environmental	Wellington is built on a large sedimentary basin filled with soft, loose sediments, such as sand, silt, and clay (Davy et al. 1995), which can amplify the effects of ground shaking (see Appendix J).
Population Density	Physical	Porirua City Council estimates that 17,700 jobs are filled within Porirua City, but with the proximity of Wellington, the Hutt and Kāpiti means citizens seek job opportunities outside the city (Porirua City Council, n.d.-b). Depending on the time of the earthquake, 70,000 commuters may be isolated from returning home (Fairclough, 2020).
Infrastructure Concentration	Physical	Transportation networks, hospitals, and government buildings are at risk of damage during an earthquake (GNS Science, 2019).
Access	Physical	Wellington is likely to be fractured by slips into five distinct areas (see Appendix L) following a 7.5 magnitude earthquake, with links

		between these taking up to 4 months to reopen. Porirua will be isolated during this time (Fairclough, 2020).
Property & Commercial Buildings	Physical	Many properties and commercial buildings were constructed between 1960 and 1970 before implementing strict building codes and guidelines for earthquake-resistant construction (Fairclough, 2020).
Socio-economic Index	Economic	There are significant disparities within Porirua City in terms of deprivation, with a vast majority of Porirua having high levels of deprivation (Singh, 2014), indicating a high level of vulnerability to an earthquake.
Culture & Ethnicity Demographic	Social & Cultural	Porirua is a very multicultural city and is home to a wide variety of ethnicities and cultures, with 60% of its population identifying, while 19.6% is Māori, and another 24.6% is Pacific (The Population Experts, 2013). Māori and Pacific's communities are likelier to experience disruptions to their homes, employment, and social networks following an earthquake (Hudson-Doyle et al., 2019).

Recognizing the range of vulnerabilities facing Porirua, both the Porirua City Council and Wellington City Council have developed community resilience frameworks to mitigate the impact of earthquake hazards on the city. This thesis will review these frameworks to assess their effectiveness in enhancing the city's earthquake resilience. Of particular interest will be their ability to address the needs of the local iwi Ngāti Toa, a strong focus of this study, and to identify any gaps or limitations in the frameworks that may need to be addressed better protect the community from earthquake hazards.

3.1.2 Existing Frameworks

Multiple community resilience frameworks have been developed to address the specific needs of the city of Porirua concerning their vulnerabilities to earthquake hazards. This section will review these frameworks to assess their effectiveness in enhancing the city's resilience to an earthquake. Their ability to address the local iwi Ngāti Toa's needs will be of particular interest, which is a crucial focus of this study. This section will review the Wellington Earthquake Initial Response Plan and the Porirua Earthquake Response Plan. The aim is to address the gaps and limitations of these frameworks to enhance the resilience of Porirua to earthquake hazards.

3.1.2.1 Wellington Earthquake Initial Response Plan

The Wellington Earthquake National Initial Response Plan (WENIRP) is to direct and coordinate the immediate national response to a significant Wellington earthquake (Stuart-Black, 2018). The Plan will be activated following a significant earthquake and covers the first three to five days of the response following the disaster. While the Wellington Earthquake Initial Response Plan aims to provide an effective immediate response to an earthquake, its benefits for Ngāti Toa are limited by its focus on general disaster response measures rather than specific strategies tailored to meet the needs and perspectives of the iwi.

The framework aims to effectively respond to an earthquake by coordinating various Wellington emergency services, organisations, and stakeholders. This integrated approach provides organisations, agencies, and the various stakeholders of the response plan clarity on their designated responsibilities (Stuart-Black, 2018). The plan includes a thorough analysis of the anticipated impacts on the critical lifelines in the Wellington region and the expected restoration timeline. These lifelines include telecommunication, electricity, transportation (roads and railways), water supply, airports, and ports. Furthermore, the plan details communication and resource management protocols during the response, including evacuation, search and rescue provisions, and medical care (Stuart-Black, 2018).

A significant limitation of this response plan is the vulnerability classification of Porirua. Porirua is the ancestral home of the local iwi Ngāti Toa. The report states that Porirua is a vulnerable community because of its high socio-economic depravity (Stuart-Black, 2018). While it is essential to identify vulnerabilities to improve community resilience, no mitigation or preparation strategy has been presented to address this vulnerability. Norris et al. (2007) define economic development as a critical component for active participation in community resilience frameworks. A large population of Māori in Porirua effectively limits the applicability of this framework to a single group within the community. This response plan fails to integrate the strengths and response capabilities of Ngāti Toa that extend beyond financial resources. Māori, including Ngāti Toa, have developed resilience strategies that do not require financial resources (Forsman, 2016). The specific needs and strengths of Ngāti Toa must be integrated into the response to improve this framework. The framework must implement a more culturally appropriate response that meets the community's diverse needs without the need for financial resources.

The main communication channel for the WENIRP is the Civil Defence website. According to Potini (2022), the local iwi Ngāti Toa does not use this communication channel to obtain information. The primary communication methods with Māori require Kanohi ki te Kanohi or face-to-face engagement, where trust can be developed between the various stakeholders (Harmsworth, 2014). Without this principle, plans developed for Māori will not be accepted. This issue is further highlighted as the plan only covers three to five days following the seismic event. During this time, various stakeholders, agencies, and organisations

are expected to intervene to coordinate the response efforts of Porirua. However, without prior engagement and interaction with the community, the intervention of these various entities is likely to be rejected as there is no relationship or trust between them and the Māori populace.

Furthermore, this framework only addresses the immediate response efforts of Wellington rather than the longer-term recovery and reconstruction efforts. Although this framework is constrained by uncertainty about the exact nature and impact of the earthquake, failing to investigate long-term recovery and reconstruction strategies means the Wellington region is likely to be susceptible to future seismic events. Community resilience requires a holistic approach, including implementing all strategies outlined in the disaster management cycle (McEntire et al. 2002). Adopting a narrow-minded approach to community resilience planning by only addressing the response phase of disaster management results in a generalisation of community needs, disregarding the diverse population of Wellington. This marginalises specific groups within the community and neglects the diverse needs and perspectives necessary for a comprehensive plan.

The WENIRP is a resilience framework used to manage and coordinate the response efforts of various stakeholders in the Wellington region. The framework provides a comprehensive plan for the Wellington region that addresses the immediate response needs of the community following an earthquake. However, ongoing efforts are needed to ensure that this plan includes diverse perspectives and needs while adequately addressing the long-term impacts of an earthquake on the Wellington region.

3.1.2.2 Porirua Earthquake Response Plan

The Porirua City Council has no specific earthquake response plan for the community. Response plans utilised for Porirua are reliant on the Wellington regional response plan. The only comprehensive guide provided for Porirua to respond and prepare for an earthquake is through the community hub guide provided on the Wellington Region Emergency Management (WREM) website.

The primary process used to prepare Porirua is the designation of community hubs within the city. A community hub is essential considering the earthquake vulnerabilities of Porirua. A community hub provides a physical location where a range of community services and activities are coordinated and provided and where community members can come together to interact, share resources, and build relationships (Jovanovic, 2018). Community hubs are critical components required to build community resilience as they provide a central point of support and coordination during and after a disaster or crisis, facilitate social connections, and provide access to essential services and resources (Jovanovic, 2018). WREM has designated ten community hubs for Porirua. There are detailed guides designated to different community hubs on the WREM website. These guides provide the community with a simplified plan to manage their immediate response with other community members following an earthquake.

Although these community hubs effectively coordinate immediate response efforts, significant limitations rely on these as the primary process to develop community resilience, primarily how the Porirua City Council has implemented this strategy. Concerning community hubs are only effective if they are accessible and trusted by all community members (Arbon et al., 2015). Due to the various environmental vulnerabilities that Porirua faces, there is significant uncertainty regarding the ability of the community to reach the community hub during a disaster. Arbon et al. (2015) further claim that community hubs are often not equipped to address complex issues caused by an earthquake. The WENIRP used a simplified response plan to account for the uncertainty following an earthquake. The designated community hubs include schools, churches, and community halls, which are not equipped to address the complex and diverse needs of the community following an earthquake.

Like the WENIRP, the communication channels to convey this information are not used by the local iwi Ngāti Toa. The location of the community hub and the specific process to implement following the disaster require an internet connection to access. Therefore, these plans become redundant if individuals do not have physical copies of these plans or are not educated prior to the disaster. This means only a tiny percentage of the community will likely have the relevant information to respond as outlined by the WERM effectively. The general population will be insufficiently equipped to respond to an earthquake, relying on their preparation, knowledge, and relationships with their neighbours. An improved medium needs to be developed to educate the community on existing work done by the council to respond to an earthquake. This will immediately improve the resilience of Porirua.

The Porirua-specific community resilience response plan aims to improve resilience by designating physical locations where the community can coordinate their response strategy, share resources, and build relationships. However, this framework adopts a simplistic approach and does not account for the uncertainty arising after an earthquake and the complex needs that will follow. Implementing strategies to educate Porirua on the available work is an immediate improvement that can be utilised. However, long-term resilience strategies require improved engagement with the community to address Porirua's complex and diverse needs.

3.1.2.3 Limitations

The major flaw in these response plans is the failure to address the specific needs and experiences of Māori. The history of Māori has been marked by the erosion of their culture due to racism and colonisation. This erosion was further exacerbated by divisive legislation like the Native Schools Act, the New Zealand Settlement Act, and the Doctrine of Discovery (McIntosh, 2005). These policies aimed to assimilate Māori into a European society, which suppressed Māori culture, language, and customs in favour of European norms and values. This process included actively discouraging Māori cultural practices and language and

promoting a European-style education and religion, ultimately destroying traditional Māori ways of life (Durrie, 2003). This deterioration ultimately weakened the social fabric of Māori communities and ability to respond effectively to external threats and stresses (Durrie, 2003). Colonisation led to loss of land and resources for Māori, resulting in marginalisation and poverty. The lack economic development amongst Māori means limited access to resources and services needed to prepare for disasters. The inability of Māori to assimilate into a European society due to racism and discrimination has resulted in limited access to education and employment opportunities. This exacerbates the economic marginalization of Māori, which reduces their ability to build resilience.

Assimilating Māori into a European society assumes that their needs are the same as those of a European community. Assimilation did not eliminate the social, cultural, economic, and environmental differences between Māori Europeans. Subsequently, this means the needs of Māori during the response and recovery following a disaster will differ. These frameworks are inequitable for the local iwi Ngāti Toa as it does not explicitly address the measures to accommodate their specific needs in the event of a disaster. Māori have a unique cultural identity and worldview (Forsman, 2016). Incorporating these perspectives and approaches into disaster management frameworks is vital for promoting equitable and effective disaster response efforts. Processes are needed to ensure the implementation of culturally appropriate responses and inclusive perspectives that meet the needs of Māori in a disaster.

3.1.3 Overview

This section has provided an overview of the state of resilience in the city of Porirua, highlighting the limitations of existing frameworks in meeting the specific needs of the local iwi Ngāti Toa. The potential for disproportionate impacts on Porirua due to their vulnerabilities underscores the importance of addressing these limitations. In the following section, we will explore how Te Ao Māori practices can inform and enhance modern community resilience frameworks, focusing on meeting the needs of Māori communities in disaster scenarios. By integrating Māori perspectives and approaches, engineers can work towards a more inclusive and practical approach to disaster management and enhance the resilience of all communities in New Zealand.

Chapter 4 Te Ao Māori Community Resilience

In Aotearoa, the Indigenous Māori population has a rich history of resilience. Māori communities have forged distinctive approaches to cultivating and sustaining resilience grounded in their worldview. Māori communities have developed unique ways of building and maintaining resilience through their unique worldview The Te Ao Māori worldview is holistic and represents the intrinsic nature of traditional Māori knowledge, values, and practices (Marsden & Henare, 1992). Marsden (2003) further expands on his

perception of the Te Ao Māori worldview by describing it as the woven universe and the central means of understanding what it means to be and live as Māori. Using Marsden's (2003) research as a reference, the Te Ao Māori worldview can be categorised by three key components: Mātauranga, Tikanga, and Kaupapa (see Figure 2). Translating these terms into a modern context includes Mātauranga as technical capacities, Tikanga as relational capacities and Kaupapa as human capacities. These concepts form the governing systems and foundational principles of the Māori worldview while offering a comprehensive and adaptable method of integrating mātauranga, tikanga, and kaupapa into disaster research. This concept was further expanded on by Kenny et al. (2015) following the 2011 Christchurch earthquake. This framework also utilises mātauranga, tikanga, and kaupapa to manage disaster-related risks, mitigate the social and environmental impacts of disasters, and facilitate community recovery and sustainability.

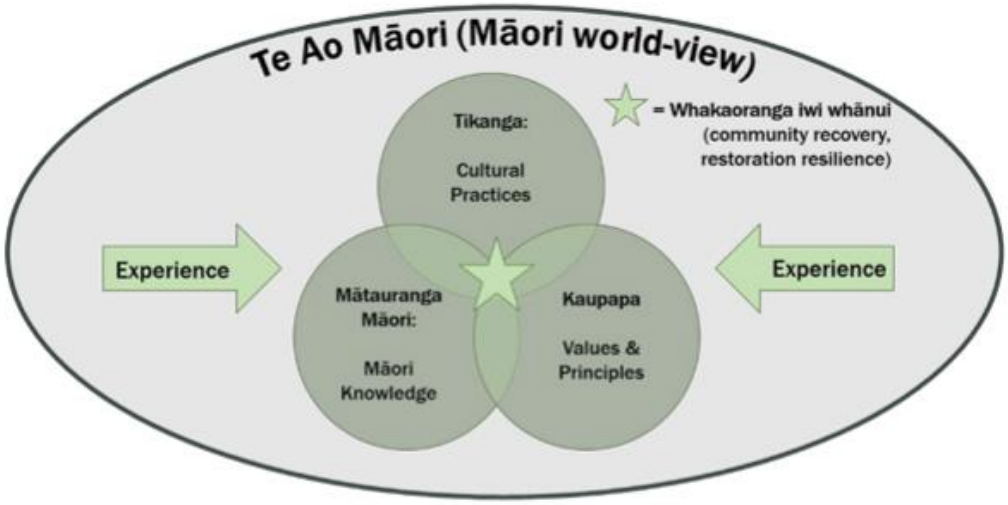

Figure 2: Te Ao Māori Worldview (Forsman, 2016)

This section will analyse each concept and its significance to practising resilience from a Te Ao Māori perspective. By exploring these concepts and their role in promoting resilience, this section aims to provide insights that can inform the development of culturally responsive policies and programs that support Māori well-being following a disaster.

4.1.1 Mātauranga – Technical capacities

Mātauranga Māori is the pursuit and application of knowledge and understanding of the natural world, following a systematic methodology based on evidence but contextualized within a Te Ao Māori worldview by incorporating culture and values (Hikuroa, 2018). The process used to collate this knowledge is holistic,

as it derives from all living creatures' observable and unobservable interactions. It is a sound knowledge system that can support technical, scientific assessments of the natural world. Pūrākau (traditional Māori narratives) and maramataka (the Māori calendar) comprise codified knowledge that uses a suite of techniques empirical in nature for investigating phenomena, acquiring new knowledge, and updating and integrating previous knowledge (Hikuroa, 2018). Kenny et al. (2015) support this claim by emphasising mātauranga Māori as being crafted from physical knowledge ascertained from the senses and perceptual knowledge created by interpreting experience and theoretical knowledge developed in response to the evaluation of subtle environmental patterns (Kenney et al. 2015). This means Māori community resilience comprises all forms of knowledge or information about the environment. Therefore, mātauranga Māori can describe the technical capacities of Māori in their understanding of natural hazards, which is used to shape Māori community responses to disasters.

Mātauranga Māori follows a systematic, evidence-based methodology while incorporating Māori culture, values, and worldview. The primary form of this knowledge is hidden within the pūrākau or traditional stories of Iwi, which comprise codified knowledge that can only be translated using Kaupapa Māori theory – research by Māori, for Māori, and with Māori (Taute et al., 2019). The personal immersion of Māori within their culture enables the correct translation of this Mātauranga. The suite of techniques employed is empirical, used for investigating phenomena, acquiring new knowledge, and updating and integrating previous knowledge, even within a modern setting (Hikuroa, 2018). This means Mātauranga Māori continues to grow. This demonstrates the dynamic nature of mātauranga and its regenerative capabilities. These features enable mātauranga Māori to evolve to respond to current situations if the correct tools are developed. This feature of Mātauranga Māori has facilitated its application in disaster research, specifically in comprehending hazard risk and management (King & Goff, 2010). Understanding the experiences that have contributed to developing this knowledge is crucial. King et al. (2007) further elaborate that Mātauranga Māori results from the enduring connection between Māori people and their environment, which has been instrumental in creating a comprehensive understanding of environmental characteristics and processes. Therefore, if Mātauranga Māori is correctly translated, it can bolster the built environment by expanding community resilience literature but contextualising it from a Te Ao Māori perspective. This expansion will provide a more holistic approach which naturally widens the source of information engineers can use to develop community resilience frameworks.

4.1.2 Tikanga – Relational Capacities

Tikanga is the behavioural guideline for living and interacting with Māori (Te One et al., 2021). It is understood as the societal lore of Māori culture that governs relationships and behaviours (Kenny et al. 2015). Tikanga is based on experience, and the traditions associated with this are often iwi specific with

underlying similarities or constants (Mead, 2016). Tikanga Māori puts mātauranga knowledge into practice and adds aspects of correctness and ritual to support it. Therefore, Tikanga Māori can be described as Māori philosophy and the practical face of Māori knowledge (Mead, 2016).

Concerning community resilience, Tikanga can be understood as the relational capacities of Māori. The nature of Tikanga has enabled the development of risk mitigation strategies such as land mapping and settlement fortifications, which have protected traditional communities by preventing land slippage from episodic flooding and ensuring that settlements were developed on stable bedrock (Kenny et al. 2015). The coastal marae was situated so inhabitants could identify early indicators for tsunami or king tides and respond accordingly, while inland settlements were near rivers to facilitate food security, with secondary sites established as flood evacuation centres (Kenny et al. 2015). The use of Tikanga also guided the application of resource management using the following principles:

- Rāhui: a temporary ban on hunting and fishing to ensure the sustainability of local flora and fauna
- Mahinga kai: traditional gardens were seasonally planted and harvested.
- Pataka: raised stores to protect food resources from foraging birds and floods.
- Rua kumara: ground storage pits ensured root vegetables were not affected by frosts.

Tikanga Māori provides a framework for living and working together in a way that is respectful of cultural practices, beliefs, and values. This framework has been used to build community resilience, particularly in the face of natural hazards and disasters (Durie, 2004). Māori have had to significantly adapt their cultural practices to protect their health and well-being (Te One et al., 2021). Adaptable practices are a prominent feature of Māori culture because of colonization and the implementation of legislation like the Native Schools Act of 1867, which sought the assimilation of Māori into European society. Jones (2016) suggested that the adaptable nature of Māori culture stems from their Tikanga. The rigidity of European law meant how Māori practised their Tikanga adapted to the surrounding circumstances of a changing environment. Tikanga Māori is exceptionally diverse and flexible, as each iwi will have different processes that reflect their local conditions or needs.

Incorporating Tikanga Māori in disaster management and risk reduction planning has enhanced community resilience (Harmsworth et al., 2014), primarily due to its adaptability. Therefore, when natural disasters occur, it is understood amongst Māori that mobilising skills and material resources, such as food and accommodation, will address the community's needs. Tikanga Māori provides a holistic approach to disaster management that recognizes the interconnectedness of people, place, and environment. This approach emphasises the importance of community engagement and participation in decision-making processes and recognises the importance of cultural identity and practices in building resilience.

4.1.3 Kaupapa Māori – Human Capacities

Kaupapa collates Māori principles and ideas that inform behaviours and customs (Kennedy et al., 2009). Concerning community resilience, kaupapa Māori effectively constitutes a set of moral rules that are relationally implemented to address risks of natural hazards and mitigate the impact of disasters (Kenney et al. 2015). The values of whakapapa (genealogy) and whanau (family) are fundamental. These principles are vital to Māori culture as they shape the social infrastructure and resilience of Māori. The emphasis on kinship means the delegation of disaster response roles is often whanau specific, where training commences early through intergenerational transmission and incorporates observational learning of future responsibilities (Kenny et al. 2015). Kenny et al. (2015) also highlight other principles in Table 2 that shape Māori approaches to natural hazards management.

Table 2: Kaupapa Māori Community Resilience Principles

Kaupapa Principle	**Explanation**
Kaitiakitanga	This principle describes the sacred role of Māori as guardians or protectors of the environment. It underpins a social obligation to provide a safe environment for the wider community (Kenny et al. 2015).
Manākitanga	This principle describes extending hospitality, respect, and support to all community members during a disaster. This principle is enacted by providing physiological necessities like food, shelter, and psychosocial support (Kenny et al., 2015).
whakawhanaungatanga	This principle describes the process of building and maintaining relationships. Kenny et al. (2015) state that whakawhanaungatanga is the operationalisation of intra and extra-tribal relationships to mobilise resources and activate social support networks.

Kaupapa Māori is described as the human capacities of Māori, where human capacities are understood to be the process by which individuals, groups, organizations, institutions, and societies develop their abilities both individually and collectively to set and achieve objectives, perform functions, solve problems and to develop the means and conditions required to enable this process (Kennedy et al., 2009). By this definition, human capacities describe the humanities way of life, and consequently, Kaupapa can be understood as the Māori way of life. Kaupapa Māori is the foundation of all knowledge systems, often formed by the individual's unique interaction with the local conditions they are immersed in. Kaupapa Māori seeks to understand the collective theories developed by Māori and maintain cultural integrity when analysing Māori issues (Kennedy et al., 2009). Therefore, any theoretical framework developed for Māori must be derived

from the experiences of Māori because only Māori genuinely understand the complexity, interconnectedness, and problems of their culture.

4.2 The Opportunity to Integrate Te Ao Māori Community Resilience

The history of Māori has seen resilient practices weaved into the very fabric of their culture. Te Ao Māori community resilience has survived through the oral transmission of waiata, whakataukī, and pūrākau but requires deciphering to understand how it was practised within the culture entirely. This provides an opportunity to incorporate valuable indigenous perspectives on practising community resilience. Māori have a complex understanding of their communities' vulnerabilities and strengths. They have developed unique methods to optimize their strengths while developing processes to mitigate, prepare, respond, and recover from disasters. Māori naturally incorporate the foundational principles of community resilience without directly defining them. Deriving this information from a people so aligned and immersed in nature is the knowledge required to improve community resilience frameworks. Norris et al. (2008) emphasized the need for community engagement and recognition of the differences in needs, vulnerabilities, and strengths between different groups within a community to improve resilience. Therefore, by collaborating with Māori, their culture can be integrated into community resilience frameworks, expanding the literature to a more holistic state and providing an equitable pathway for vulnerable communities to participate using the methods that best accommodate their needs.

Chapter 5 – Traditional Māori Community Resilience

In the Māori culture, pūrākau, waiata, karakia, and whakataukī hold significant value as they are used to pass down ancestral knowledge and cultural practices from one generation to another (Hikuroa, 2018). This information is often shared by kaumatua, the respected elders within the community. The Wellington region's local iwi, Ngāti Toa, has a rich history comprising myths, legends, and spiritual beliefs passed down from generation to generation. For this thesis, Ngāti Toa will be the primary focus of the research. These stories offer valuable insights into how Ngāti Toa has developed and sustained its resilience as a community. Within Ngāti Toa culture, traditional stories hold great significance as a source of knowledge. By examining how these stories have contributed to the community's resilience, this thesis can provide valuable insights into how other communities can leverage their cultural practices to build resilience. This thesis aims to explore the traditional stories shared by kaumatua in Ngāti Toa and determine how these stories have contributed to their community's resilience. The findings of this investigation will have practical implications for other Māori communities looking to build their resilience using the mātauranga, tikanga, and kaupapa specific to their iwi.

5.1 Research Methodology - Kanohi-ki-te-kanohi Kaumatua Kōrero

The research methods adopted were conducted following tikanga Māori and the Kaupapa Māori theory – research by Māori, for Māori and with Māori, using an actioned based participatory research method (Taute et al., 2019). The lead researcher is of Māori descent and is immersed in his culture. He advocates reviving Te Ao Māori values and language in the modern world. The knowledge associated with this is integrated into this research through the researcher’s lived experience. This factor contributed to the proposed research methodology of this section; specifically, kanohi-ki-te-kanohi (face-to-face discussions at home) were used as the basis for this research section. The kōrero was held at kaumatua's kāinga (homes) as this setting was the most comfortable for them. It was essential to foster comfort when discussing deep and sensitive Mātauranga.

The research was conducted in partnership with Ngāti Toa, the local iwi of Porirua in the Wellington region. Kaumatua who participated in the kōrero were directly contacted through whanau relationships of the researcher. Three Ngāti Toa Kaumatua participated in the kōrero and shared both pūrākau and lived experiences that highlight how Ngāti Toa practice community resilience. A Ki Wai Wiwi, or flexible approach, was also adopted when conducting the kōrero with Kaumatua. Following a brief introduction of the research purpose, the kōrero began with a single question; how did the Iwi Ngāti Toa traditionally prepare for disasters? The kōrero naturally evolved from this question.

5.2 Pūrākau from Ngāti Toa

Pūrākau is a traditional form of Māori narrative, containing philosophical thought, epistemological constructs, cultural codes, and world views (Hikuroa, 2018). When conducting the kōrero with kaumatua, two Pūrākau were shared that specifically related to the development of community resilience. These include the creation of the world and the origins of the deity Rūaumoko (the Māori God of volcanoes, earthquakes, and geothermal activity). This pūrākau contains principles that highlight how community resilience was practised and viewed within traditional Māori culture amongst the Iwi Ngāti Toa. The content of the stories shared is not consistent across all Māori. Each Iwi, hapū, and whanau have variations in these beliefs. Hapū and whanau tend to demonstrate a bias towards story versions favouring their tupuna. Despite the differences in the stories, the key themes and principles of the stories are consistent across all Māori. The whakaaro (understanding) will also differ between each Iwi, hapū, and whanau. These stories highlight humanity's origins, whanau, and connection to the Whenua. These stories heavily influence their values, systems, and knowledge.

5.2.1 The Creation – Ranginui and Papatūanuku

Parai (2022), a kaumatua of Ngāti Toa, shared the pūrākau of the creation where the God Ranginui (the sky father) and Papatūanuku (the earth mother) were created by Te Kore (the nothingness), Te Pō (the darkness), and Te Ao Mārama (the light). Ranginui and Papatūanuku were joined together and brought life to the world through nine sons:

- Tāne Māhuta – the god of forests
- Tāwhirimātea – the god of wind and storms
- Tangaroa – the god of the ocean
- Tūmatauenga – is the god of war
- Rongo-mā-Rāeroa – the god of peace
- Rongo-mā-Tāne – the god of cultivated foods
- Haumia-Tiketike – the god of wild foods
- Whiro – the god of darkness
- Rūaumoko – the god of earthquakes, volcanoes, and geothermal activity

Because Ranginui and Papatūanuku were joined, their children lived between them, sheltered from the world. No light was able to enter this confinement created by Ranginui and Papatūanuku. They wanted to remain together with their children to protect them from the world. Although the motivation to protect their children was pure, the darkness oppressed them. This oppression frustrated the children, who desired to see

the light. Eventually, the eldest son Tāne Māhuta, separated his parents to allow the light from Tama-Nui-te-Rā (the sun) to flood into the world, freeing his brothers, which enabled life to progress and thrive.

Following this brief synopsis, kaumatua shared a whakataukī which reads as follows: Ka warea te ware, ka area te Rangatira, which translates to ignorance is the oppressor, vigilance is the liberator. Ranginui and Papatūanuku unintentionally oppressed their children by sheltering them from the world, which fostered ignorance by preventing them from experiencing the world and learning. Ignorance was induced through a lack of knowledge, which meant the children of Ranginui and Papatūanuku could not adequately prepare for life's challenges. Vigilance liberated them from their ignorance. Vigilance in this pūrākau is a direct reference to knowledge and understanding of the natural world. Cruikshank (2000) emphasizes this point as the transmission of indigenous knowledge embodies both remembered sensory information built upon repeated observation and proper understandings that are usually transmitted orally in story form or ceremonial form with abstract principles and important information encapsulated in metaphor. Vigilance is, therefore, a direct reference to knowledge meaning the whakataukī emphasizes the need for education to raise individuals' capabilities. In this case, education on disaster risk reduction is required to improve the resilience of vulnerable communities. Education is a powerful tool that empowers individuals to act appropriately in disasters and provides the necessary information to adapt to the changing environment.

Traditional Māori community resilience was developed in response to the state of the pre-colonial built environment. The subsequent colonisation and socio-economic deprivation of Māori deteriorated the culture where the mātauranga, concerning community resilience, became lost to the general Māori populace. The community resilience mātauranga was halted in its expansion to reflect the changes in the built environment of Aotearoa. These changes have resulted in more complex systems and processes to meet a community's needs. Māori are ill-prepared to respond to modern disasters because of the changes in the natural and built environment in New Zealand. Modern concepts of community resilience are foreign to Māori, while their traditional principles require additional research and revival to be utilised in the present. Traditional Māori community resilience can only be integrated into existing resilience frameworks if Māori are educated in disaster risk reduction. Education in disaster risk reduction will raise their technical capabilities to respond more effectively to disasters and improve their resilience as their needs, vulnerabilities, and disaster response strengths can be more comprehensively integrated into resilience frameworks. Enhancing an individual's understanding of disaster risk reduction improves community resilience as knowledge about roles, responsibilities, and expectations is clearly outlined. Individual preparedness and how individuals can work collectively with other community members to respond and recover are enhanced. Education on disaster risk reduction also provides individuals with information on

where to turn for help for themselves and their neighbours, enabling the entire community to be resilient in the face of unknowns (Chandra et al., 2014).

5.2.2 Rūaumoko – The God of Volcanoes, Earthquakes, and Geothermal Activity

Kaumatua continued providing overviews of the nine sons of Ranginui and Papatūanuku. The pūrākau of Rūaumoko provided strong correlations to disaster risk reduction principles. The pūrākau of Rūaumoko begins with his origins in the womb of his mother, Papatūanuku. When Ranginui and Papatūanuku were separated, Rūaumoko resided in his mother's womb. It was believed that the origins of earthquakes were a direct result of the movement of Rūaumoko within the womb. Pregnancy illnesses of Papatūanuku caused volcanic eruptions, and the varying body temperatures caused by pregnancy cause geothermal activity and underground heat. These phenomena led Māori to believe that Rūaumoko is a powerful deity. The disrespect of his mother often led to the intervention of the Rūaumoko to induce large earthquakes and volcanic eruptions. Especially within the central north island, iwi had specific Mātauranga and Kaupapa to manage the unrest of Rūaumoko as volcanic activity occurred daily throughout this region. This Mātauranga influenced the construction techniques of Pa sites, the locations of settlements, and preparation methods, including emergency food supplies and roads for trading and evacuation, while integrating sustainable environmental management. Māori understood how the ground's instability, magma's pressure build-up under the earth's crust, and the heat source of geothermal activity all connected (Maxwell, 1990). The threat of earthquakes and volcanic eruptions influenced Māori to develop methods to mitigate and prepare for these disaster events. If Rūaumoko was displeased with Māori, geothermal activity was the first sign to begin preparations for a volcanic eruption. To mitigate the intervention of Rūaumoko Māori employed the Te Ao Māori principle of kaitiakitanga.

Kaitiakitanga means guardianship, protection, and preservation of Papatūanuku, constituting the entirety of the natural environment. Kaitiakitanga is often used with Wairuatanga, which acknowledges the spiritual dimension of all existence and the interconnectedness of all living beings. Māori do not view themselves as superior to the natural environment because all humanity is birthed from Papatūanuku. Māori share a deep connection with the natural world, as there is a belief that all life is connected. Being endowed with knowledge and the ability to have guardianship, Papatūanuku is considered a sacred, foreordained responsibility of Māori. When Māori failed to uphold this responsibility and subsequently disrespect Papatūanuku, Rūaumoko would intervene by warning Māori through geothermal activity. To uphold this sacred responsibility Māori employed a variety of practices, including:

- A ban on fishing and birding recreationally (rāhui)
- Correct preparation of baskets and appropriate usage for different food types (Tikanga)

- Only harvesting what is needed instead of excessively taking and storing food that is wasted (Kaitiakitanga)
- Hunting during the appropriate seasons – only using bird snares outside of the breeding seasons (Wao Tapu)
- Fishing quota or limits – fishing using large-scale strung nets was limited to annual events (Kaitiakitanga)
- The rāhui or prohibition on the access, hunting, agriculture, or development of land (rāhui)
- Using maramataka to guide planting and harvesting (Maramataka or mātauranga)
- Laying sacred mauri stones blessed with a karakia by a tohunga to protect the resources and provide a bountiful harvest (Mauri Ora)

Traditional forms of Māori community resilience are holistic, with spiritual, sustainable, and physical preparation processes required. Kaitiakitanga is a principle grounded in spirituality and sustainability. Preparation for earthquakes was not focused on reactively responding to the warnings of Rūaumoko but by proactively planning and living a hazard-resilient lifestyle according to their knowledge and understanding of the natural world. Resources to prepare for disasters should be proactively used and a consistent part of everyday living for people. This manner of preparation means that when the imminent threat of disasters rises, the community can immediately respond and adjust to the environmental changes. Making these correlations is impossible from a scientific lens, but it makes perfect sense when viewed from a Mātauranga Māori perspective. Ngāti Toa has a complex understanding of their communities' vulnerabilities through pūrākau, waiata, whakataukī, art, and their continued observations of the natural world, which continues to be added to and passes down orally. This understanding enables the development of unique methods to mitigate, prepare, respond, and recover from disasters.

5.3 The Origins of Ngāti Toa

Following the pūrākau shared by kaumatua, the kōrero advanced to discuss the early migration and history of Ngāti Toa. Resilient practices were developed amongst Māori to help mitigate and prepare for war-related disasters. The environment these resilient principles originate from are different, but the motivation for developing them all stems from the same need, which is to withstand and recover from adversity (Chandra et al., 2011)

5.3.1 Me Noho Takatū – Be Prepared

Ngāti Toa, like all Māori, originated from Hawaiki, which was the original home of Polynesians. Due to overpopulation, famine, and war, many of the chiefs in Hawaiki dispersed and populated throughout the Pacific (Potini, 2022). One of these chiefs includes an ancestor of Ngāti Toa, Hoturoa, who commissioned

and captained the waka Tainui on the voyage to Aotearoa. One kaumatua shared that Hoturoa departed to Aotearoa on a Uenuku night. The kaumatua explained that a uenuku, or the appearance of a distinct rainbow, is a bad omen. Those travelling with Hoturoa urged him to delay his travel and wait for a more reasonable season to voyage, as the maramataka indicated that winds and storms characterised the month he intended to travel. This period was known as Tamatea or the new moon. Instead of heeding his whanau's warnings, Hoturoa challenged his whanau and the sea as he declared, “Let me wrestle with Tamatea. I will conquer him on the sea.” This declaration inspired his whanau and instilled the courage to undertake the voyage despite the Uenuku omen. Kaumatua indicated that Hoturoa had faith in himself because of his preparations for the journey, specifically the commissioning of the waka Tainui. Hoturoa commissioned Rakatāura to construct the waka. Rakatāura was a renowned waka carver, employing a traditional technique called Rāta. Using Rāta and the reputation of Rakatāura as a renowned carver instilled confidence in Hoturoa and his whanau. Eventually, Hoturoa sailed to Aotearoa, conquering the sea despite the omen. He and his whanau eventually settled in Kāwhia on the North Island’s west coast of Aotearoa.

Carving waka is a meticulous process that requires spiritual sensitivity, sustainability, and a comprehensive understanding of the Te Ao Māori worldview. Kaumatua expressed that this methodical preparation is integrated into all stages of the waka construction and requires the community's involvement. Hoturoa had confidence in making this journey despite the Uenuku omen, as his people carefully prepared his waka to wrestle and withstand the oncoming adversity from the sea. Although this story does not include the development of resilience for a disaster, it highlights how necessary preparation is to Māori and the confidence it instils within them, despite facing overwhelming obstacles and unknowns. Hoturoa highlights how Te Ao Māori preparation extends beyond a physical capacity to include spiritual, cultural, social, and sustainable processes. Te Ao Maori community resilience and preparation for a disaster is a holistic process. Kaumatua shared a short whakataukī explaining this. The whakataukī states Me Noho Takatū, which translates to be prepared. One kaumatua believed that this is the underlying message of Ngāti Toa that epitomizes how they approach community resilience, which is to be prepared. Be prepared physically, be prepared spiritually, be prepared socially, and be prepared culturally. The balance of these processes enables confidence to be instilled in individuals to face overwhelming obstacles, odds, and unknowns.

The experience of Hoturoa in his preparation for the migration to Aotearoa highlights a fundamental principle important to Māori when developing community resilience, which is the importance of leadership in disaster preparation and response. Leadership is a central element of community resilience during emergencies as it effectively communicates information that meets the population's needs (Cohen et al., 2017). According to Bass and Stogdill (1990), effective leadership is the interaction among group members that initiates and maintains improved expectations and the group's competence to solve problems or attain

goals. However, Kouzes and Posner (2006) mentioned that leadership is not just about leaders, nor is it about a position in an organization or community present, but instead rather, it must be in everyone's interest to designate a leader. Hoturoa was a courageous leader that inspired his people to continue the voyage despite the omens. He was a competent leader whom his people elected. Māori especially value leaders as it provides them with guidance and assurance in the face of unknowns. Within Maoridom, effective leadership has always been an essential component that determines the success of an iwi.

5.3.2 Toa Rangatira – Chivalrous and Chiefly Warriors

Kaumatua continued to share critical historical events of Ngāti Toa that they believe relates to the Iwi and their preparation capabilities. The following story shared by Kaumatua involved a man named Tūpāhau. Tūpāhau was a tohunga or priest who was also a capable warrior. Tūpāhau was one of the founding fathers of Ngāti Toa that brought their iwi to fame. Not long after settling in Kāwhia, many of the Iwi and hapu within the Waikato region resorted to war for control over the fertile land. These wars developed a fierce rivalry between two tohunga, Tūpāhau and Tāmure. The two battled consistently, with neither tohunga beating the other. In their final battle, Tāmure assembled thousands of warriors to try to overwhelm Tūpāhau. However, Tūpāhau was a great strategist and had an aptitude for war. Tūpāhau employed techniques and lured Tāmure to an environment that negated his numbers advantage. Combined with the ferocious nature of Tūpāhau and his people, these techniques led to his eventual victory over Tāmure. During war amongst Māori, the victor of battles would often slay their enemies. However, following this victory, Tūpāhau showed mercy and spared Tāmure, a gesture rarely offered to enemies in war. This generosity of Tūpāhau earnt him and his people the title Toa Rangatira, which translates to chivalrous and chiefly warriors. This title became a mantra for Tūpāhau and his people that Ngāti Toa continues to uphold.

These early tribal wars with Waikato iwi resulted in harsh living conditions for Ngāti Toa. The natural and built environment was constantly changing as many whanau members died in war or were required to relocate due to defeat. As such, individuals needed to build their capabilities to contribute to the community during the war. This meant every iwi member was required to build their whare, waka, hunt, gather, weave, and fight. These skills were not optional but necessary for survival. Lacking these skills resulted in poor quality of life and death. To mitigate this, Ngāti Toa were all capable and proficient in various skills, enabling them to live in a constant state of preparedness. This means community resilience is more than a framework but a lifestyle born out of the necessity to survive. Two whakataukī shared by the kaumatua summarizes the fundamental principles describing the preparedness processes of Ngāti Toa. The whakataukī reads whakareri I to waka taua mo te pakanga ka waiho ki uta, which translates to prepare your warship for battle and leave it ashore. This whakataukī is used with another proverb stating, "If you break the mast, you know how to fix the mast because you made the mast." This whakataukī describes two critical

principles that Ngāti Toa embody when practising community resilience. These principles are 1) to ensure individuals are capable of their survival and 2) always be vigilant and prepared for disaster events.

The principle of preparation is essential to Ngāti Toa and is still a prominent feature within the iwi today. The uncertainty of war always loomed, especially against Ngāti Toa, who developed several enemies during their war with Waikato iwi and their eventual migration South to Kāpiti. Preparing for war encompassed more than the individual's skill set. It included the entire iwi to be prepared. Kaumatua shared that preparation for war included constructing war waka, creating food storages, amassing weapons, renewing defences, strengthening alliances, controlling the trades, using technology, developing emergency evacuations routes, and raising the capability of tamariki (children). The harsh living conditions meant this was a necessity. Living in a constant state of preparedness meant the nature of living a resilient lifestyle became engrained in the fabric of their culture, a lifestyle still active today.

5.3.3 The Migration South – Partnerships

Kaumatua advanced the kōrero by sharing the story of Te Rauparaha, a prominent leader within Ngāti Toa. Te Rauparaha was a chieftain and wanderer who often travelled across Aotearoa to live with neighbouring iwi. This lifestyle led to the formation of strong alliances and partnerships with a variety of iwi. Some of these alliances included Ngāti Raukawa, Ngāti Maru, Ngāti Whātua, Ngāti Tama, Ngāti Rāhiri, and Ngāti Maniapoto, which were all local to the central north island. These alliances and partnerships remain the primary reason for the survival of Ngāti Toa. Upon their arrival in Aotearoa, a war between Ngāti Toa and Waikato iwi commenced for control of Kāwhia. The war for Kāwhia only intensified with the death of chieftains on either side. To escape this conflict, Te Rauparaha encouraged his people to migrate South to Kāpiti as land and resources were abundant and an opportunity to trade with Pākehā. This suggestion was made with hesitancy and doubt, as Kāwhia was the ancestral home of Ngāti Toa. However, the turning point occurred in the overwhelming defeat of Ngāti Toa by a combined force of Waikato and Maniapoto iwi. Several thousand warriors invaded Kāwhia and drove Ngāti Toa to Te Arawī, a coastal stronghold south of Kāwhia, where they remained under siege for months. Fortunately, among those laying siege was Te Rangituataka, chief of Ngāti Maniapoto whom Te Rauparaha had formed alliances during his travels. During the siege, Te Rangituataka secretly supplied Te Rauparaha with food and aid in escaping Te Āti Awa in Taranaki. Ngāti Toa would have been destroyed if it had not been for this alliance. Developing partnerships is an essential principle that led to the survival of Ngāti Toa. This story of Te Rauparaha highlights the importance of developing frameworks that foster partnerships when developing community resilience for Māori. Māori can be a resilient community as it is woven into their culture and lifestyle. However, the complexity of the built environment combined with the introduction of new types of community needs because of modern civilisation has increased the need for partnerships. Modern

challenges require innovative solutions that extend beyond the capacity of Māori. By developing partnerships, Māori can improve community networks and foster collaboration that can provide ongoing support and resources to address their complex needs. Furthermore, a community that utilises partnerships can leverage their collective expertise and resources to develop approaches that reflect its needs and address its complex issues.

5.3.4 The Kāpiti Conquest – Technology & Strongholds

The final story shared by kaumatua included the conquest of the Cook Strait following the departure of Ngāti Toa from Kāwhia. Before the departure from Kāwhia, Te Rauparaha had spent time with Ngāti Maru in the Hauraki Gulf, where he participated in a war expedition from Taranaki to the Cook Strait. This expedition was the earliest involvement of muskets in Māori warfare (Potini, 2022). Many iwi had never encountered a musket prior and were decisively defeated as traditional weapons were no match to the superior Pākehā technology. Te Rauparaha learnt the value of technology during this expedition.

Furthermore, Te Rauparaha noticed a ship sailing through the strait. A northern chief indicated that their iwi traded with these ships for muskets, iron tools, foreign animals, exotic food, clothing, and knowledge. This chief indicated that the Cook Strait was becoming a popular trading route for Pākehā because of its central location and fertility. During this expedition, Te Rauparaha determined Kapiti as a site of significance, and he theorized that the iwi in control of this region would become the most dominant force in the nation. To achieve this, Te Rauparaha ensured that preparing flax and greenstone was an equal priority to training warriors as these resources enabled them to trade. Te Rauparaha constructed a stronghold on Kāpiti island to further aid in their conquest. From a military perspective, Kāpiti is a vulnerable community. The centralized location meant enemies could attack Ngāti Toa from all angles. Therefore, to control Kāpiti, alliances, resources, and a strong iwi were required. Being foreigners from Kāwhia, many local iwi were fearful of this migration. This was further perpetuated by the exploits of Te Rauparaha in the Cook Strait during his northern war expeditions and his use of muskets. Local iwi was fearful of this migration. Te Rauparaha foresaw these challenges and congregated his iwi on Kāpiti, which acted as their stronghold during tribal and colonial wars. This decision was the most critical factor in their conquest of Kāpiti. This enabled Ngāti Toa to pool their resources together, which allowed an immediate response to disasters as they occurred. The stronghold fostered a strong sense of unity amongst the Iwi as it was a self-sustainable ecosystem filled with whanau. Ngāti Toa eventually became the most dominant iwi on the Kāpiti Coast. They secured control of the trading routes, formed alliances, and constructed a fortified stronghold on Kāpiti island, which secured the Cook Strait for Ngāti Toa.

The use of technology was a vital factor that aided in the conquest of Kāpiti. Using relevant technology to mitigate, prepare, and manage disasters is vital to improving community resilience. Technology can aid in

identifying threats, communicate and coordinate response planning, and improve the preparation of disaster management by fostering more significant levels of unity through technological mediums. Basher (2013) suggested that managing disaster risks and events depends on the innovative use of science and technology. Without the use of technology introduced by Pakeha, Te Rauparaha would have never conquered Kāpiti.

Furthermore, this story highlights the strength of community hubs and localized self-sufficient communities. Congregating Ngāti Toa was a strategic decision to pool resources together to sustain the iwi, grow their strength, protect their whanau, and foster unity. By congregating his people together, Te Rauparaha unintentionally created a self-sufficient community hub with the resources and capabilities to respond to the war disaster effectively. Self-sufficiency is a critical component of community resilience and entails increasing the capacity of individuals, communities, or institutions to become more self-reliant (Chandra et al., 2011). The power of a self-sufficient community resides in individuals' ability to grow their capabilities to respond to disasters. The use of community hubs further helps to foster self-sufficiency and raise the community's competence to better respond to disasters. Community hubs are anchors for institutions to address vulnerability, build community resilience, and foster adaptive responses to improve social development (McShane et al., 2022). These hubs offer refuge, emergency accommodation, meeting places and information points, food, medical help and communications, and other services and supports according to local contexts (McShane et al., 2022). Opening community hubs before disasters instead of activating them after disasters is how Māori would develop strongholds to congregate to during a crisis.

5.4 The Great Depression?

During the kōrero with Kaumatua, a story was shared about their experience of The Great Depression in their youth. The Great Depression was a period of economic recession due to a significant fall in stock prices (Cunningham, 2016). In New Zealand, from 1930, export prices began to plummet, falling 45% by 1933. By the end of 1930, urban businesses and manufacturers felt the flow-on effects. Demand for their goods and services fell, as did the prices they charged. Unemployment rose to 12% of the registered workforce in 1933, and those lucky enough to keep their jobs often found their wages slashed by as much as 20% (Cunningham, 2016). Despite the hardships New Zealanders were burdened with, the Kaumatua expressed their confusion at the statement that they were in an economic recession. The kaumatua observed no changes in their life following the beginning of the Great Depression but noticed an improvement in relationships within the iwi. Kai was sourced locally from the Moana and grown on the Whenua. Five tupuna were distributed across Porirua, from which the kaumatua sourced kaimoana (seafood) and wai (water). The only noticeable difference following the Great Depression was the congregation of whanau and the joint effort to collect kai and wai, which enabled a deep sense of unity to develop. Kaumatua expressed that during this time, there was an increased presence of whanau working together to support one

another. The Ministry of Social Development (2021) reported that social capital or unity could not be developed without first developing community resilience. However, Ngāti Toa highlighted that social capital could be developed and enhanced through hardships.

Kaumatua further indicated that their lifestyle and the abundance of resources in Porirua was the primary reason many Ngāti Toa Iwi members did not recognise the economic recession. Kaumatua emphasised this using a whakataukī shared by Te Rauparaha once he established Porirua as the new ancestral home of Ngāti Toa. The whakataukī reads waiho i Porirua, i te kainga ururua, which translates to remain in Porirua, where the resources are plentiful. This whakataukī strengthens Ngāti Toa by emphasising the self-sustainable Porirua ecosystem, which their tupuna (ancestors) had prepared for them. Their food sources were naturally sourced from their harbour and rivers, while their Mātauranga in agriculture further sustained them. Before Porirua's expansion and growth, natural food sources were sustainably managed, aligning with the principles of Kaitiakitanga (environmental management and stewardship). The growing influence of Western culture within New Zealand and the passing of the Native Schools Act (legislation to assimilate Māori to a European lifestyle) meant the culture naturally suffered.

Māori had to adapt to this changing world to survive, losing their Mātauranga, Tikanga, and Kaupapa fragments. Porirua's growth caused overfishing in their traditional food sources as new residents did not respect the authority, stewardship, and guardianship Ngāti Toa had over the environment. This meant sustainable management of the harbour and streams suffered, devastating the local fauna and flora of the region. The substantial growth of the city also meant additional infrastructure and utility services were required to support the population. Wastewater pipes were constructed in many local streams where food was sourced. The construction methods and processes of the time were culturally insensitive but failed to adequately prevent leakage into the streams, resulting in the pollution of the streams and harbour, further requiring Ngāti Toa to assimilate into Western culture. The sustainable environmental management of the natural environment through the principle of Kaitiakitanga supported and sustained Ngāti Toa during the recession. Little adjustments were required to adapt to the recession as this way of living was still common for Māori during the 1930s. Where to collect wai, source kai, and how to grow it were essential skills that mitigated these effects. Utilising this process enabled an immediate response by Ngāti Toa to the recession. This meant that Kaumatua was unable to notice changes caused by the recession.

5.5 Overview

The history of Ngāti Toa and their interpretation of pūrākau have seen resilient practices woven into the fabric of their culture. This knowledge has survived through the oral transmission of waiata, whakataukī, and pūrākau but requires deciphering to understand how resilience was practised within the culture entirely. A summary of the primary principles utilised by Ngāti Toa is depicted in Figure 3. Kaumatua believe the

complete revival of these specific processes is difficult due to the loss of Mātauranga through colonisation and because the purpose for these processes stemmed from the necessity of survival. Revitalising that need is almost impossible in modern society, as the threat of war and survival is non-existent. Although the current living conditions of some Māori remain harsh by modern standards, it is still vastly better than those living during the colonial and tribal wars. So, to revitalize this practice within community resilience frameworks, the motivation for this lifestyle must be evaluated and repurposed to account for both the change in the cultural and demographic environment of New Zealand.

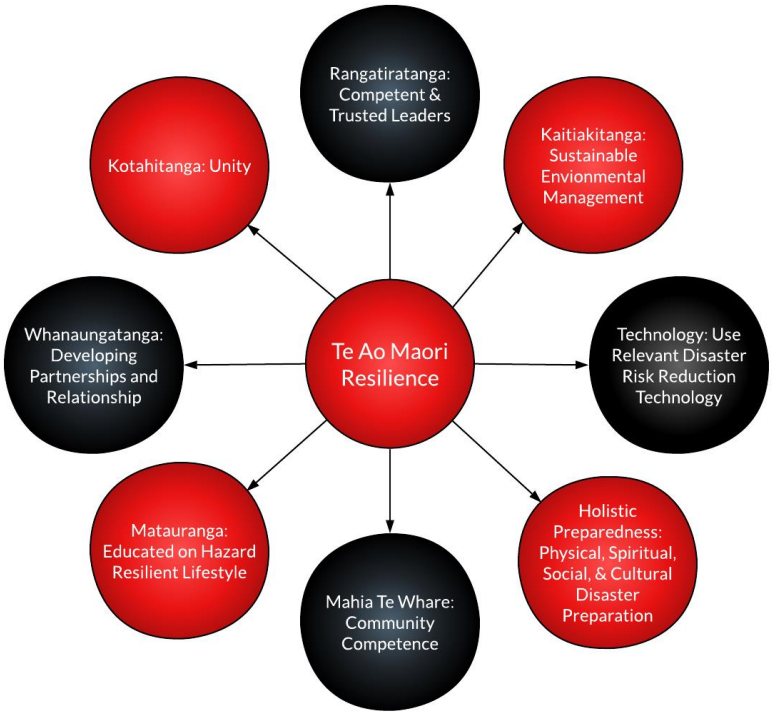

Figure 3: Traditional Te Ao Māori Community Resilience

Chapter 6 – Ngāti Toa Earthquake Response Strategy

This disaster Wānanga overviews how modern Māori of the Iwi Ngāti Toa practice community resilience. These responses are the Mātauranga of the individual Ngāti Toa participants and do not represent the entire perspective of the Iwi. These responses will help guide engineers in the development of community resilience frameworks that are equitable. A total of twenty Ngāti Toa Iwi members participated in the Wānanga. There were five Wānanga held on the following dates: the 8th of October, the 21st of October, the 11th of November, the 2nd of December, and the 20th of December. The Te Rūnanga o Toa Rangatira Senior Leadership team recruited participants through online communications. The research purpose and goal were shared with the leadership team, who then aided in selecting appropriate participants to represent Ngāti Toa.

6.1 Research Methodology – Disaster Wānanga and Pōwhiri

The Wellington Earthquake National Initial Response Plan was developed by the Ministry of Civil Defence & Emergency Management as a credible worst-case disaster scenario using a combination of probabilistic, geological, and scientific data (Stuart-Black, 2018). The response plan considered various risks and vulnerabilities within the Wellington region. The expected damages and recovery timelines were derived while considering these risks and vulnerabilities concerning a 7.5 magnitude earthquake striking the Wellington region. This plan was developed to assist emergency managers and agencies respond effectively to this complex emergency scenario (Stuart-Black, 2018). The information provided in this report was posed to Ngāti Toa participants to evaluate their response to this disaster scenario.

The research method adopted to convey this information was followed by tikanga Māori and Kaupapa Māori methodology. The proposed research methodology was wānanga and pōwhiri (traditional style meetings and discussions), replacing traditional academic workshops. The Wānanga was held at the Te Rūnanga O Toa Rangatira head office, utilizing a Kanohi-ki-te-kanohi (face-to-face) and kei moumou Taima (open and meaningful) approach. Using this approach allowed researchers to obtain information safely and sensitively from participants while also sharing relevant knowledge that will help bolster the resilience of Ngāti Toa and prepare participants for the realistic earthquake scenario posed by the Ministry of Civil Defence & Emergency Management.

6.1.1 Description of Earthquake

The following scenario was taken from the Wellington Earthquake National Initial Response Plan. A large, shallow earthquake along the Wellington Fault, with a magnitude of 7.5 on the Richter Scale, will be the basis for this scenario. The Earthquake will hit at approximately 5 pm on Tuesday (Peak hour Traffic) during June (Winter). The strong initial impact of the Earthquake is followed by an increased level of

violent shaking lasting for fifty seconds. The most significant impacts are felt on either side of the Fault line within Wellington City and Levin, as shown in Figure 4.

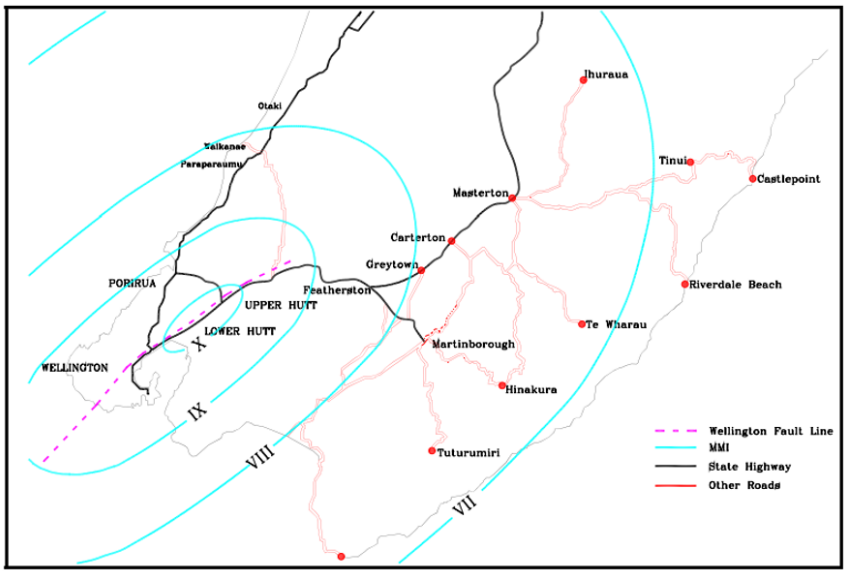

Figure 4: 7.5 Magnitude Earthquake

Tsunami warnings are immediately dispatched, and aftershocks of the earthquake are felt throughout the evening. Fault movement results in vertical and horizontal movement of subsurface rocks and, subsequently, upheaval, movement of foundations and severe damage to structures within this area. The high ground shaking results in Porirua experiencing severe slope failures, fault movement, and large areas of liquefaction, which decimates the physical and built environment. Rockslides are also predominant in the Ngauranga and Ngaio Gorges, along State Highway 58 between Paremeta and Pautahanui and the Wellington fault scarp, essentially isolating the Porirua.

6.1.2 Summary of Damages

The Wellington Earthquake National Initial Response Plan provides an overview of the expected damages following the 7.5 magnitude earthquake. The expected damages include the following:

Expected impacts on population:

- The event occurred during the evening's peak hour traffic resulting in approximately 500 deaths, 4,000 injuries and 1,800 people trapped
- All healthcare facilities in the Capital and Coast, Hutt Valley and Wairarapa District Health Boards (DHBs) are damaged and operating at a severely reduced capacity
- The diarrhoeal disease will occur because of contaminated drinking water
- Reduced response capacity of emergency services

- The false perception that dead bodies heighten the risk of disease outbreaks will also exist
- Heightened stress associated with separation (estimated 7,500 commuters from Porirua will be dispersed)

Expected impacts on infrastructure:

- Potable water, stormwater and wastewater reticulation networks are highly likely to be severely damaged or destroyed, and it will take months to restore
- Approximately 60,000 properties will be damaged or destroyed
- More than 30 buildings have collapsed in the CBD entirely due to severe liquefaction and foundation settlement
- Porirua will be isolated by road due to significant slip damage on SH1 at Centennial Highway between Paekākāriki and Pukerua Bay and SH2 at Rimutaka Hill between Upper Hutt and Featherston
- The rail network will be inoperable for over 3-months
- Wellington Airport's runway will be inoperable for two days
- CentrePort (Wellington) will be inoperable, with only a limited level of service provided after five days

Expected impacts on utilities:

- Inoperability of electricity accessories and services
- Cellular phone networks and house networks will be inoperable, overloaded, and degraded
- Gas transmission pipelines supplying the lower North Island are likely to be damaged, isolated and either inoperable or degraded
- National fuel shortages across all grades (including diesel, petrol and jet)
- Fast Moving Consumer Goods will remain inoperable until roading systems and ports have restored functionality

6.1.3 Critical Infrastructure Restoration Timeline

The Wellington Earthquake National Initial Response Plan provides a summary of the expected timeline for the restoration of crucial critical infrastructure within Porirua. These timelines include the following:

- Restoration of travel to North/West Wellington: 7-days
- Emergency Water Network Restoration: 8-days
- Electricity Restoration: 20-days
- Telecommunication Restoration: 20-days

- Food Shortage Resolved: 20-days
- Restoration of travel to Upper Hutt District: 3 months
- Restoration of travel to the Kapiti District: 4 months

The summary of damages and restoration timelines derived from the Wellington Earthquake National Initial Response Plan was used as the basis for the disaster wānanga. The risks, vulnerabilities, and damages assumed in this report were posed to Ngāti Toa participants. Participants were asked about this earthquake scenario to gauge their understanding of how community resilience would be practised within Ngāti Toa. This aided in developing an iwi-led response plan to support the Ngāti Toa members in an earthquake event.

6.2 Preliminary Questions

Before proposing the earthquake disaster scenario, various induction questions were asked to gauge the overall understanding of community resilience amongst Ngāti Toa Iwi members and simultaneously measure their confidence in the Iwi, Porirua City Council (PCC), and individual response plan for disasters.

6.2.1 Response to Resilience

Participants were first required to record the term they thought best describes resilience. A summary of those terms is provided in Table 3. Participants recorded multiple terms, so some percentages were inflated.

Table 3: Summary of Terms Describing Resilience

Term	Frequency	Description
Strength	60%	A collective quality rooted in interconnectedness, interdependence, and a deep connection to the natural world and people.
Toughness	25%	Individual quality involves perseverance, determination, and the ability to endure hardship while maintaining a sense of connection to the community and the natural world.
Endurance	25%	A combination of physical and spiritual strength allows individuals and communities to persist through difficult times and maintain a connection to the natural world and their cultural traditions.
Tenacity	25%	A determined and persistent approach to problem-solving is rooted in a deep connection to the community, cultural traditions, and the natural world.
Fortitude	25%	A combination of courage, strength, and resilience, rooted in a deep sense of connection to the community, the natural world, and cultural traditions.

Struggle	15%	A process that causes growth and transformation, requiring a deep sense of connection to the community, the natural world, and cultural traditions to persevere and overcome adversity
Hardship	10%	An opportunity for personal and collective growth and transformation, requiring a deep sense of connection to the community, the natural world, and cultural traditions to navigate and overcome.
Resistance	10%	Standing up against injustice and oppression draws on a deep connection to the community, the natural world, and cultural traditions to preserve and protect their way of life.
Mana	10%	A sense of personal and collective power, authority, and prestige is earned through service, leadership, and upholding cultural values and traditions.

Strength was the most frequent term used to describe resilience, with sixty per cent of participants recording this answer. Accompanying terms participants used to describe resilience are synonyms of strength. This includes the terms toughness and endurance, referenced by twenty-five per cent of participants. Other synonyms of strength recorded by participants included perseverance, tenacity, and fortitude. Twenty-five per cent of participants also used terms that described the need for resilience instead of what resilience is. These terms include resistance, hardship, and struggle. Ten per cent of participants also described resilience using the Te Ao Māori principal mana, which is described as persona, spiritual, and collective strength. The terms used to describe resilience help formulate how Māori view community resilience.

6.2.2 Response to Community Resilience

Participants were then required to record the term they thought best describes community resilience. A summary of those terms is provided in Table 4. Participants recorded multiple terms, so some percentages were inflated.

Table 4: Summary of Terms Describing Community Resilience

Term	Frequency	Description
Iwi	30%	The concept of extended family and community, encompassing a sense of shared identity, responsibility, and intergenerational connections that contribute to a strong and resilient community
Together	20%	Collective action, cooperation, and interdependence, drawing on a shared sense of identity, culture, and connection to the natural world to build strength and overcome adversity.

United Strength	20%	The collective power and resilience that emerges when diverse individuals and communities come together with mutual respect, shared values, and a commitment to working towards a common goal
Collective Strength	20%	Ensuring all individuals and communities have equal access to resources, opportunities, and decision-making power creates a more resilient and equitable society.
Collective Struggle	20%	Drawing on the community's strength and unity to face and overcome challenges and adversity while upholding cultural traditions and values.
Kotahitanga	20%	Unity and solidarity emphasise the importance of coming together as a collective to face challenges, make decisions, and work towards a common goal that upholds cultural values and traditions—the process of developing and forming relationships.
Whanau/Whakapapa	15%	The importance of family and intergenerational connections, acknowledging the strength and resilience that comes from having a sense of belonging and connection to one's ancestors, cultural traditions, and community.

The collective perception changed when the term community resilience was posed to participants. All the terms mentioned are derivatives of the principle of unity. Thirty per cent of participants used the term Iwi to describe community resilience. Additional terms include united strength, collective strength, and collective struggle. Participants also described community resilience with kotahitanga, whakapapa, and whanau. A defining feature of Māori culture is the unity and social connectedness observed amongst whanau. The skeletal structure of Māori epistemology centres on whanau connections, whakapapa, and the interconnectedness between the environment and people (Mahuika, 2019). Whakapapa is considered crucial to assertions of Māori identity and tribal membership. It is the heart and core of all Māori institutions from the Creation to what is now iwi (Mahuika, 1998). This highlights how community resilience for Māori is centred on the collective interests of whanau instead of the individual. It aims to ground individuals and help them view their life through a grander scheme beyond themselves. This requires individuals to make sacrifices for the well-being of all and the collective effort to build everyone up together.

6.2.3 Feelings of Safety in Porirua

Participants were asked if they would feel safe in Porirua if an earthquake were to strike. Participants were divided in their feelings of safety in Porirua, with fifty-five per cent feeling safe while the other forty-five per cent did not. All participants expressed that residing in their ancestral home and being surrounded by whanau (family) with whom they share whakapapa (genealogical ties) creates a sense of security. This security is derived from participants' deep trust in their whanau to develop an effective response plan. Although some participants reported feeling secure in Porirua, they admitted that they are not equipped to deal with an earthquake if it occurs. Those participants who stated they would not feel safe in Porirua during an earthquake believed that nowhere in New Zealand would be safe. The participants' realization of their unpreparedness for an earthquake and their awareness of the local vulnerabilities in Porirua intensified the sense of insecurity they experienced.

6.2.4 Confidence in Council

Participants were asked if they had confidence in the Porirua City Council's response plan in the event of an earthquake. Participants unanimously lacked confidence in the Porirua response plan for an earthquake. This lack of confidence derives from the lack of information and communication on the Porirua earthquake response plan. Many participants lacked confidence because they did not know whether the plan existed. Several participants also stated that the lack of collaboration with the council and the contrast in strategic objectives means resources are distributed elsewhere. This relationship has fostered mistrust to develop between the community and the council. So, information relevant to disaster response planning and any decision-making done to improve the resilience in the community will be met with hesitancy, especially if Ngāti Toa is not involved. Developing a cooperative relationship with the community is essential so that information and decisions related to response planning are trusted.

6.2.5 Confidence in Iwi Response Plan

Participants were asked if they had confidence in the Iwi response plan in the event of an earthquake. Participants' opinions were divided, with sixty per cent stating the iwi is not prepared for an earthquake. Participants who expressed doubts about the iwi response plan claimed insufficient emergency supplies, response equipment, and trained personnel in disaster risk reduction skills as reasons for their lack of confidence. Furthermore, the insufficient funds to enhance earthquake preparedness further exacerbate the issue. Participants expressed that their immediate focus in the iwi is raising whanau out of poverty and providing opportunities for tamariki to enrol in STEM courses in university. With this strategic goal, participants expressed that preparing for earthquakes and developing response plans is not a priority. Forty per cent of participants who have confidence in the response plan of the iwi are not confident in a plan but in the ability of Ngāti Toa to come together in times of crisis. Participants listed their response to the

pandemic as an example of innate unity. The covid response highlighted the ability of the iwi to come together to respond in times of crisis without prior planning.

The declaration of a national emergency following the pandemic disrupted the entire community of Porirua. Participants indicated that instead of waiting for government response, the iwi immediately mobilized by electing a panel of leaders to begin responding to the disaster. Participants established a secure communication channel with government representatives to obtain relevant updates to distribute to the iwi and help guide their response planning. The leadership panel identified the vulnerable in their community by listing the following:

- Kaumatua who are unable to travel for food,
- Whanau, who could not afford food without financial assistance,
- Prominent families in social housing,
- Whanau in isolated living conditions, and
- Individuals in the high-risk health category for covid

With the vulnerable identified, in-depth planning and actions began to meet their needs. Food was delivered to whanau, people experiencing poverty, and large families. The leadership also contacted whanau members individually to monitor their well-being and assess their needs. With the vaccine's introduction, the iwi noticed a high vaccination rate. The process divulged by the iwi included constructing vaccination clinics within the marae and whanau centre while directly administering vaccines in the homes of kaumatua, who could not travel to the centres. The staff responsible for administering vaccinations were Ngāti Toa members, and information relevant to the safety of vaccines was distributed by whanau. These processes were necessary as there was widespread reluctance to be vaccinated, but using qualified whanau capable of administering vaccines and distributing information through appropriate mediums meant Ngāti Toa exhibited a high vaccination rate. The response to this disaster instils a strong sense of trust in the response capabilities of the iwi.

6.2.6 Increase in Confidence

Participants discussed what would increase their confidence in the Iwi and Porirua Council's response plan. Participants suggested a variety of principles and processes that would increase their confidence in the Iwi and council's response plans to an earthquake. The principles discussed in the wānanga are collated in Table 5.

Table 5: Summary of Processes to Improve Response Plans

Principle/Process	**Responsibility**	**Explanation**
Communicating Plan	Council	Distribute a response plan to the community instead of leaving the responsibility to the individual to find a plan.
Training	Council	Provide relevant training to the community in the skillsets required to respond to an earthquake.
Education	Council	Raising awareness of an earthquake's risk to the Iwi and guiding them to manage risk.
Leadership	Iwi	Elect people within the Iwi to take control of planning and preparation.
Proactive Planning	Iwi & Council	Begin planning pre-disaster instead of waiting for the disaster to respond.
Funding	Iwi & Council	Dedicate resources to improving preparedness for an earthquake
Involvement/Collaboration	Iwi & Council	Increase collaboration of community, iwi, and PCC in preparation for an earthquake

Participants expressed that it is the responsibility of both the iwi and the council to improve the response plan of Porirua. Participants expressed that response plans should not be separate but one plan for the entirety of the community that reflects the needs of all. As kaitiaki of Porirua, Ngāti Toa believes they are responsible for protecting the community's environmental, social, and cultural well-being. At the same time, the local council was constructed to promote communities' social, economic, environmental, and cultural well-being in the present and future. (Local Government Act, 2002). With a shared purpose, participants expressed the need for response planning collaboration. Gaillard and Mercer (2012) indicate that collaboration has the potential to facilitate practical risk assessments, spur dialogues, and drive actionable initiatives to improve the resilience of a community. However, few frameworks and initiatives exist that effectively bridge the gap between bottom-up and top-down collaboration (Mercer et al., 2009). Community resilience is a complex multi-dimensional issue that requires the community's collective effort. Collaboration involves multiple individuals who combine their efforts to achieve mutually desired outcomes (Briggs et al., 2006). With a shared purpose, participants indicated that collaboration with the PCC is vital to increasing their confidence in response plans. Participants expressed that the community response to disasters is a collective effort. Therefore, a singular response plan should be developed in

partnership with the diverse groups living in Porirua. This will ensure that the needs of everyone are designed for and reflected in the response strategies.

6.2.7 Local Vulnerabilities

Participants then shared their specific Mātauranga of the vulnerabilities in Porirua. The participants were requested to document the vulnerabilities specific to their locality and explain the reasons for their beliefs. A summary of these vulnerabilities is collated in Table 6.

Table 6: Summary of the Vulnerabilities in Porirua

Type	**Vulnerability**	**Explanation**
Resources	Economic	There is no known food or water storage to which the Iwi have access. There is also a lack of emergency infrastructure and trained individuals within Porirua to help respond to an earthquake.
Socio-economic Depravation	Economic	The existence of poverty in Porirua makes it challenging to allocate resources towards earthquake preparedness, as the priority is given to uplifting people from poverty. Individuals cannot adequately prepare for disasters independently due to various limitations.
Access	Physical	Porirua has limited access routes and vulnerable roading connections within the city itself. In an earthquake moving within the region and city will be difficult.
Infrastructure	Physical	Many homes and infrastructure are old unreinforced masonry buildings dating back to the 1960s and 1970s when the city was first established. Due to the age of the infrastructure, it is probable that older structures, which were not constructed to the same safety standards as newer ones, would be destroyed in the event of an earthquake.
Low-lying Coastal City	Environmental	Porirua is located on the coastline and will be at risk of tsunamis following an earthquake.
Local Environment	Environmental	The topography and soil type of the region means Porirua will be susceptible to significant landmass changes following the earthquake. There will be a substantial number of landslides

		following the earthquake because of the geography and topography of Porirua.
Awareness	Social & Cultural	Community members are unaware of the risk an earthquake poses to the community and how to prepare for it.
Education	Social & Cultural	There is a lack of understanding and education on preparing for an earthquake.
Relationship with Government	Social & Cultural	There is a lack of unity and collaboration between the Iwi and the government. This means there is a lack of trust in leaders and politicians that are not Ngāti Toa.
Addiction	Social & Cultural	Many of the community is addicted to alcohol, drugs, and gambling. These addictions must be addressed and supported, as the disaster will further damage their well-being.
Capabilities to Respond	Social & Cultural	There is a lack of qualified individuals with the necessary skill set to respond to an earthquake.

Participants identified a range of vulnerabilities through observations of the built environment. These included economic, social, cultural, environmental, and physical. Mazzocchi (2018) claims that indigenous knowledge is primarily based on long-term empirical observations adapted to local conditions. Hikuroa (2018) further emphasises that the foundation of Mātauranga Māori is the accumulation of centuries of detailed observations of built-up evidence, hypotheses and predictions that were made, tested, and critically analysed. Participants identified relevant vulnerabilities in their community that correlate to those suggested by Stuart-Black (2018) and the initial earthquake response plan developed for the Wellington region (see Table 1). This highlights the capacity for Mātauranga Māori to be integrated into community resilience frameworks. Mātauranga Māori is an ongoing process of observations of the natural and built environment changes. This enables the adaptable adjustments of plans to maintain the desired level of resilience for the community.

6.3 Response

This section of the wānanga will evaluate how participants would respond to the earthquake scenario developed in Chapter 4. The structure of the wānanga sought to gauge participants' current understanding of community resilience frameworks and features. This evaluation will highlight how the Mātauranga of participants will help navigate and guide the response plans of Ngāti Toa following an earthquake. The development of an initial disaster response plan focused on the 72-hour, 7-day, 3-week, and 3-month timeline following the earthquake.

6.3.1 The Influence of Maslow's Hierarchy of on Response Plan

With limited education on community resilience frameworks and disaster risk reduction, participants used Maslow's hierarchy of needs as a supporting framework to guide their response plan. Maslow's hierarchy of needs is a motivational theory comprising a five-tier model of human needs, which helps assess people's requirements, needs or values necessary for survival and motivation (Maslow, 1943). The theory states that humans are motivated to fulfil their needs in a hierarchical order. This order begins with the most basic needs before moving on to more advanced needs (Maslow, 1943). The needs discussed by participants included physiological needs, safety, love and belonging, esteem, and self-actualization (see Figure 7).

6.3.2 The 72-hour Response

The first phase of the response plan focused on the immediate response of the iwi within the first seventy-two hours following the earthquake. Participants agreed that their priority would turn to their families to ensure their safety. Due to the anticipated occurrence of the earthquake at 5 pm, several participants expressed that they would be separated from their families. There was a diverse range of responses where individuals would journey to the expected locations of whanau, while others would opt to remain at home and hope their family would get back. Participants discussed organising emergency vehicles amongst whanau that would service the community to reunite families separated throughout the region. This would not be a formal process but an immediate response initiated with neighbours and whanau within the immediate vicinity. This would be an ongoing process throughout the response phase.

Participants indicated that once they were united with their families, they would provide for the community's physiological needs, including food, water, and shelter. Most participants desired to designate trusted leaders to guide the response planning. Participants felt inadequately prepared to respond to an earthquake and preferred to fulfil supporting roles under trusted, capable leadership. A panel of leaders in the iwi would be elected to achieve this. This panel will immediately begin planning and coordinating the response of whanau. The first step to achieving this is to aid whanau in securing their homes, gathering belongings, and inventorying their resources (supplies, equipment, and skillsets). With the scope of available resources understood, participants indicated that planning would begin to ensure that available resources are appropriately distributed and managed to sustain the community according to their needs until additional help arrives. Participants believed the optimum strategy to improve the response coordination was to seek shelter and congregate together at the marae, where the collective effort of whanau would improve their response capabilities. Participants expressed that congregating is also essential for sharing resources. In a disaster, the marae will provide shelter and a hub to pool resources together for relief. Congregating to the marae enables the iwi to address the health of vulnerable whanau. Participants assumed the whanau who specialises in the health sector would also congregate at the marae and designate the hall

on the marae as a health centre where the critically injured and vulnerable will be attended to until emergency services arrive.

6.3.3 The 7-day Response

After the basic physical needs of the community were met again, the participants voiced their desire to ensure safety within the community. Information on timelines and government response information was identified as a crucial requirement. During this period, participants would investigate establishing secure communication channels for the community to contact whanau outside the region and obtain updates from the civil defence. With a secure communication line conveying relevant information, the leadership panel can more effectively plan appropriate responses to meet the community's immediate needs, account for environmental changes, and adapt processes aligned with civil defence suggestions.

Participants expressed that the community's safety needs would extend to securing the surrounding built environment. The disruptions caused by an earthquake are expected to induce additional hazards and risks in the community. Under the direction of the leadership panel assessments, securing the marae's immediate surrounding area would begin. This would include the following:

- Removal of hazardous materials or waste
- Cleaning of debris like fallen trees and slips
- Cordon off unsafe areas, including fallen powerlines, exposed wastewater pipes, and destroyed roads
- Establish safe travel routes to the surrounding community
- Establishing communication channels within the community and with organizations outside the city

Participants also expressed a strong desire for the response plan to include the entirety of the community instead of just the iwi. Further aligning with Maslow’s hierarchy of needs, with establishing safety, participants would seek to establish a sense of love and belonging within the community by inviting them to shelter or their marae. Re-establishing safety in the community will foster greater collaboration that shortens the expected recovery time through increased collective participation in responding. The joint effort of the community is believed to be the key to re-establishing safety and enhancing the response capabilities by sharing resources (equipment, supplies, and personnel).

6.3.4 The 3-week Response

At this stage of the response, participants assumed emergency services had intervened. With the established physiological, safety, and sense of love & belonging, participants expressed the need to exercise Maslow’s

next community need of esteem. In this context, demonstrating esteem would involve assigning leadership responsibilities to competent civil defence personnel. At this point, participants believed their inadequacies concerning their technical capabilities and understanding of effective disaster response planning means guidance from qualified individuals is required. With the re-establishment of critical lifelines in the region, meeting the communities' physiological needs will begin to pivot back to individual responsibility. Participants expressed the desire to re-establish essential community components, including school and working opportunities for unemployed individuals. Participants believe this period will be the most difficult for the community. The 3-week mark is when participants believe the magnitude of the disaster will fully be realized. Social-support systems will need to be established to aid in alleviating the mental disruption of the community. Participants expressed the importance of establishing normality through schooling and work opportunities to improve the community's well-being. These opportunities will fuel the community with a sense of purpose and alleviate their suffering through active participation in the recovery. This would also aid in the reestablishment of financial services. Participants expressed the importance of re-establishing access to financial services as it will be crucial to recovering. With the transition to recovery strategies, participants emphasized the need for increased participation in a meaningful and open manner. During this period, participants would look to begin the insurance process and support the community, especially kaumatua, in this process.

6.3.5 The 3-month Response

Further, using Maslow's hierarchy of needs, participants expressed that the 3-month response plan focuses on the communities need for self-actualization. Participants expressed that the long-term response plan becomes an individualized process. During this time, the restoration of large-scale infrastructure is expected to begin with ongoing remedial and strengthening works, but this responsibility resides on the government and civil defence planners. Participants indicated their focus would be supporting whanau to adapt to a new environment, monitor their specific long-term response needs, and plan on achieving them. Wānanga was indicated as the vital process of congregating whanau together to help achieve these needs. The wānanga would foster unity by organizing activities for tamariki, sharing kai, singing waiata, and planning unique long-term recovery strategies to meet the needs of individual whanau. The 3-month response plan is focused on restoring functionality in the community and aiding whanau to adapt to the changes in the environment.

6.3.6 Summary

It was essential to raise awareness of how the vulnerabilities of Porirua affect Ngāti Toa personally. Without this awareness, Ngati Toa would not feel the need to prepare for an earthquake. General frameworks like the WENIRP are insufficient as they assume that Ngāti Toa only values their need for critical lifeline services. However, participants indicated that they valued reuniting with their whanau over the need for

food and water. By raising awareness of how the vulnerabilities of Porirua affected them personally, participants derived response strategies to the best of their ability that addressed their greatest needs and concerns.

It is important to note that no detailed response plan could be derived from these Wānanga as participants indicated that this would require the coordination and participation of all iwi members who hold the relevant Mātauranga needed to respond to the earthquake effectively. Despite these requirements, a summary of the response plan is depicted in Figure 5.

The response plan developed focuses on the collective responsibility of the community to each other rather than the individual. Response plans that foster unity and support processes that build up the collective community are the priority response for Ngāti Toa.

Figure 5: Ngāti Toa Response Plan

6.4 Mitigation

With the conclusion of the response planning, the wānanga shifted to developing proactive planning to mitigate the effects of disasters. This section of the wānanga evaluated the principles suggested by Bruneau (2003), who claims that four components are required to assess and enhance the seismic resilience of

communities quantitatively. These components include robustness, redundancy, rapidity, and resourcefulness. May (2021) also suggests that adaptability is required to increase resilience and reduce community vulnerability. Participants were asked why these features are essential and how they could be implemented to minimize the loss of human life and infrastructure damage. Following this evaluation, participants were asked to redefine the resilience feature into a correlating Te Ao Māori principle.

6.4.1 Robustness

Robustness is the ability to withstand stress without suffering degradation (Bruneau, 2003). Participants were required to explore why they think robustness is essential to developing community resilience, how it can be developed to mitigate the effects of disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.4.1.1 Importance of Robustness

Robustness was the preconceived definition of community resilience for participants. A robust community will reduce infrastructure damage, and individuals can focus on responding to the disaster. Confidence in the robustness of infrastructure is crucial because it will help the community to cope in a stressful environment. This is especially important for critical lifelines as the operation of this infrastructure lessens disruptions and reduces the stress in the community. Robust infrastructure focuses on the structural and non-structural processes that reduce the loss of life. Of the components suggested by Bruneau (2003), this principle focuses on minimizing the casualties following a disaster.

6.4.1.2 Implementing Robustness

When asked how robustness could be implemented to mitigate the effects of a natural disaster, participants indicated that using relevant building standards is the focus. Porirua is an underdeveloped community with much of the housing infrastructure being unreinforced masonry buildings. Participants expressed that existing infrastructure should be investigated to determine seismic resilience, while future infrastructure should be designed to withstand a significant earthquake. This evaluation process should be continuous and ongoing. If there are changes in the building standards or environment (built or natural), immediate infrastructure evaluation should occur to maintain seismic resilience.

6.4.1.3 Redefining Robustness

Participants were asked to redefine Robustness using a Te Ao Māori principle. Table 7 provides a summary of the principles discussed by participants.

Table 7: Redefining Robustness Summary

Principle	**Frequency**	**Explanation**

Mana	75%	Mana is a supernatural force and power in a person, place, or object. Participants believe achieving mana in infrastructure occurs throughout the entirety of the design holistically by sustainable sourcing of local materials, using relevant technical & cultural knowledge, and adhering to appropriate spiritual customs.
Mātauranga	10%	Mātauranga translates directly to Māori knowledge, wisdom, understanding, and skill. Participants expressed that using all sources of knowledge is required to ensure that robustness is achieved in infrastructure and people.
Wairuatanga	5%	Wairuatanga translates to encouragement and promotion of the spiritual identity with the land, sea and air, supporting a unified and holistic approach. Participants believe incorporating spiritual elements into infrastructure through sustainable practices requires effective environmental management of resources.
Rangatiratanga	5%	Rangatiratanga is defined as the right of Māori people to rule themselves and self-determination. It also translates to the highest chieftainship. Rangatiratanga is a principle used to denote a leader in any capacity. Participants believed competent leaders must lead this initiative to ensure robust infrastructure and people.
Mana-Orite	5%	Mana-Orite is a principal that seeks for Mātauranga Māori to have equal status and priority in design compared to Western knowledge. Participants expressed that Mātauranga Māori should contribute equally to developing robust infrastructure.

Seventy-five per cent of participants redefined robustness using the Te Ao Māori principal mana, described as the holistic principle of robustness. Mana seeks to uphold the integrity of infrastructure by integrating traditional practices of sustainability and spirituality into the planning, construction, and close-out phases of infrastructure development. Incorporating sustainable and spiritual processes optimizes the infrastructure beyond a physical capacity. Mana uses traditional construction methods, sustainable material selection, and appropriate tikanga to strengthen infrastructure holistically.

6.4.2 Redundancy

Redundancy is defined as the extent to which elements are substitutable in the event of disruption of degradation (Bruneau, 2003). Participants were required to explore why they think redundancy is essential

to developing community resilience, how it can be developed to mitigate the effects of disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.4.2.1 Importance of Redundancy

If infrastructure is inadequately robust, the redundancy strategies become the critical lifelines that support the community in a disaster (water, power, communications, etc.). With redundancy strategies, the time required to respond to disasters decreases. Redundancy strategies are the community's last resort to mitigate the further loss of life and reduce suffering. Participants believe the unpredictability of disasters means the strength of infrastructure will always be susceptible. Redundancy then becomes the fail-safe plan that enables the community to maintain a low level of functionality following a disaster. The community can quickly adjust and adapt to their needs with redundancy strategies.

6.4.2.2 Implementing Redundancy

Porirua has a diverse demographic with varying levels of resilience from household to household, which means individuals' specific needs and capability to prepare for an earthquake are unique. Porirua also has a linear infrastructure system, which means the loss of critical infrastructure induces a domino effect on the surrounding environment. Therefore, the responsibility of preparing resides in the community. This includes shared water storage, food supplies, emergency equipment, and developing relevant disaster response skills. Participants suggested that smaller community hubs should be developed to support this endeavour. The community will be organized into smaller sub-sections and have a local community hub assigned to them. Here, responsibilities can be dispersed across these sub-sections to foster self-sustainability, share resources, and mitigate the potential loss of critical lifelines following an earthquake. As individuals develop their redundancy component and coordinate with surrounding households, their collective resilience will increase.

6.4.2.3 Redefining Redundancy

Participants were asked to redefine redundancy using a Te Ao Māori principle. Table 8 provides a summary of the principles discussed by participants.

Table 8: Redefining Redundancy Summary

Principle	**Frequency**	**Explanation**
Mana Motuhake	60%	Mana Motuhake translates to autonomy, self-government, self-determination, and independence - mana through self-determination and control over one's destiny.

Whakapapa	15%	Whakapapa, or genealogy, is a taxonomic framework that links all animate and inanimate, known and unknown phenomena in the terrestrial and spiritual worlds, binding all things. It maps relationships so that mythology, legend, history, knowledge, tikanga (custom), philosophies and spiritualities are organized, preserved and transmitted from one generation to the next. Participants expressed that relying on these connections is the redundancy plan, the connection to the environment for protection and resources (food & water) and the connection to whanau who are resilient to disasters.
Ki tai wiwi, Ki tai wawa	15%	Ki tai wiwi, ki wai wawa translates to flexibility. Participants believe that individuals should not depend on backup infrastructure for their survival but rather be adaptable as the disaster unfolds, specifically, have processes and plans that promote the self-sustainability to survive a disaster without support from backup infrastructure.
Mahia te whare	10%	Mahia te whare translates to fostering capabilities. Participants believe that redundancy plans should be the individual's responsibility and that raising one's capabilities to respond to a disaster without intervention from government or organizational aid leaves one vulnerable to disasters. In contrast, self-sustainability and capable individuals in resilient living to increase resilience.

Sixty per cent of participants redefined redundancy as Mana Motuhake. It was redefined as Mana Motuhake, which translates to self-determination, with the principle being autonomy and control. Participants expressed that there is socio-economic deprivation in Porirua. This means the resources available to the iwi are not delegated to earthquake preparation but to improve their quality of life. However, individuals within the iwi have the resources and capacity to respond to earthquakes effectively. The nature of whakapapa and whanau means those vulnerable individuals in the iwi will congregate with those who are resilient. Participants expressed that deriving whanau-centred redundancy plans is the preferred method to implement redundancy. This includes formally organising whanau into groups that would coordinate redundancy plans on a smaller scale. This enables the redundancy plans to become individualized to the specific needs of whanau and account for their capability level to respond to a significant earthquake. The term self-sufficiency and self-reliance describes the application of mana motuhake in a community

resilience framework. This includes stockpiling supplies, developing a whanau emergency plan when critical lifelines fail, and managing an emergency without immediate external assistance following an incident. Self-sufficiency through mana motuhake is a collective responsibility that requires sacrifices to both personally prepare and support the preparation efforts of surrounding whanau.

6.4.3 Rapidity

Rapidity is the capacity to promptly achieve goals to contain and avoid disruptions (Bruneau, 2003). Participants were required to explore why they think rapidity is essential to developing community resilience, how it can be developed to mitigate the effects of disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.4.3.1 Importance of Rapidity

Rapidity reflects the planning phase of the community. It is believed to be important as it fosters unity and supports the mental well-being of the community. The community faces significant challenges regarding responding to disruptive events quickly and effectively. Following the disaster, recovery times are unknown, and changes in the environment (built and natural) continue to foster uncertainty in the community. Rapidity mitigates the unpredictability caused by disasters and helps individuals to cope by setting key recovery milestones for people to work towards achieving.

6.4.3.2 Implementing Rapidity

Implementing rapidity into community resilience frameworks is complex. Individuals described adaptable planning as a critical process to achieving rapidity. An efficient plan can only be developed when the scope of the problem is understood, meaning efficient recovery and response planning can only begin the post-disaster event. Observing the changes in the built and natural environment must be an ongoing process following a disaster. In constructing this plan, responsibilities should be delegated throughout the community. This requires appropriate communication mediums to be developed to transfer relevant information. Participants indicated that this medium includes trusted leaders and secure communication channels. Leaders should use these communication lines to convey key messages and mobilize swift responses.

6.4.3.3 Redefining Rapidity

Participants were asked to redefine rapidity using a Te Ao Māori principle. Table 9 provides a summary of the principles discussed by participants.

Table 9: Redefining Rapidity Summary

Principle	**Frequency**	**Explanation**

Kotahitanga	65%	Kotahitanga translates to unity. Participants believe that working together collectively increases the pool of resources available to the community. The use of unity promotes social cohesion, cultural strength, and collective action, enabling Ngāti Toa to respond effectively to challenges, maintain their identity, and sustain their well-being.
Na te kakano	10%	Na te kakano translates to from the seed. Participants believe that to achieve goals promptly; the community must be involved at the earliest stages to understand the entire scope of the problem and, thus, the solution.
Ki tai wiwi, Ki tai wawa	5%	Ki tai wiwi, ki wai wawa translates to flexibility. Participants expressed the need to be flexible during the initial phases following the disaster, as no response plan can predict the effects of a natural disaster. Therefore, planning as the disaster unravels is critical to achieving goals promptly.
Rangatiratanga	5%	Rangatiratanga is defined as the highest chieftainship. Participants believe competent leaders are required to lead the community to achieve the required goals to restore normality.
Kanohi ki te Kanohi	5%	Kanohi ki te Kanohi translates to face-to-face – engaging in person. Participants believe that leaders and first respondents must meet face to face with the community to get greater involvement from them, thus achieving goals timely.
Whanaungatanga	5%	Whanaungatanga translates to relationship, kinship, and sense of family connection - a relationship developed through shared experiences and working together, which provides people with a sense of belonging.
Ko te tumanako	5%	Ko te tumanako translates to transparent. Participants believe that immediately following the disaster planning must be transparent with the community to increase involvement and give individuals clear goals to work towards, giving them hope and a distraction from their losses.

Sixty-five per cent of participants redefined rapidity with the Te Ao Maori principle kotahitanga. Rapidity was seen as necessary to help the mental health issues individuals will suffer immediately following a disaster, hence why kotahitanga was used as a redefining principle. Coming together with a singular goal and achievable milestones to restore normality is a practical action that can be taken to bring people together. Kotahitanga describes the need for response plans to foster unity. This requires inclusive planning

that creates a shared purpose and distributes specific responsibilities appropriately throughout the community.

6.4.4 Resourcefulness

Resourcefulness identifies problems and mobilises resources when conditions threaten the system (Bruneau, 2003). Participants were required to explore why they think resourcefulness is essential to developing community resilience, how it can be developed to mitigate the effects of disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.4.4.1 Importance of Resourcefulness

Participants were asked to explain why resourcefulness is vital to developing community resilience. Participants believe resources to be a combination of physical supplies, appropriate equipment, and personnel with practical skillsets to respond to disasters. Resourcefulness is a safety net for individuals if the critical lifelines of the community are inadequately robust or the redundancy strategies fail. Resources are crucial to support the community until emergency services and organizations intervene.

6.4.4.2 Implementing Resourcefulness

Participants expressed that identifying specific needs is the priority, and conducting an inventory of available resources is required to achieve this. When the scope of available resources in a disaster is mapped, planning can begin to identify the specific needs of individuals and the community following a disaster. With this information, leaders in the community can distribute resources according to the community's needs while coordinating appropriate strategies to mitigate the potential lack of resources. This requires constant monitoring of changes in the natural and built environment. This will provide response planners with the information to re-evaluate the resource requirements of the community and appropriately adapt to these needs. Constant evaluation of resource requirements and distribution of these according to the individual needs within the community is the implementation of resourcefulness by Ngāti Toa.

6.4.4.3 Redefining Resourcefulness

Participants were asked to redefine resourcefulness using a Te Ao Māori principle. Table 10 provides a summary of the principles discussed by participants.

Table 10: Redefining Resourcefulness Summary

Principle	**Frequency**	**Explanation**
Kotahitanga	25%	Kotahitanga translates to unity. Participants believe working together collectively increases the pool of resources available to the

		community, which promotes social cohesion, cultural strength, and collective action, enabling Ngāti Toa to respond effectively to challenges, maintain their identity, and sustain their well-being.
Kia takatu tatou	25%	Kia takatu tatou translates to supporting long-term social and economic development. Participants believe the economic struggles of iwi mean the priority response is not to prepare for earthquakes but the lack of financial resources.
Mahi tahi	15%	Mahi tahi translates to working together as one. Because of the economic depravity of many in the iwi, participants believe a collective effort must be established to gather the necessary physical, intellectual, and social resources to respond to disasters.
Mahia te whare	10%	Mahia te whare translates to fostering capabilities. Participants believe improving education about the risks of earthquakes and the appropriate preparation methods to mitigate the risks will naturally enable people to be resourceful in the regimes that best suit the individual.
Whanaungatanga	10%	Whanaungatanga translates to relationship, kinship, and sense of family connection - a relationship through shared experiences and working together, providing people a sense of belonging. Participants believe in the Te Ao Māori worldview and an equitable community. In times of crisis, whanau connections will support participants if they have insufficiently prepared or lack resources.
Whakatika te he	10%	Whakatika te translates to accountability. Participants believe that the responsibility for having the necessary resources to respond to a disaster resides with the individual. Appropriate processes to aid individual preparation should be prioritized instead of external resources.
Kaitiakitanga	5%	Kaitiakitanga means guardianship, protection, preservation or sheltering. It is a way of managing the environment based on the traditional Māori worldview.

Various principles were used to describe resourcefulness from a Te Ao Māori worldview. The idea of Kaitiakitanga was mentioned by one participant but provided a deep insight into how resilience could be practised amongst Māori. Kaitiakitanga describes the concept of guardianship for the sky, the sea, and the

land (Mead, 2016). This is practised through the sustainable management of the natural environment and its resources. As discussed with Kaumatua from Ngāti Toa, Iwi members did not feel the effects of the great depression as harshly as others worldwide. One reason is the access to natural resources or Kaimoana (food gathered from the sea) by the Iwi, the food source for many during those times. By living in Kaitiakitanga, sustainable management of the local flora and fauna was observed, and the people of Ngāti Toa had an endless storage supply of resources that consistently sustained them through even the most difficult circumstances. Participants indicated that restoring these natural food and water sources would be a priority strategy to implement resourcefulness.

6.4.5 Adaptability

Adaptability is the ability to adjust, change, or modify efforts or expectations to meet the changing needs of society and the changes due to the shock event (May 2021). Participants were required to explore why they think adaptability is essential to developing community resilience, how it can be developed to mitigate the effects of disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.4.5.1 Importance of Adaptability

When asked to explain the importance of adaptability, participants expressed that disasters are unpredictable. The specific effects and time of the disaster are unknown. A disaster could occur whilst mitigation and preparation strategies are incomplete or before planning begins. Adaptability is a crucial component of community resilience as vulnerabilities and risks unidentified during planning will emerge. Response plans must consider these variables and cannot rely entirely on prior preparations. A community must be prepared to rapidly plan and mobilise these strategies as the disaster unfolds to new unknowns.

6.4.5.2 Implementing Adaptability

Participants indicated that communities could not rely on response plans as disasters are unpredictable and filled with unknowns. An adaptable method to mitigate this is constantly evaluating natural and built environment changes. Response plans should consistently be evaluated and updated to reflect these changes. However, participants believe adaptability is inherited through experience. Adaptability requires attentive observation, and adapting to subtle changes in the environment is challenging as adaptability is an iterative process with no definitive method or measurable indicator. An adaptable leader with relevant experience in community response plans should be elected to mitigate the lack of adaptable processes. A competent leader can confidently navigate the complexities of response planning and adapt to environmental changes. Their experience will prepare the community for not having a plan.

6.4.5.3 Redefining Adaptability

Participants were asked to redefine adaptability using a Te Ao Māori principle. Table 11 provides a summary of the principles discussed by participants.

Table 11: Redefining Adaptability Summary

Principle	Frequency	Explanation
Ki wai wiwi, ki wai wawa	45%	Ki was wiwi ki wai wawa translates to flexibility. The participants considered flexibility vital as it allows them to adjust to changing circumstances, develop new skills, and adapt their strategies to overcome challenges.
Te ararau o Tangaroa	25%	Te ararau o Tangaroa translates to the many pathways of Tangaroa and describes the variety of methods an individual can use to travel the sea. The participants emphasized that the described framework directly reflects the importance of adaptability, as it entails the need to adjust to changing circumstances, embrace new ideas, and draw on cultural values to overcome challenges.
He ringa miti tai heke	20%	He ringa miti tai heke translates to adjustable. The participants viewed being adjustable as crucial, as it helps them remain open-minded, flexible, and responsive to changes, enabling them to navigate challenges effectively.
Kakama	10%	Kakama translates to quick to adjust or fast. Participants expressed this as their ability to adapt to unexpected changes and respond to emergencies rapidly.

Forty-five per cent of participants redefined adaptability using the Te Ao Maori principle ki wai wiwi, ki wai wawa. All the principles provided by participants translate directly to adaptability or a synonym of it. Adaptability systems, processes, and plans must support individuals to function in the face of unknowns as a disaster unfolds. Participants believe the consequences and damage caused by a natural disaster are unpredictable. Participants believe their history and the experience of their tupuna have seen adaptable practices weaved into their culture. The expression and practice of Maori culture enabled its survival by adapting to the changes in the surrounding natural and built environment. Jones (2016) noted that tikanga especially is adaptable. Tikanga varies between iwi, hapū and whanau. Compared to the rigidity of Western law, the tikanga of iwi, hapū and whanau is adapted to suit the needs and experiences of the affected entity. Rapid identification of environmental changes should be followed by evaluations of the current scope of

works completed to improve resilience. If the existing processes are sufficient, then no modifications are needed. However, if there are substantial environmental changes, the plan can be adjusted accordingly to account for these changes.

6.4.6 Ranking of Community Resilience Features

Participants were also asked to rank each resilience feature in the order they thought was most important for developing community resilience. The distribution of votes is depicted in the image below.

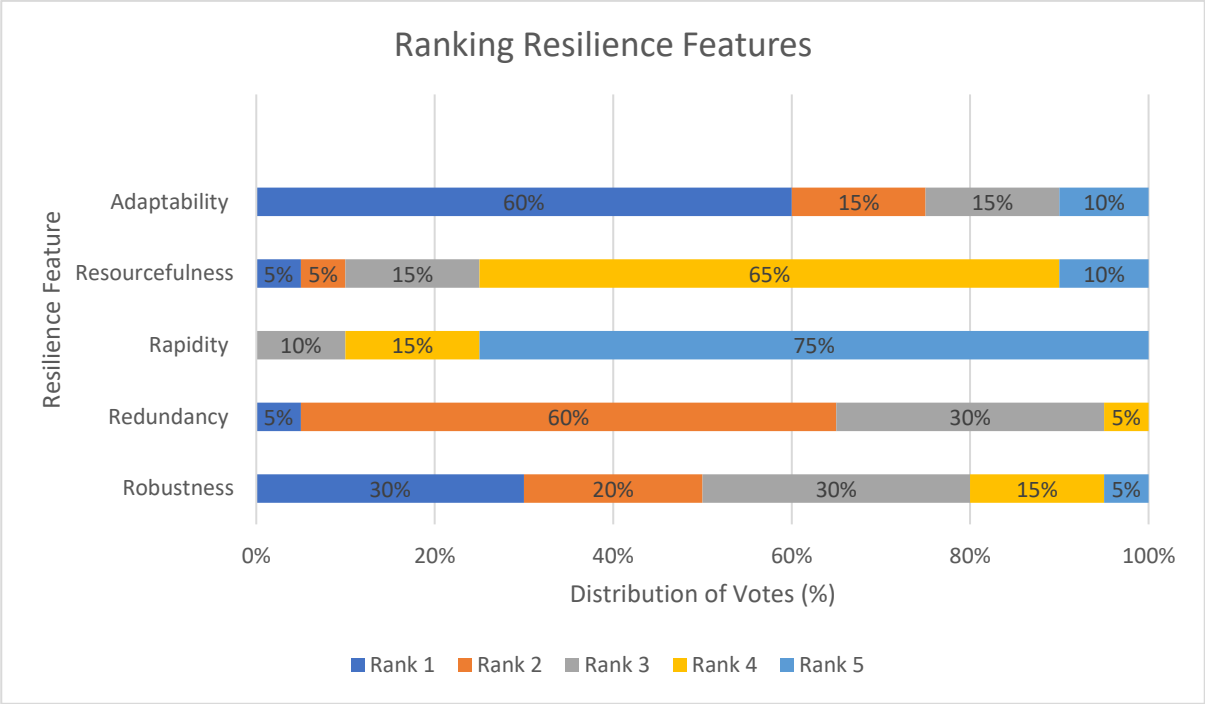

Figure 6: Ranking of Key Resilience Features

Adaptability was ranked as an essential feature of developing community resilience. This feature naturally aligns with the Te Ao Maori worldview. Participants believe disasters are unpredictable and that no amount of planning can prepare an individual for the unknowns induced by a disaster. Participants ranked redundancy as the second most important feature of developing community resilience. This was followed by robustness, resourcefulness, and rapidity. A whakataukī was used to describe why adaptability is valued above these other features described by Bruneau. The whakataukī reads “Te ararau o Tangaroa.” This translates to the many pathways of Tangaroa. The whakataukī describes the various methods an individual can use to travel the sea. However, the influence of the elements, weather patterns, and sea processes highlights the critical theme of whakataukī: adaptability because the sea is unpredictable. Participants recognised that earthquakes are also unpredictable and that building resilience requires planning to be flexible as there will be a high level of uncertainty. Robust buildings may collapse, redundancy systems

may fail, and the potential of underestimating available resources will affect the recovery timeline. Adaptability was ranked as the most crucial feature to building resilience amongst participants because it accounts for human error and potential oversight within the planning of response plans.

6.5 Preparation

Norris et al. (2007) suggest that communities must have networked resources to participate in community resilience frameworks, including participation strategies. This includes four principles: economic development, social capital, information & communication, and community competence. Participants were asked to discuss why these principles were necessary, how they would implement them in their community, and redefine the network resource into a Te Ao Māori principle to indicate how mātauranga Māori specifically can be integrated into response plans.

6.5.1 Economic Development

Economic development creates equity and stable livelihoods for the community through wealth generation (Norris et al., 2008). Participants were required to explore why they think economic development is vital to enhancing community resilience, how it can be developed to prepare for disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.5.1.1 Importance of Economic Development

A community's economic development enhances resilience by improving the quality of life for the community. Large portions of Porirua suffer from socio-economic depravity, which means disaster preparedness is not a priority as it is an unaffordable expense. Mitigation and preparation strategies are ongoing investments to lessen disasters' impact on people and property. These strategies produce a minimal return on investment in improving the community's well-being outside of disasters. Therefore, developing resilient communities and individual households requires economic development.

The participants cited Maslow's hierarchy of needs as a fundamental framework for explaining the significance of economic development. Maslow's hierarchy of needs is a motivational theory that presents a five-level model of human needs (see Figure 7), which can be used to evaluate individuals' fundamental requirements, necessities, and values essential for survival and motivation (Maslow, 1943). According to the theory, individuals are driven to fulfil their needs in a hierarchical sequence, starting with the most basic needs and progressing to more advanced ones (Maslow, 1943). The pyramid suggests that people must satisfy lower-level needs before progressing to higher ones. Community resilience is considered an advanced need, whereas economic development is viewed as a physiological need to be met before

enhancing resilience. Therefore, implementing economic development should concentrate on helping the community adequately fulfil its physiological needs.

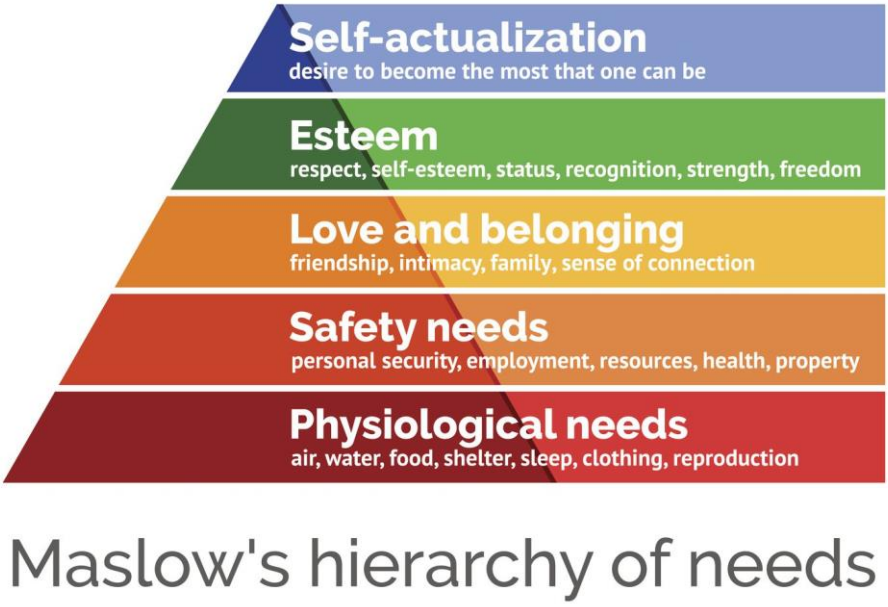

Figure 7: Maslow's Hierarchy of Needs (Hooper, 2020)

6.5.1.2 Implementing Economic Development

The term equity was used as the process required to improve the collective resilience of the community effectively. Equity specifically references the opportunity for the community to work and study. Specific processes include developing local businesses and employment opportunities so individuals can work within Porirua. Ngāti Toa is currently mitigating socio-economic depravity through partnering with STEM organizations. These partnerships offer scholarships to tamariki to study within the STEM field while the partnering organizations utilize these individuals within their businesses for internships, industry experience, graduate programs, and eventual employment opportunities. This upskills the future generations of Ngāti Toa and provides the opportunity for improved income through higher-qualified professions. Ngati Toa is implementing economic development by bypassing the need to resolve poverty by developing equity through equal employment and education opportunities.

6.5.1.3 Redefining Economic Development

Participants were asked to redefine economic development using a Te Ao Māori principle. Table 12 provides a summary of the principles discussed by participants.

Table 12: Redefining Economic Development Summary

Principle	Frequency	Explanation
Kia Takatu Tatou	55%	Kia Takatu Tatou translates to the support of Māori aspirations and long-term economic development. Participants conveyed that this principle is essential as it can provide sustainable solutions to meet the basic needs of the iwi and enhance their capacity to withstand economic, social, and environmental shocks.
Ohangatanga	30%	Ohangatanga means recognising both parties' goals to improve their economic position significantly. The participants conveyed that their present lack of resources hinders their ability to respond to disasters, leading them to depend on partnerships; however, they acknowledged that potential partners would be hesitant to collaborate if there is no discernible benefit to their participation.
Whakaurunga	10%	Whakaurunga means supporting Māori to participate in all matters that increase well-being actively. Participants stressed that holistic wealth development involves considering an individual's financial status and well-being, which is vital in enhancing the iwi's mental, physical, and social health and building resilience against adversity and stress.
Whakatika te he	5%	Whakatika te translates to accountability. Participants believe that only the individual can improve their economic position.

Fifty-five per cent of participants redefined economic development using the Te Ao Māori principle kia takatu tatou. These principles describe the aspiration for long-term wealth development and active participation in all matters that increase well-being. Wealth is viewed holistically to encompass principles that extend beyond monetary means. This is modelled in the Ngāti Toa Mauri Ora model. This model describes the Te Ao Māori method to improve individuals' life essence or well-being. This model suggests that improving the well-being of individuals requires the equal development of cultural identity, heritage, social connections, education, health, whanau connections, shelter, and employment.

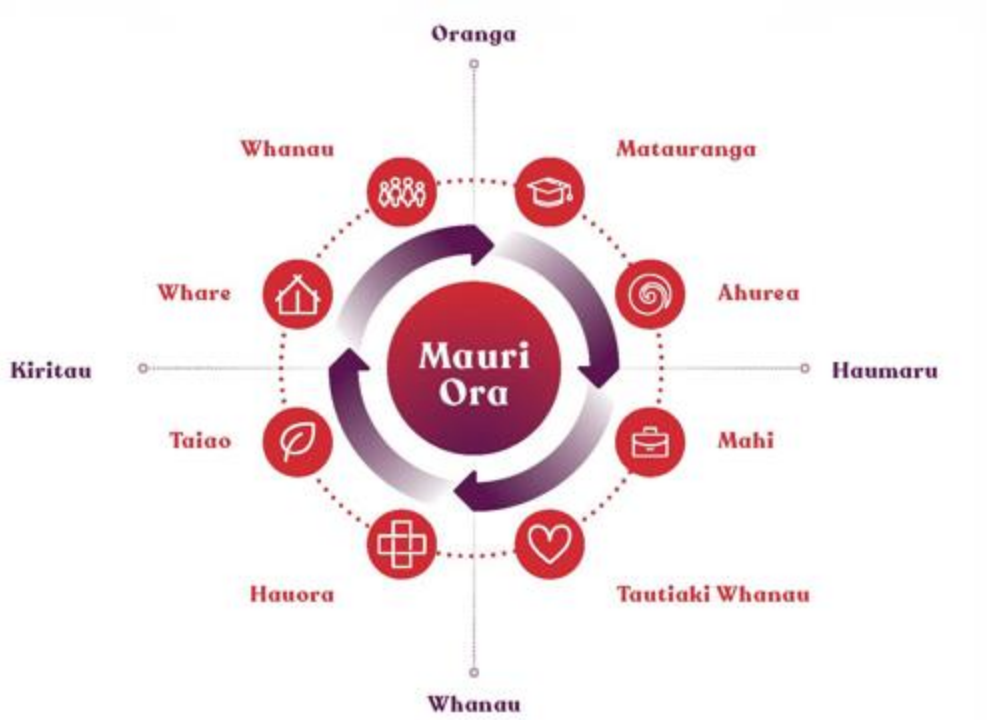

Figure 8: Mauri Ora Model (Elkington, 2022)

The Mauri Ora model is Maslow's Hierarchy of Needs expressed from a Te Ao Māori perspective. The Te Ao Māori solution is the balanced improvement of the individual's well-being and quality of life, which can be achieved without economic means. Poverty and a poor quality of life are significant barriers preventing resilient development. If people's quality of life is, improved disaster preparedness and community resilience will be developed.

6.5.2 Social Capital

Social capital is defined as individuals being connected and supporting each other (Norris et al., 2008). Participants were required to explore why social capital is vital to enhancing community resilience, how it can be developed to prepare for disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.5.2.1 Importance of Social Capital

Social capital is significant because it enables the unification of diverse groups. By unifying diverse groups, shared goals and purposes can be achieved despite differences in values, priorities, or needs. Within the iwi, participants expressed that the values and priorities of whanau vary. Conflict resides between families, but grievances are set aside to respond to emergencies as a high level of trust is observed between whanau. This phenomenon enables the development of adaptable responses to mobilize immediately to disasters.

6.5.2.2 Implementing Social Capital

Participants expressed that developing and strengthening relationships is required to implement social capital. This requires constructing robust community spaces that can also be mobilized as disaster shelters. Constructing disaster shelters is an important feature to provide the physiological needs of a community following a disaster. However, these spaces are not how social capital is developed but the experiences shared with the community in these spaces. Participants indicated that developing social capital requires constructing disaster shelters as community spaces. Recreational activities must be held in these spaces to develop and enhance the community's social capital. This develops relationships within the community and strengthens them. This creates an environment and space where the community will likely congregate following a disaster.

6.5.2.3 Redefining Social Capital

Participants were asked to redefine social capital using a Te Ao Māori principle. Table 13 provides a summary of the principles discussed by participants.

Table 13: Redefining Social Capital Summary

Principle	**Frequency**	**Explanation**
Kotahitanga	55%	Kotahitanga translates to unity. Kotahitanga describes the processes of developing relationships to create a sense of belonging, which promotes social cohesion, cultural strength, and collective action, enabling Ngāti Toa to respond effectively to challenges, maintain their identity, and sustain their well-being.
Whanaungatanga	45%	Whanaungatanga is the process of enhancing and strengthening relationships through shared experiences, which provides people with a sense of belonging by working towards collective goals.

Fifty per cent of participants redefined social capital using the Te Ao Māori principle kotahitanga, while 40% used whanaungatanga. Kotahitanga directly translates to unity and describes the process used to form relationships. Whanaungatanga is closely related to this principle as it describes maintaining these relationships through shared experiences. The relationship is inherited through whakapapa and whanau connections but enhanced through the shared experiences of individuals on their marae. This creates a profound unity is created. These principles focus on creating an inclusive environment that fosters a sense of belonging. This environment means the focus resides on the collective rather than the individual. Therefore, when disasters occur, these deep connections and trust in their whanau aid in rapidly mobilising their response. Whanau will immediately congregate in their marae in a disaster as it is their community

hub. Marae is where their relationships have been developed and enhanced through the shared experience on the marae.

A kaumatua shared a whakataukī that describes how the social capital within Ngāti Toa is developed. The whakataukī is posed as a question, have we smelt you sweat in the kitchen? Although simple, this whakataukī links back to the critical framework used amongst Ngāti Toa to respond to disasters: the whare kai model. Within all Māori Iwi resides a hierarchy of leadership. There is no democratic system that elects individuals to positions of power or leadership. There is only one way to climb that hierarchy, and it requires all to first sweat in the kitchen to earn a leadership position. Through this unlikely path, the unity of Ngāti Toa is developed. The knowledge learnt and the relations made during these times build the foundation of social capital within the Iwi. Each tangi acts as a small family reunion which strengthens existing relationships and helps develop further connections. The connections developed and strengthened here are why participants congregate at the marae following the earthquake.

6.5.3 Information & Communication

Information & communication is defined as the system's ability to function in the face of unknowns and to distribute relevant information that individuals need (Norris et al., 2008). Participants were required to explore why they think information & communication is vital to enhancing community resilience, how it can be developed to prepare for disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.5.3.1 Importance of Information & Communication

Lack of relevant information and communication is the current barrier preventing Ngāti Toa from developing community resilience in partnership with the Porirua City Council. There is information concerning disaster preparation for Porirua. However, it has not been communicated to the community. Information and communication are vital to developing community resilience because it provides the community with the relevant information to plan their response to an earthquake effectively. This information includes education on individual preparation in disaster risk reduction processes, why individuals should be prepared, and work being done within these spaces for the community. However, it is equally important to communicate this information so the community can coordinate their response efforts. Understanding how to prepare and mitigate the risks or vulnerabilities in the community is crucial to improving resilience. With relevant information communicated to the community, actionable and proactive planning that accounts for their needs can be developed.

6.5.3.2 Importance of Information & Communication

When asked how information & communication could be implemented to prepare the community for a natural disaster, participants claimed two-way communication methods and the development of appropriate communication channels as necessary. Participants expressed that the current communication channels used to distribute response plan information are inadequate and do not reach the community's intended audiences or vulnerable groups. The current method is described as one-way communication, whereas participants express the need for two-way communication. One-way communication is the unidirectional flow of information or the transfer of information in a preassigned direction from a sender to a receiver (Fung, 2006). Two-way communication is the bidirectional flow of information. It is an interactive communication model that describes communication as a process in which participants alternate positions as sender and receiver and generate meaning by sending messages and receiving feedback within physical and psychological contexts (Schramm, 1997).

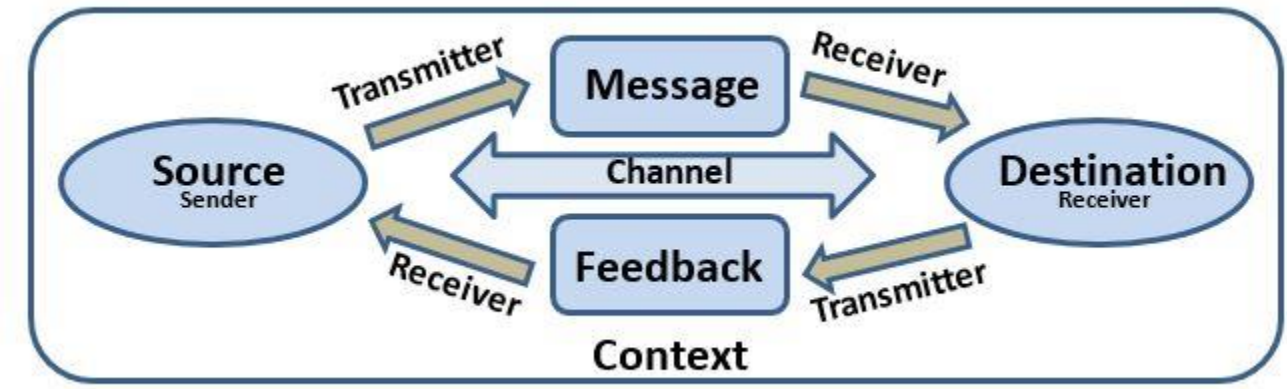

Figure 9: Two-way communication model (Furst, 2014)

When dealing with Māori, participants expressed the need for equal communication exchange. To participate in community resilience frameworks, participants must receive the relevant information to respond while ensuring the information they have shared is integrated into the plans. Participants express the need to be involved as crucial. Without their involvement, their needs will not be addressed. Therefore, the information describes the need for relevant and representative information that reflects the community's needs. Two-way communication is an interactive model that will guide engineers and planners to obtain relevant information for the community appropriately.

Participants also expressed the need for trusted information to be communicated. This requires appropriate channels and mediums to communicate information. The Porirua City Council only share their response

plans on their website. All participants indicated that Ngāti Toa does not use these mediums. Participants suggested that electing capable leaders with the technical capacity to contribute to response plans will mitigate this. Māori require Kanohi ki te Kanohi or rangatiratanga ki te rangatiratanga. These translate to face-to-face and leader-to-leader. The appropriate medium for transferring information related to response plans is direct communication. When leaders in the community communicate this information, the affected groups will likely trust the information. Representation and collaboration are key terms that describe how Māori would implement this networked resource.

6.5.3.3 Redefining Information & Communication

Participants were asked to redefine information & communication using a Te Ao Māori principle. Table 14 provides a summary of the principles discussed by participants.

Table 14: Redefining Information & Communication Summary

Principle	Frequency	Explanation
Na te Kakano	30%	Na te Kakano translates to from the seed. The participants expressed that this principle reflects the Māori life cycle. Participants stress the importance of early involvement as it shapes the outcome. Acknowledging that Ngāti Toa has a distinct worldview, sense of time, and priorities and that new issues or research agendas may take time for the iwi to absorb, form their opinion, and develop their position and response.
Kei mou mou taima	25%	Kei mou mou taima translates to a waste of time and describes the need for open and meaningful engagement. Participants expressed the importance of not wasting people's time. Ngāti Toa is seeking meaningful engagement and outcomes for them from collaboration.
Kanohi ki te kanohi	20%	Kanohi ki te kanohi is a cultural preference for Māori to meet face-to-face. Participants expressed that this setting is vital to building trust.
Ko te tumanako	20%	Ko te tumanako translates to good faith or goodwill and describes the desire for transparent engagement (not hiding anything). Participants emphasized the importance of knowing the involved parties, receiving a good faith invitation, and being informed about potential representatives who can substitute for them if they cannot attend to ensure their views are represented.

Rangatiratanga ki te rangatiratanga	5%	Rangatiratanga translates to chief to chief. It is a critical concept in Māori culture that emphasizes the importance of having leaders and decision-makers with appropriate status and authority at the negotiation table. This principle is a tikanga process that starts with "Chief to Chief" and then moves to more junior staff or membership to build trust and confidence among the community.

Various Te Ao Māori principles were used to redefine information and communication. Communication requires the equal exchange of information early. Participants believe the involvement of Māori is never collaborative and often too late for them to contribute to planning efforts. There is also a failure to recognize Mātauranga Māori and its capability to contribute meaningfully to community resilience frameworks. Māori understand their communities' vulnerabilities well and know their strengths in responding to disasters, what they need in a disaster, and how best to implement that plan. Frameworks derived for vulnerable communities must have active involvement and representatives from those affected groups to ensure their specific needs are met, as designers cannot assume what vulnerable communities need. Shared components will be required in a community to improve its resilience, but each community will have unique needs specific to its natural and built environment. Therefore, the principles described by participants highlight the desired approach of Māori when distributing and communicating critical information concerning disaster risk reduction. The need for early, open, honest, meaningful, and transparent communication is the fundamental principle to ensure that response plans are equitable for Māori.

6.5.4 Community Competence

Community competence is individuals' collective action, decision-making, and capabilities to respond to an unfolding disaster (Norris et al., 2008). Participants were required to explore why they think community competence is vital to enhancing community resilience, how it can be developed to prepare for disasters and redefine the feature into a corresponding Te Ao Māori principle.

6.5.4.1 Importance of Community Competence

Participants expressed that community competence enables the community to respond to disasters and provided individuals with the ability to cope in a stressful environment. Having the relevant skill set enables self-sufficiency. A competent community is seen as crucial as it allows the response to be community led with an immediate mobilization of response strategies following a disaster.

6.5.4.2 Implementing Community Competence

Participants identified three key processes: identifying relevant disaster preparedness skills, formal training of skills and designating leaders to distribute responsibilities. Participants would first designate a leadership panel to identify relevant disaster response skills. Responsibilities would be delegated to various sub-committees comprised of individuals with specific skill sets relevant to disaster response planning. For example, a sub-committee would comprise a group of individuals capable of first aid, while another committee would be qualified fire wardens. The panel of leaders would decide the relevant skillsets to develop and coordinate responses across the various sub-committees. By distributing responsibilities, the range of skills the community will inherit increases more when compared to individual competence.

6.5.4.3 Redefining Community Competence

Participants were asked to redefine community competence using a Te Ao Māori principle. Table 15 provides a summary of the principles discussed by participants.

Table 15: Redefining Community Competence Summary

Principle	**Frequency**	**Explanation**
Mahia te whare	55%	Mahia te whare translates to build the house. This principle highlights the importance of fostering capabilities for developing resilience by empowering Ngāti Toa to build their capacity and capability rather than creating frameworks for them without their involvement.
Whakatika te he	30%	Whakatika te he translates to right the wrongs and describes the importance of accountability when building resilience. This principle highlights the importance of learning from the past and anticipating the future to build resilience. This entails avoiding past mistakes and injustices, assuming accountability for actions, fulfilling promises, and acknowledging and respecting the views of Ngāti Toa.
Mana Motuhake	15%	Mana Motuhake translates to separate identity, autonomy, self-government, self-determination, independence, sovereignty, and authority - mana through self-determination and control over one's destiny.

Fifty-five per cent of participants redefined community competence using the Te Ao Māori principle mahia te whare, which translates to fostering capabilities. 30% of participants also used the term whakatika te he, which translates to accountability. These principles describe community competence as an individual's responsibility. However, developing competence or capabilities is to support the iwi. This competence is

developed through the mātauranga, tikanga, and kaupapa of the iwi, as formal training in disaster preparation requires access to financial resources and time that whanau do not have due to socio-economic depravity. Participants explained this process using the whare kai model. The whare kai model is a phenomenon unique to Māori that describes the process of Whanau and Iwi coming together with the shared purpose of supporting each other. This model is often used at a tangi and describes how responsibilities are naturally delegated amongst the whanau to ultimately complete all the required tasks of the tangi to support the grieving whanau. Often a koha (offering) is given to aid the grieving whanau, which can include anything from money, and food, to time. It is a tikanga process that highlights the principle of reciprocity reflects. Koha precisely reflects the mana (power) of the individual providing the offering by reflecting what the giver can give. This highlights the importance of merely contributing and offering what you can in response to hardships. This principle enables robust relationships with high levels of trust to form.

During a tangi, there is no formal delegation of tasks. Whanau will congregate at the marae and aid those members of the Iwi who hold the associated Mātauranga of different customs. The specific responsibilities at a tangi have been handed down through the generations and taught among whanau members. Those with no specific Mātauranga arrive and support families with various knowledge. This knowledge includes management of kai preparation within the whare kai, hangi preparation, tombstone construction, appropriate tikanga (customs) observance with the deceased's arrival, and even kaimoana gathering. Each Mātauranga serves a purpose to support the grieving family and ensure the tangi operates according to the Iwi's appropriate Tikanga and Kaupapa. No specific role is more important than the other. Active participation in the marae enables the development of a range of skills relevant to disaster risk reduction, which includes the preparation of hangi, gathering kai moana, traditional construction methods, carving, food preparation, hunting, and even management skills. These skills have relevance in disaster response planning. Developing these skills through active involvement in marae enables the development of disaster risk reduction skills without the need to resolve poverty.

6.5.5 Ranking Networked Resources

Participants were also asked to rank each networked resource in the order they thought was most important for enhancing community resilience. The distribution of votes is depicted in Figure 10.

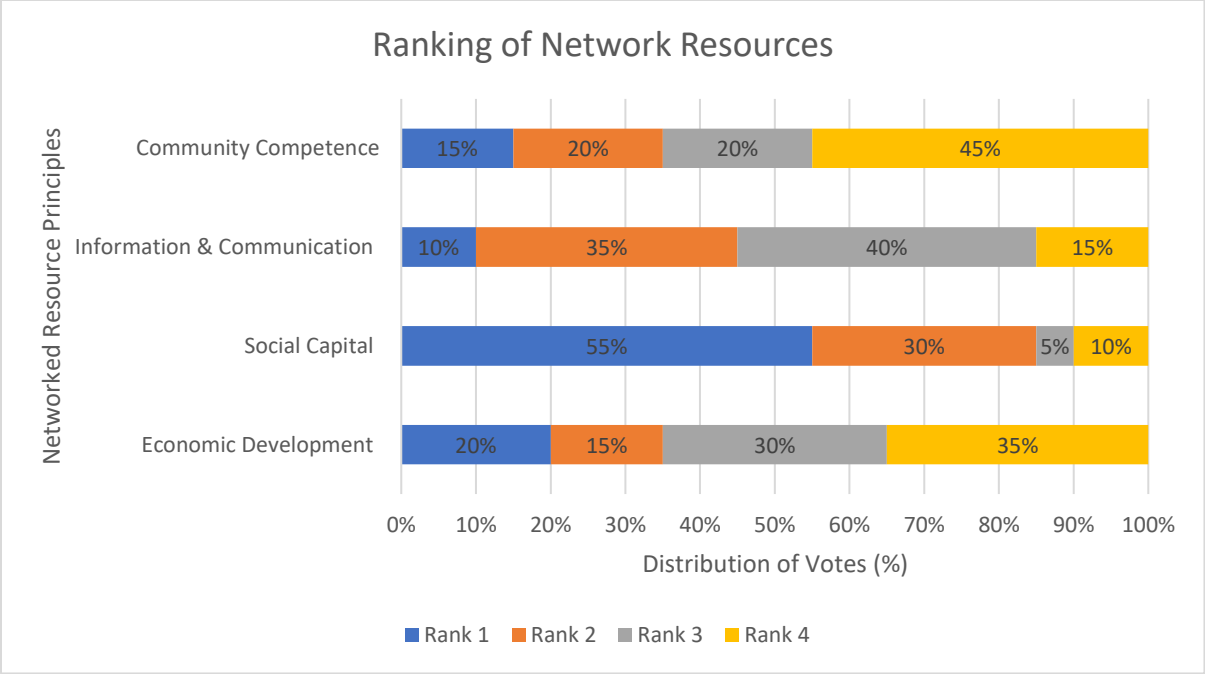

Figure 10: Ranking of Networked Resource Principles

In developing community resilience, participants believe that developing social capital is the most critical network resource. This was closely followed by information & communication, economic development, and community competence. Social capital correlates with principles of kotahitanga and whanaungatanga, which give the ability of iwi to respond to disasters naturally. The natural unity exhibited in Māori culture contributes to why in disaster events, Māori can instantaneously respond and adapt to unfolding disasters. High social capital enables the iwi to bypass the need for economic resources to develop resilience by improving the individual's well-being. Social capital also mitigates the potential insufficient communication of relevant disaster preparedness information, especially with the local council. It enables secure communication channels to remain if relationships are maintained and strengthened. Within a Te Ao Māori context, if whanau continue to congregate at the marae, a range of skills will be developed to be utilized in community responses to disasters. This unity is believed to be crucial to achieving all the networked resources proposed by Norris et al. (2008) and why it was ranked as the most important.

6.6 Recovery

The recovery phase requires stabilising and restoring essential community functions (Coetzee, 2010). This critical phase describes the processes to restore the community to a resilient and functional state. The recovery section of the wānanga sought to investigate how participants would behave during the recovery phase of disaster response planning. Questions were designed to review the concepts discussed in the previous sections and evaluate how Ngāti Toa would implement their recovery strategies with an enhanced

understanding of community resilience. Integrating Mātauranga Māori into this disaster cycle phase is essential as the reduced functionality of the community provides an opportunity to address the needs of the vulnerable that were not adequately met pre-disaster event.

6.6.1 Statement Agreeance

The first questions of this section evaluated five principles proposed by Norris et al. (2008). These concepts were recommended as critical features required to increase a community's resilience which include:

1) To increase resilience to a disaster, communities must develop economic resources, reduce risk and resource inequities, and attend to their areas of greatest social vulnerability.
2) To assess social capital, one of the primary resources of any community, local people must be engaged meaningfully in every step of the mitigation process
3) Pre-existing organizational networks and relationships are critical to rapidly mobilizing emergency and ongoing support services for disaster survivors
4) Interventions are needed that boost and protect naturally occurring social supports in the aftermath of disasters
5) Communities must plan, but they must also plan for not having a plan; this means that communities must exercise flexibility and focus on building effective and trusted information and communication resources that function in the face of unknowns

These statements provide an overview of how to restore resilience in the community. These suggestions allowed participants to reflect on the concepts discussed in the prior section and evaluate how they thought best to recover from the proposed earthquake scenario while preparing for future disaster events. Participants were required to indicate their level of agreeance with these suggestions.

6.6.1.1 Statement 1

The first suggestion by Norris et al. (2008) states that to increase resilience to a disaster, communities must develop economic resources, reduce risk and resource inequities, and attend to their areas of greatest social vulnerability. All the participants either agreed or strongly agreed with the proposal of Norris and colleagues. Participants mentioned that preparing for an earthquake will never be a priority for impoverished individuals. Participants believe that raising the community out of poverty will naturally result in people becoming more educated and aware of the risk of earthquakes within the region. According to the Department of Internal Affairs, disasters disproportionately affect communities with high levels of socio-economic vulnerability (McAnulty, 2022). Communities with high levels of socio-economic vulnerability have a limited capacity to adapt, especially to a changing environment from disasters and climate change. The New Zealand Index of Deprivation (NZDep) is an area-based measure of the socioeconomic vulnerability of communities in New Zealand (McAnulty, 2022). NZDep is displayed using

a decile system where decile 1 represents areas with minor vulnerability, while decile 10 represents areas with the most vulnerability. Porirua is categorized as a decile nine on this index, indicating a high vulnerability to disasters due to socio-economic depravity. Until this depravity and inequality are resolved, the strategic priorities of the iwi will remain on resolving poverty before community resilience can be prioritized.

6.6.1.2 Statement 2

The second suggestion by Norris et al. (2008) states that assessing social capital, one of any community's primary resources requires the meaningful engagement of local people in every step of the mitigation process. Ninety per cent of participants agreed or strongly agreed with Norris et al. (2008), while only ten per cent disagreed. These results highlight the desire of participants to collaborate with engineers in the mitigation process to ensure the built environment is resilient and meets their needs. Participants believed that response plans could not be created without their input as only Māori know their needs and how best to address them while upholding their cultural identity.

6.6.1.3 Statement 3

The third suggestion by Norris et al. (2008) states that pre-existing organizational networks and relationships are critical to rapidly mobilizing emergency and ongoing support services for disaster survivors. Sixty-five participants agreed with statement 3, proposed by Norris et al. (2008), while the remaining thirty-five per cent disagreed. Participants accept a lack of capability to effectively plan and respond to an earthquake because of inadequate education on community resilience literature and socio-economic depravity. Participants expressed that their immediate issues extend beyond earthquake preparedness, and therefore, acquiring partnerships to help bolster their resilience is essential until they reach the technical capability and self-sufficiency to respond to disasters independently without partnerships. The following partnerships included:

- Industry partners with engineering consultancies to guide mitigation and preparation strategies
- Universities to educate the iwi on disaster preparedness and train tamariki
- Local business partnerships to mobilise and coordinate their resources following a disaster
- Government partnerships with civil defence planners, local city councils, and government agencies provide additional funding for pre-disaster preparations, mitigation strategies, and enhanced emergency response services
- Social partners with the community, including church communities and community groups, to reconnect the community while diversifying involvement in future disaster responses
- Strengthening hapū and whanau connections where pre-defined responsibilities are designated to specific families for future disaster response

Once self-sustainability is achieved, partnerships would be limited to social, hapū, and iwi relationships.

6.6.1.4 Statement 4

The fourth suggestion of Norris et al. (2008) states that interventions are needed that boost and protect naturally occurring social supports in the aftermath of disasters. Seventy per cent of participants expressed that they disagreed with the statement of Norris et al. (2008), while the remaining thirty per cent disagreed. Many participants disagreed with this statement because unity is a foundational principle that Ngāti Toa uphold. This unity means the focus during disasters resides on the broader collective struggle of whanau rather than the individual. This unity was refined through the shared experiences of participants on their marae. These connections continue to be strengthened with a new generation of Ngāti Toa. The deep whanau connections enhanced through the shared struggles of the Ngāti Toa iwi means participants felt interventions to boost social support were not required.

6.6.1.5 Statement 5

The final suggestion of Norris et al. (2008) states that communities must plan, but they must also plan for not having a plan; this means that communities must exercise flexibility and focus on building effective and trusted information and communication resources that function in the face of unknowns. All participants agreed with this suggestion by Norris and colleagues, with half of the participants strongly agreeing. Participants expressed that it is the trust developed within whanau that fosters flexibility. This trust in whanau means information shared between them is often considered reliable and enables immediate responses to disasters. Flexibility is a prominent feature of Māori, especially Ngāti Toa. It is a principle innate in Māori that was required because of the harsh living conditions in Aotearoa. The natural and built environment was constantly changing. Therefore, flexibility was a necessity for survival. Because these observations were communicated by whanau, who are trusted, the iwi is more likely to respond. If this information about changes in the environment is communicated by strangers not known to the iwi, then regardless of the urgency needed to adapt, the iwi will be reluctant to adhere to these warnings.

6.6.2 Long-term Recovery Plan

Participants discussed this question from the perspective of how they could be more prepared for the next disaster event instead of how they would restore the functionality of their community. Following the previous discussions, participants expressed the need first to address their lack of education and technical understanding of community resilience. Growing awareness and education in community resilience was overwhelmingly crucial for participants. Participants believe that it is their responsibility to ensure their needs in a disaster are met, as only the iwi know what they need, where they lack, and how to respond appropriately. By understanding community resilience more comprehensively, mitigation and preparation strategies can be better tailored to the needs of Māori.

Participants expressed that their current capacity to respond to disasters is entirely reactive. Participants rely on their innate unity as their sole mitigation and preparation strategy; however, it is believed to provide a robust foundation to develop community resilience merely. Participants expressed the need to develop mitigation strategies by constructing new infrastructure and strengthening the built environment. Improving the state of resources (including personnel, supplies and equipment) and redundancy plans would be investigated. The specific strategies would involve the restoration of their puna. Currently, there are five puna within the jurisdiction of Ngāti Toa. Here, the iwi would collect water and kaimoana sustainably, using Kaitiakitanga as a guiding principle to sustain them. Restoring the puna and improving their robustness to withstand an earthquake would be a priority long-term recovery strategy. This addresses their need for increased resources and redundancy if critical lifelines are destroyed, bypassing the need for economic development for many iwi members who cannot resolve poverty. Through these schemes, equity and participation of individuals in community resilience will increase, which improves the built environment and decreases vulnerability.

Because of the current socio-economic vulnerability of the iwi, priority resides in addressing the economic inequality within the community so additional whanau members can participate in community resilience. Participants expressed that developing relationships with organisations for training in disaster risk reduction and response to disasters would be prioritised to achieve this. Using organisational relationships will enable the iwi can be trained in the relevant skillsets to respond as individuals and collectively as a community.

Participants also expressed the desire to improve the capabilities of their marae to aid in their goal of self-sufficiency. Participants desired a robust and self-sufficient marae to improve community resilience, which will act as community hubs or shelters following a disaster. A marae is a place where traditional Te Ao Māori principles are observed. Including these values mean a marae becomes a physical place for the community to gather and a spiritual space of safety enhanced through whakapapa. Marae, therefore, creates a sense of connectedness and unity that promotes the well-being of Māori. As safe havens, they may be rapidly mobilised support centres for communities impacted by natural disasters. The strength of marae for Māori is the shared experiences of individuals created on these grounds. These experiences will lead Māori congregating to their ancestral homes following a disaster. Therefore, participants indicated that the marae should be refurbished to support the community in attaining food and water and provide a space to share resources following a disaster. This will reduce the time to initiate response plans. The Ngāti Toa marae in Takapuwhahia is not equipped to handle a large influx of people requiring assistance. Participants suggested improving their marae using the following methods:

- Developing renewable energy to power the marae following a disaster
- Constructing additional wharenui to support the influx of people

- Increase the kitchen size to support the preparation of food for larger capacities
- Establish a secure communication line with civil defence and government that will operate following a disaster
- Strengthen existing buildings and ensure newly developed sub-structures on the marae are built to the more robust building standards
- Develop emergency food and water storage on the marae
- Increase the number of toilet and shower facilities
- Increase bedding storage

Participants believe these improvements will allow the marae to support a large influx of people and enable a quicker response following the disaster. Participants expressed that minimizing the disruptions caused by the earthquake is their priority because recovery can be implemented sooner. Improving their people's and their marae's capability is the priority in implementing their recovery strategies.

6.6.3 Ranking of Features Required for Collective Resilience

Norris et al. (2008) suggested that building collective resilience, flexibility, decision-making skills, and trusted sources of information that function in the face of unknowns is required. Participants ranked these features suggested by Norris in the order they thought was essential to building collective resilience.

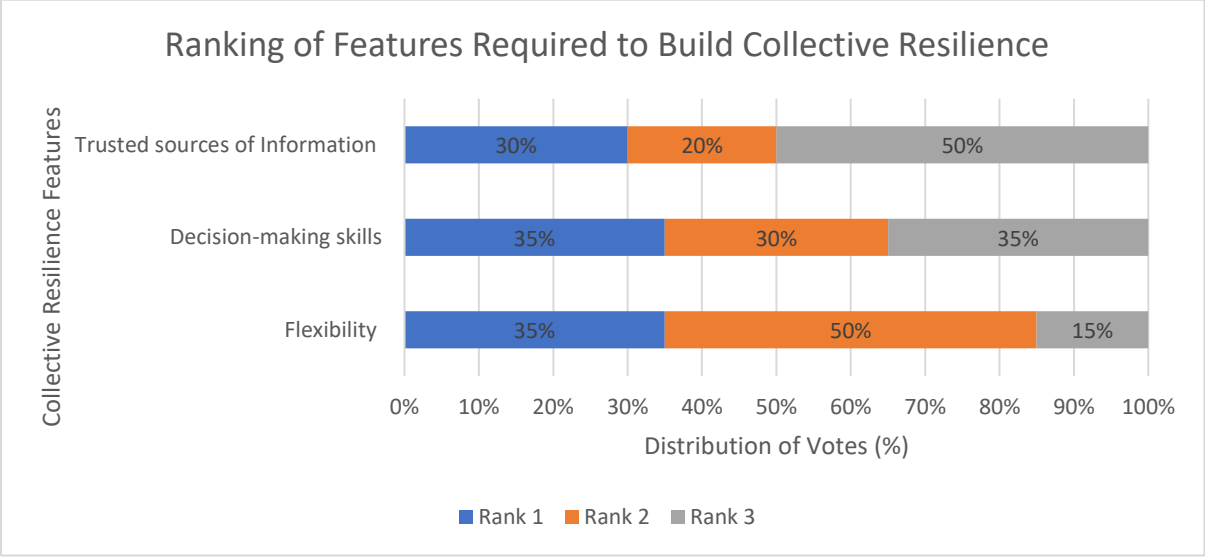

Figure 11: Ranking of Features Required to Build Collective Resilience

Thirty-five per cent of participants voted for flexibility and decision-making skills essential to building collective resilience. However, fifty per cent of participants' second votes were given to flexibility, while only thirty per cent were assigned to decision-making skills. Indicating that participants value flexibility

when building resilience. This aligns with the ranking of the community resilience features in the mitigation section, where participants vote adaptability as the most important feature to develop community resilience.

6.6.4 Ranking of Disaster Phases

The wānanga was structured to evaluate how community resilience is practised in four disaster management cycles. Participants were asked to rank each disaster phase in the order they thought was most important for developing community resilience, specifically which disaster phase resources should be funnelled.

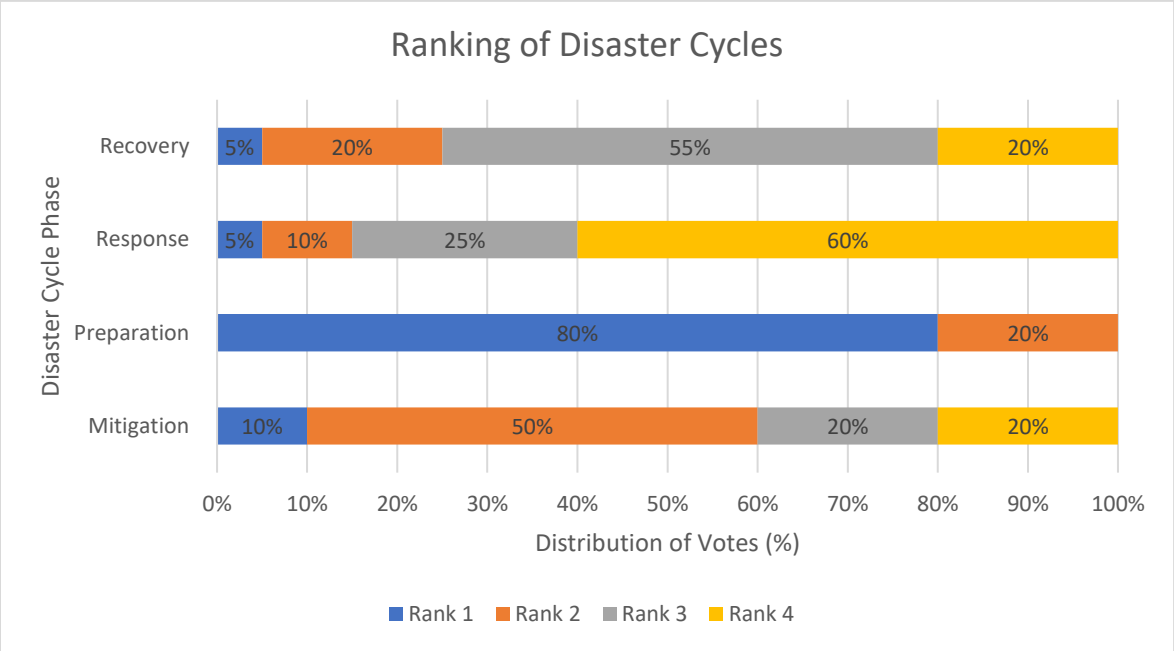

Figure 12: Ranking of Disaster Cycles

Eighty per cent of participants ranked preparation as the most critical disaster phase to dedicate resources to improve community resilience. Fifty per cent of participants also voted for the mitigation phase as the second most crucial phase to focus resources on improving the community's resilience. These disaster phases are closely linked and express participants' desire for proactive planning for earthquake preparation. The disaster cycle was designed to illustrate the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred (Coetzee, 2010). Each phase has a designated purpose in the disaster life cycle. Preparedness is defined by ongoing training, evaluating and corrective action, ensuring the highest level of readiness (Coetzee, 2010). Preparedness from a Te Ao Māori perspective is an ongoing adaptable process. It requires constantly evaluating the state of the environment and determining if the current preparation level is adequate to withstand the subsequent environmental changes. Constant observation of the environment and monitoring these changes is natural for Māori. It is how their

Mātauranga developed and continues to grow. This process is how community resilience is developed amongst Māori and how Mātauranga Māori can be integrated into community resilience frameworks.

Chapter 7 – Raising Resilience

The disaster wānanga gave participants an overview of the effects a magnitude 7.5 earthquake will have on Porirua. The expected extent of damages overwhelmed participants due to their lack of preparedness for this disaster. Participants suggested developing a tool to aid their preparation efforts against a future seismic event. This suggestion led to the creation of two additional deliverables; a vulnerability matrix that will be used to identify vulnerable communities in New Zealand against seismic hazards and an individual resilience calculator that will guide individuals to address their unique focus points to improve their resilience. These tools provide insight into the desired future of assessing resilience from a Te Ao Māori perspective.

7.1 Matrix to Identify Vulnerable Community to Earthquake

A vulnerability matrix identifies and evaluates potential risks or vulnerabilities within a system, process, or organization (Menoni et al., 2012). To improve Ngāti Toa's resilience, assessing the risk level and prioritizing actions to mitigate the effects of an earthquake on Porirua is vital. The Department of Internal Affairs developed a matrix in August 2022 evaluating vulnerable communities in New Zealand exposed to flood hazards. The components of this report were used to construct a vulnerability matrix to identify vulnerable communities and households exposed to earthquake hazards in New Zealand. This matrix focuses on three components: social vulnerability, socio-economic vulnerability, and susceptibility to an earthquake. The matrix consists of six criteria, which include:

- The risk an earthquake poses to the community or household
- The use of seismic resilient infrastructure and housing
- The development of a community and personal earthquake response plan
- The socio-economic vulnerability of the community or household
- The communities or households' ability to pay for seismic resilient infrastructure or housing
- The level of social vulnerability of the community or household

The summary of the community and household vulnerability matrix is provided below.

Table 16: Community Earthquake Vulnerability Matrix

Criteria	**The Measurement**	**Explanation**
Earthquake Hazard	BRANZ earthquake zones or Z > 0.3 (see appendix D)	The level of earthquake risk is divided into several zones, as some regions are more prone to earthquakes than others. If a community is in zone 3-4, it is at the most significant risk of an earthquake and meets the criteria.

Earthquake Protection Infrastructure	Minimum or no developing/planned future earthquake protection infrastructure	Proactive planning and investment in the community to enhance the performance of the built environment to mitigate the risk of an earthquake and improve resilience. A community with work underway to seismically protect infrastructure does not meet the criteria.
Earthquake Response Plan	No community response plan	An emergency response plan is a document that lays out the series of steps the community will take during a disaster to ensure safety and minimize the impact on the built environment. A community with no response plan meets the criteria.
Socio-economic vulnerability	New Zealand Index of Deprivation (NZDep 2018)	The NZDep is an area-based measure of socioeconomic vulnerability in New Zealand. It measures the level of socio-economic vulnerability for people in each small area. A decile 9 or 10 community meets the criteria.
Community's ability to pay	Council financial (TA) capacity and broader district socio-economic data	The financial capacity of the wider community within each territorial authority boundary is a proxy for the ability of a community to pay. Rates revenue, debt, capital expenditure and balance sheets assets determine the community's ability to pay. The community meets the criteria for low rates, high debt, low capital expenditure, and minimal assets.
Social Capital Vulnerability	Low well-being index and trust score (Stats NZ)	Well-being statistics indicate people's assessments of their lives (i.e., how satisfied they are) and objective information (i.e., their labour force status). These statistics also measure the level of trust between the community and its various constituents (neighbours, government, emergency services). Low trust and well-being indexes mean the community meets the criteria.

Understanding vulnerability is crucial for developing community resilience because resilience strategies are designed to mitigate the impact of vulnerabilities that a community may face. This matrix aims to identify the vulnerable communities to an earthquake using a small subset of indicators. Through this identification, mitigation strategies could be developed to reduce the expected impacts of a seismic event in New Zealand. This matrix was completed relatively quickly, which meant that not all risks or hazards were captured. Social, economic, and physical risks were the primary indicators used to classify a community's vulnerability to an earthquake, as these features were determined as the most important to

Ngāti Toa. Although this matrix provides a simplified method to identify a community's vulnerability, the broad scope of this tool means the potential resilient households within the community are ignored. There is a disparity of resilience within the Māori community, especially amongst Ngāti Toa. Each household differs in capability and preparedness to respond to earthquakes. These capable households are anchor points for Ngāti Toa, as vulnerable iwi members will congregate with these individuals for immediate support following a seismic event. Therefore, the matrix was expanded to include the individual measurement of vulnerability between households within the community.

Table 17: Household Earthquake Vulnerability Matrix

Criteria	**The Measurement**	**Explanation**
Earthquake Hazard	Does the household reside in Zone 3-4 on BRANZ earthquake zones or Z > 0.3 (see appendix D)	If a household is in zone 3-4 of the NZ BRANZ map, it is at the most significant risk of an earthquake and meets the criteria.
Earthquake Protection Infrastructure	No earthquake protection infrastructure	Household with no work underway to seismically secure or improve their home meets the criteria. This can include mitigation strategies like seismic strengthening of the home or securing furniture and loose household items.
Earthquake Response Plan	No response plan in place	A household with no response plan meets the criteria. This can include preparation strategies like 72-hour kits, emergency resources, coordination plans with neighbours and evacuation plans.
Socio-economic vulnerability	New Zealand Index of Deprivation scale, middle to lower class income earner, and overcrowded home	A household decile 9 or 10 community on the New Zealand Index of Deprivation scale, low-income home, and overcrowded household means criteria is met. A household self-assessment can be conducted by assessing the number of individuals living in the household and income bracket.
Ability to prepare/respond	ELSI level 1-3 (Lower living standard measurement)	Economic Living Standard Index (ELSI) is used to describe the living standards of an individual. Low ELSI means the household meets the criteria.

Social Capital Vulnerability	Low well-being index and trust score (Stats NZ), consistent positive interactions with neighbours, and low number of relatives living nearby	A low trust and well-being index means the household meets the criteria. A self-assessment by the household can be conducted to determine trust in neighbours, well-being and several relatives living nearby.

Ngāti Toa views resilience as a collective responsibility. To account for this perspective; the matrix is required to measure the resilience and vulnerability of each community member. This is an essential feature for participants as the needs and capabilities of the individuals in the community are unique. The aim of developing this matrix was to identify the origin of their vulnerability, their current resilience level, and actionable steps that integrate their specific needs and unique skill sets into actionable strategies to improve their resilience. This matrix successfully identifies a vulnerable household from the list of indicators used, but the main limitation is the failure to provide actionable steps to improve their resilience once identified as vulnerable. It also does not account for changes in the built or natural environment that influence their vulnerability, nor does it consider improvements in their resilience. This means the matrix can quickly become outdated if the indicators are not consistently reviewed for their applicability. Considering these limitations when using this vulnerability matrix to assess community resilience is essential. In collaboration with Ngāti Toa, developing an additional tool to complement the vulnerability matrix was recommended to provide a more comprehensive analysis. With these requirements and limitations, a community resilience calculator was developed to complement this matrix.

7.2 The Ahi Ka Calculator

Ahi ka is an essential principle of Ngāti Toa that references the traditional practice of burning home fires. The principle emphasizes the importance of continuity, land connection, and community and culture stewardship (Morrison et al. 2019). Ngāti Toa considers this principle necessary because, by burning home fires, the iwi can maintain a sense of continuity and connection in times of adversity. Those involved in creating this calculator believed the ahi ka calculator reflects the purpose of this tool, which is to provide a measuring tool to evaluate the strength of the iwi to respond to a disaster and identify the processes that can improve their ahi ka.

A community resilience calculator is designed to measure the capacity of a community to withstand, adapt to, and recover from adverse events and to identify areas where improvements can be made to enhance community resilience (Berman et al., 2016). The calculators include a range of indicators that reflect different features of resilience, combined using an algorithm to generate an overall score that reflects the community's resilience level (Berman et al., 2016). The calculator's results inform policy and decision-making at the community level to prioritize investments in resilience-building initiatives and track progress over time. The tool can also benchmark the resilience of different communities and identify best practices and lessons learned that can be shared across communities.

This calculator aimed to create a tool that can improve the community resilience of Ngāti Toa and Porirua. Each comprising member of the community has unique needs and skill sets that can be utilized to respond to an earthquake event. The equitable community resilience calculator was developed to reflect this characteristic by selecting 40 resilience variables important to Ngāti Toa. The variables included features the individual could immediately influence to improve their resilience, while the local council must provide or coordinate other components. These variables were assigned five additional components, which include the following:

- The definition of the variable
- During the disaster cycle phase, the variable must be employed during
- The resilience feature or network resource that variable is associated with
- The controllability of the variable (see Appendix C)
- The indicator used to measure the progress of the variable's implementation

A summary of the components of the calculator is provided in Appendix A. Indicators of variables were collated from the conceptual frameworks provided by Links et al. (2018), while the variables considered were sourced using the ARC-D tool kit constructed by McCaul et al. (2016). This calculator assesses the individual household's resilience using a range of components that an individual can implement to bolster their resilience and features the council must coordinate or provide to improve seismic response capabilities. An array of principles must be used as an individual's resilience is directly influenced by the community's vulnerability and resilience. The collective community resilience will more accurately reflect the current state of the built environment instead of assuming a blank level of resilience by using these individual assessments. This provides the necessary information to develop the optimum strategies to appropriately respond to a seismic event based on the community's demographic, individual needs, and unique skill set. Although some of the components reflect the specific needs and skill set of Ngāti Toa, the calculator can be used for a range of communities across Aotearoa. Once the calculator components were completed, two assessments were conducted with the participants who aided in the calculator's construction.

7.2.1 Baselining the Resilience of Porirua

To estimate these households' resilience baselining Porirua's resilience is required. The estimated resilience of Porirua is subjective to the researcher's investigation of existing disaster risk reduction information on Porirua and personal experience of living in the city. This assessment does not represent the accurate resilience level of Porirua. The assumptions used to determine resilience are collated in Appendix E. Using the classification scheme (see Appendix B), Porirua was given a resilience score of 41%. This indicates a moderate level of resilience for Porirua. Porirua City Council has developed some capacity to prepare for, respond to, and recover from a seismic event. Porirua is capable of minimally mitigating the impact of an earthquake. The local council requires additional support to develop their community capacities to respond as Porirua currently relies on broader regional resources. The Wellington City Council's initial earthquake response plans are the primary tool guiding resilience strategies employed by Porirua Council. More significant resources and planning must be conducted for Porirua to improve its resilience.

7.2.2 Assessment 1

The baseline resilience of forty-one per cent for Porirua will be applied to this assessment. The description of household one includes the following:

- Household one is middle class
- House one is located in a low-lying coastal area
- There are two working parents and two children in high-school
- Household one indicated they are homeowners and have two vehicles.
- Participants indicated they have a high well-being level and a healthy lifestyle because of their living circumstances
- Participants indicated they are highly involved in the community and iwi
- Participants believe they are moderately educated in DRR and H&S following the disaster wānanga
- Participants indicated they are not living a hazard-resilient lifestyle as prior to the wānanga, and they were uneducated in DRR and H&S
- Participants claim they have a small number of medical supplies and response equipment due to prominent flooding in the area
- Household one claims they have secured furniture and lost household items

The specific calculator inputs for household one are summarized in Appendix F, and G. The resilience score for household one is forty-six per cent, indicating a moderate resilience level. The assessment was conducted on the 2nd of December, 2022. Household one was given two years to maximise the resilience variables with a controllability level of 3 and improve those classified as level 2. This controllability matrix

(see Appendix C) indicates the extent of influence or control individuals have to improve the resilience level of the variable. If these variables are maximised, the resilience level of household one is expected to increase to sixty-five per cent. Meaning household one will be approaching resilience. This improvement can be achieved without Porirua City Council improving the city's built environment.

7.2.3 Assessment 2

The baseline resilience of forty-one per cent for Porirua will be applied to this assessment. The description of Household Two includes the following:

- Household two is a lower class
- Household two is in a low socio-economic area
- This is a family of 8 with one working and one stay-at-home parent who have six children between the ages of 6 to 17
- Household two relies on social housing and government benefits for financial support.
- Public transport is the primary mode of travel for households. Two
- Participants indicated they have a low well-being level and unhealthy lifestyle because of their living circumstances
- Participants indicated they are highly involved in the iwi with limited interactions in community events
- Participants indicated they remain uneducated in DRR and H&S following the disaster wānanga as the concepts were difficult to comprehend
- Participants indicated they are not living a hazard-resilient lifestyle as prior to the wānanga; they were uneducated in DRR and H&S
- Participants indicate they have no personal medical supplies or response equipment
- Household two indicated they have not seismically secured their house

Appendix H and I summarise the specific calculator inputs for household two. The total resilience score of household one is thirty-eight per cent, indicating a low resilience level. The assessment was conducted on the 2nd of December, 2022. The household was given two years to maximise the resilience variables with a controllability level of 3 and improve those classified as level 2. If these variables are maximised, the resilience level of household one is expected to increase to fifty-eight per cent by the 2nd of December 2024, which is classified as moderate community resilience. This score does not consider potential improvements to the built environment or changes in household two living conditions.

7.3 Review of Calculator

This calculator is within the drafting phase due to its limited timeframe and late addition as a deliverable. As a result, there are several limitations when using this calculator. The variables considered are subjective and open to interpretation. More specifically, how different calculator components are defined or measured may contrast with those proposed by Ngāti Toa. The aim of constructing the calculator was to simplify the complex and multidimensional nature of resilience into a single score or ranking.

Consequently, the oversimplification of this calculator masks essential details and nuances that could affect a community's ability to respond and recover from a crisis if they do not whakapapa to Ngāti Toa. Furthermore, the calculator has limited applicability to communities outside of Ngāti Toa. This is because components include unique characteristics of Ngāti Toa, which are context specific to their iwi. The timeframe to complete this deliverable also constrained the calculator's simplicity and ease of use as an assessment can only be conducted with the support of appropriately qualified engineers who understand the multidimensional complexities of community resilience literature. With additional resources and planning, the aim is to improve the calculator’s accuracy. This includes the refinement of components so assessments can be completed independently by community members without assistance from engineers. In addition to this simplification, the calculator will expand its applicability for communities and iwi outside of Ngāti Toa.

This community resilience calculator uses a set of indicators to measure the different aspects of resilience important to Ngāti Toa. These indicators reflect the specific needs and skillset of Ngāti Toa while providing an essential strategy to improve their resilience considering the surrounding built environment. The calculator identifies how an individual is resilient and where they are vulnerable. The summation of these components provides a simplified baseline for tracking the progression in resilience, monitoring changes in the built environment and evaluating the effectiveness of existing resilience-building efforts. This supports the decision-making process of Ngāti Toa by providing the iwi with the necessary information to develop targeted strategies and interventions to improve their resilience levels. Using this community resilience calculator, Ngāti Toa will gain a deeper understanding of their resilience capacities and develop more informed and practical approaches to disaster management and preparedness. The calculator will help Ngāti Toa to become more resilient and better equipped to respond to and recover from adverse events by considering their unique needs and capabilities. Refining this tool is viewed as the preferred resource that can aid in raising resilience to a seismic event within Ngāti Toa.

Chapter 8 – A Resilient Community

Traditional community resilience frameworks often fail to account for the unique experiences and perspectives of the indigenous Māori community. This unintentionally restricts Māori participation making traditional community resilience frameworks inequitable. These frameworks are exclusive to those individuals that meet the criteria outlined by resilience frameworks. It was identified that the Ngāti Toa had weaved resilient practices into the very fabric of their culture. This provides an opportunity to reimagine how community resilience can be practised within a modern setting and improve the equity of frameworks for Māori.

This thesis reviewed the historical, current, and future aspirations of Ngāti Toa concerning community resilience to address the inequitable nature of existing frameworks. How Ngāti Toa practised community resilience is codified in a variety of pūrākau, whakataukī, and waiata specific to the iwi. Several pūrākau, whakataukī, and waiata of Ngāti Toa were deciphered to overview how resilience was practised within their iwi. Evaluating this knowledge provided a brief overview of how community resilience was traditionally practised amongst Ngāti Toa and yielded insights into the processes that would best address their vulnerabilities.

The review continued by evaluating the current understanding of resilience amongst Ngāti Toa and how it could be practised within a modern setting to address their needs in a disaster. Through these discussions, how best the resilience of Ngāti Toa could be raised was identified by developing a resilience calculator designed to improve Ngāti Toa's resilience by accounting for their specific needs and strengths. The principles important to Ngāti Toa guided discussions to evaluate how best their resilience can be raised. This aided in the development of tools and technology designed to improve the resilience of Ngāti Toa by accounting for their specific needs and strengths.

The common trend observed across this analysis is the equitable nature of Te Ao Māori community resilience. Participation of Māori in community resilience development is vital to improving the resilience of Aotearoa as this ensures community resilience frameworks are correctly tailored to suit their needs, vulnerabilities, and strengths. Māori intimately understand their communities' vulnerabilities and strengths in disaster response planning. Developing frameworks for Māori without the integration of their knowledge leads to the inequitable application of community resilience frameworks. This inequitable application of frameworks is the primary barrier preventing Māori from improving their resilience in a modern setting. Therefore, integrating mātauranga Māori into community resilience frameworks is merely the active collaboration of engineers with Māori in disaster response plans for the community.

This chapter will briefly explain how existing resilience frameworks in New Zealand are inequitable. The evaluation of the historical, current, and future aspirations of Ngāti Toa concerning community resilience has enabled recommendations to be made that will improve the equity of these resilience frameworks. In conclusion, the researcher will define a resilient community while highlighting how Māori are simultaneously resilient but vulnerable.

8.1 Barriers Preventing Resilience

Community resilience frameworks aim to enable communities to adapt, withstand, and recover from adverse events such as natural disasters, economic downturns, and social disruptions (Norris et al., 2008). These frameworks are designed to meet the needs of communities during times of crisis. However, despite these efforts, biases exist in applying community resilience frameworks, leading to inequitable outcomes that disproportionately affect Māori communities. This issue highlights the need for improved community engagement and empowerment in disaster response planning to promote equitable outcomes and enhance the overall resilience of communities.

8.1.1 Economically Driven Resilience

Participants identified that Ngāti Toa has significant socio-economic disparities compared to the wider Wellington region. Communities that suffer socio-economic depravity are often disproportionately affected by natural disasters and other emergencies. Norris et al. (2008) claim that economic development is required to participate in resilience frameworks. This is because resilience frameworks often prioritise physical infrastructure and technological solutions over social and cultural factors, which disadvantage marginalised communities (Collins et al., 2018). Community resilience frameworks typically assume that poverty must be eliminated before meaningful participation can occur. This assumption is reinforced by a report from the Ministry of Social Development (2021) that argues that economic development is necessary for building social capital. However, Potini and Parai (2022) challenge this view by demonstrating that Ngāti Toa can develop social capital and enhance resilience even amidst hardship. This unique phenomenon is explained in the whare kai model, described in chapter four. By failing to acknowledge this model, policymakers risk perpetuating the myth that Māori communities must first solve poverty before they can build resilience. This complex issue could leave Māori communities vulnerable and requires careful consideration. This needs to resolve poverty also results in limited access and allocation of resources critical to building resilience (funding, personnel, supplies, technology, and infrastructure). This makes it more difficult for Māori to implement effective resilience strategies and recover from emergencies, resulting in greater vulnerability and harm to Māori during and after disasters (Wiser et al., 2002).

8.1.2 Representation

Inadequate representation in the development of community resilience frameworks has further exacerbated the disparities of resilience for Māori. Ngāti Toa has not been involved in developing the Porirua earthquake response plans. When reviewing existing plans, it was discovered that their needs, vulnerabilities, and strengths were not considered. Although the WENIRP framework claimed to be considerate of culturally appropriate responses and recognised the importance of including Māori perspectives in the response plan, participants in the wānanga indicated that the Māori perspectives considered were not aligned with the values of Ngāti Toa, but rather general Māori principles. This oversight may be attributed to a failure to recognise the unique perspectives of different Māori tribes, which have unique tribal structures governed by their histories and environments. According to Ngāti Rahui (2014), this structure includes three sub-structures: iwi (tribe), hapu (sub-tribe), and whanau (extended family), which all share similar cultural, spiritual, and economic ties to their land and resources (see figure 13)

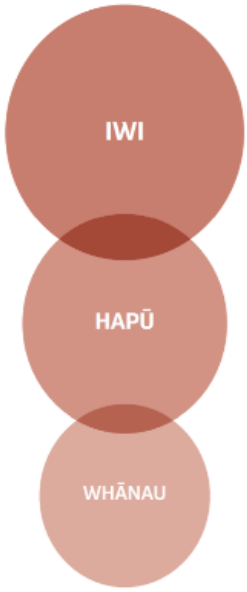

Figure 13: Māori Relationship Structure (Ngāti Rahui 2014)

Even whanau who share the same iwi or hapū may vary in cultural practices, values, and perspectives because of the differences in their history and surrounding environment (built and natural). Therefore, the WENIRP framework may have considered perspectives and values but not the specific principles of Ngāti Toa. As a result, the effects of an earthquake are far more significant for Ngāti Toa. Involvement of Māori in disaster planning is required because Māori have cultural differences and distinct needs. Engineers who are not Māori are often insensitive to these needs as they are unaware of the cultural context in which Māori communities live. This naturally results in situations like Ngāti Toa, where frameworks are not effective or

appropriate for Māori communities and may even create barriers to preventing resilience improvement. Incorporating and properly handling principles such as whakapapa, manākitanga, mana, kotahitanga, and other Māori cultural values and practices are essential in building resilience within Māori communities. It is crucial to acknowledge that this requires ongoing involvement and leadership from Ngāti Toa to protect the integrity and virtue of these principles, which are foundational to their way of life. It is recommended that Ngāti Toa must have a significant role in the framework's design and ongoing maintenance to ensure their ongoing relevance and effectiveness. This will ensure that their values are correctly handled. Cutter et al. (2014) further claim that resilience frameworks overlook the importance of social networks and cultural practices in disaster response and recovery, which disadvantages communities that rely on these informal resources. Failure to consider social determinants differently results in uneven distribution of resources and benefits across communities (Chandra et al. 2011).

8.1.3 Insufficient Engagement

It was found that the frameworks reviewed in chapter two lacked any consultation and engagement with Ngāti Toa during their creation. This issue highlights the need for improved community engagement in disaster response planning as the frameworks did not reflect their needs nor consider how Ngāti Toa could contribute to the initial response plan for the Wellington region. This exclusion of Ngāti Toa in developing these frameworks raises questions about their effectiveness and suitability. The fact that Ngāti Toa was not even aware of the existence of these frameworks further highlights the issue of whom these frameworks were designed for. It is possible that the local council does not acknowledge that different groups within the community have distinct needs. Hence, the frameworks are simplistic and lack applicability for Ngāti Toa. Community resilience frameworks designed for Māori must be inclusive and require community engagement to achieve this. It is essential to recognise that different groups within a community have different needs, vulnerabilities, and strengths, and involving them in the planning process is crucial for developing equitable and culturally appropriate resilience frameworks. The lack of engagement between Ngāti Toa and the local council highlights how traditional resilience frameworks are restrictive in their application. The classification of Porirua as a vulnerable community due to various environmental, economic, cultural, and social factors (as shown in Table 1) may be one reason for the lack of engagement with Māori communities. Some may question how a vulnerable community like Porirua could contribute to community resilience or what unique needs a Māori community might have. There could be a belief that vulnerable communities require intervention rather than engagement. However, it is essential to recognise that vulnerable communities like Porirua have strengths, assets, and knowledge that can be utilised in resilience frameworks. Integrating Māori cultural values and practices can strengthen community resilience and improve outcomes for all community members. Inclusive community engagement can ensure that the

unique needs of Māori communities are considered and that they have an active role in disaster response planning. Engaging and empowering Māori communities' equity can be increased and effective resilience frameworks for all community members.

8.1.4 Inequitable Resilience

The lack of trust between Ngāti Toa and the local council only worsens the existing inequity within resilience frameworks. The lack of meaningful engagement and trust in Māori communities results in their disengagement with these frameworks, as they are not designed with their cultural needs and values in mind. This exacerbates the barriers to improving resilience and emergency response planning in Māori communities, as they are left vulnerable to disasters. However, this issue is not isolated to Porirua or Māori communities. Historical racism and discrimination, which Māori have suffered since colonisation and the implementation of divisive legislation by the government, have created deep-seated issues that underpin one of the primary barriers preventing the improvement of community resilience for Māori. As Tierney et al. (2001), Adger (2006), and Cote and Nightingale (2012) argue, resilience frameworks designed for Māori will not be successful unless they address the root causes of inequality and promote social justice in disaster planning and response. Only then can equitable and effective resilience frameworks be created that include all community members.

8.1.5 Infrastructure Dependencies

The most significant detriment of colonisation to Māori culture was the lost of independency and self-sustainability to respond to a disaster. Colonisation introduced new values, technologies, and lifestyles to Māori. Kaumatua of Ngāti Toa indicated their resilience principles derived from their survival needs. These resilience principles are tied to a traditional lifestyle that sustained them during a disaster and in everyday living. Kaumatua emphasised that this lifestyle was practised in the 1930s during the Great Depression and sustained during the economic recession. The principle of kaitiakitanga (guardianship and sustainable environment management) enabled Ngāti Toa to source food locally despite the economic struggles. Life did not change for Ngāti Toa until Porirua grew. The over-fishing of their food sources and their eventual pollution by installing wastewater pipes (that ran parallel and leaked into this water) forced Ngāti Toa to assimilate into a European lifestyle. This assimilation means Ngāti Toa depend on infrastructure systems and critical lifelines to sustain them in a disaster. Living a hazard-resilient lifestyle became irrelevant because the colonised lifestyle was convenient, where necessities were conveyed through infrastructure or monetary means. However, these infrastructure systems are interlinked and connected, as Riecker (2013) highlighted in Figure 14, which makes them susceptible to a disaster if a single lifeline fails.

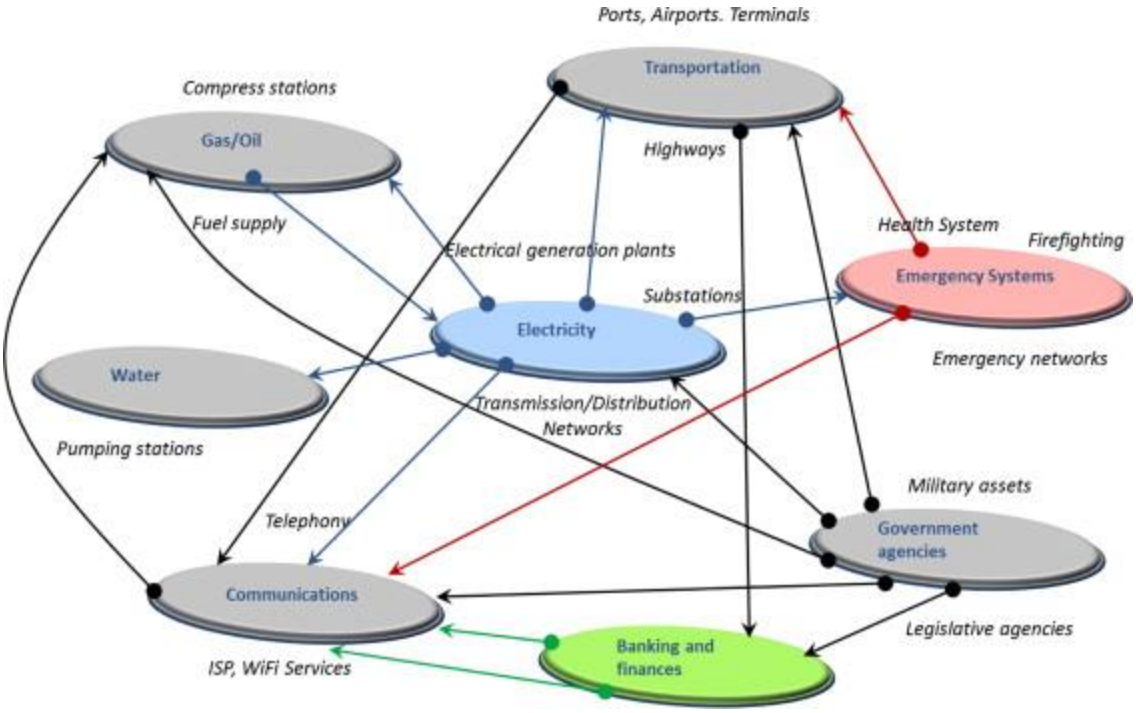

Figure 14: Critical Infrastructure Relationship (Riecker, 2013)

These infrastructure systems are dependent on each other for their operations. If a single lifeline is damaged in a disaster, a domino effect causes the failure of the rest. This failure means Ngāti Toa are especially susceptible to disaster because their resilient nature is not regularly practised due to colonisation and their assimilation into a European society, which made them dependent on these systems to sustain them. This susceptibility is further illustrated by Kattle et al. (2020) in Figure 15, which illustrates a disaster's cascading effect on infrastructure.

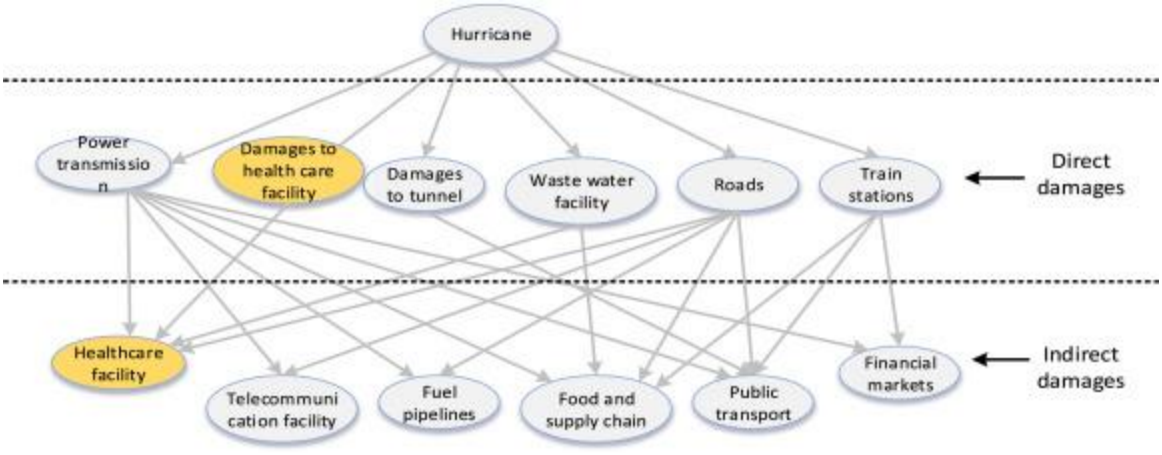

Figure 15: Effect of Disaster on Infrastructure (Kattle et al. 2020)

Unfortunately, because of the timing of the assimilation of Ngāti Toa, they naturally populated the lower class of society, as highlighted by being ranked a decile nine on the socio-economic depravity scale (NZDEP, 2018). This increases their susceptibility to a disaster as their immediate worries are providing for their basic needs instead of a future disaster. Future resilience strategies must by-pass the need to solve socio-economic depravity and address the dependency of Ngāti Toa on a fragile infrastructure system.

8.1.6 Overview

The Porirua City Council Earthquake Response Plan and WENIRP were found to be inequitable for Ngāti Toa. The researcher investigated these frameworks in chapter two, and it was found that they do not fully consider the unique needs and perspectives of Ngāti Toa, nor does it adequately incorporate Māori cultural values and practices into their design and implementation. Frameworks must involve and empower communities to address the inequality in disaster response planning. It is essential to recognise that different groups within a community have different needs, vulnerabilities, and strengths, and this understanding will lead to more significant equity and participation of Māori in the planning process.

8.2 Te Ao Māori Resilience

Through an examination of historical and contemporary perspectives on resilience within Ngāti Toa, this thesis has identified several barriers that hinder the participation of the iwi in the resilience frameworks proposed by the Porirua and Wellington City Councils. By synthesizing these insights, this section presents a set of critical processes necessary to enhance Ngāti Toa's resilience and potentially serve as a model for another iwi, hapū, and whanau throughout Aotearoa.

8.2.1 Principle-Based Resilience

Participants acknowledged that Ngāti Toa has an unmatched understanding of their community's vulnerabilities and has developed unique methods to mitigate, prepare, respond, and recover from disasters that naturally incorporate the foundational principles of community resilience without necessarily using those exact terms. This evaluation of Ngāti Toa's current state of resilience revealed limitations in applying community resilience frameworks, which often rely on rule-based rather than principle-based resilience. Ostrom (1990) claims that principle-based societies are superior to rule-based societies because principles provide more flexibility and adaptability than rigid rule systems. Especially because disasters are unpredictable, increased adaptability or flexibility will enhance the community’s response capabilities. This indicates that principle-based community resilience frameworks may bolster the resilience of Māori more when compared to traditional resilience frameworks as the Te Ao Māori worldview and culture naturally aligns with incorporates a principle-based governance system.

How to implement principle-based resilience was demonstrated by the iwi Ngāi Tahu following the 2011 Christchurch earthquake. Twenty-four hours following the earthquake, Ngāi Tahu established the Māori Earthquake Recovery Network as they are kaitiaki (guardians) of the region (Mason et al. 2019). After the earthquake, Ngāi Tahu initiated a door-knocking campaign and used the traditional principle of kanohi ki te kanohi (face-to-face) to conduct direct assessments of community members' levels of well-being, resources, and accommodation circumstances (Kenny et al. 2015). Local Māori wardens are responsible for this and were instructed to enact the manākitanga (hospitality) principle to extend respectful support to address the immediate and specific needs of the community. This principle provided a flexible response by identifying household-specific needs and the optimum strategies to address them. This specifically included relocating households to response shelters or coordinating with local agencies to secure the community's house and provide resources to support their immediate needs (Kenny et al. 2015). This strategy resulted in higher levels of engagement as the face-to-face consultation fostered trust between the community and respondents. Subsequently, greater involvement occurred in response to the Christchurch earthquake.

Principle-based resilience reflects the Te Ao Māori worldview. The principles used by Ngai Tahu in response to the earthquakes are the values specific to their iwi, which reflect their unique needs. Principles-based community resilience will allow for a more nuanced approach to decision-making, and mean frameworks will better reflect what is essential to the community. Therefore, community resilience becomes more than an arbitrary concept designed to enforce compliance to a set of rules, but rather a process that promotes cooperation to meet a community's needs following a disaster. Traditional Māori principles govern the Ngāti Toa community. Applying principle-based response plans would benefit from developing resilience frameworks for Ngāti Toa.

8.2.2 Collaborative Engagement

This analysis has demonstrated the historical effectiveness of Ngāti Toa community resilience. However, this effectiveness is limited within a modern setting because of the lack of collaboration and partnerships. Colonisation caused the transition of Aotearoa into a European society, which forced Māori to adapt to new values and ideals, creating a disparity in their response capabilities. The changes in the natural and built environment and the suppression of Māori cultural identity made it difficult for Māori to effectively adapt their resilience strategies as they are heavily linked to their cultural identity. This disparity is further perpetuated within Ngāti Toa due to the low level of trust between the iwi and the Porirua City Council. This lack of trust stems from previous experiences where the Council engaged with Ngāti Toa at later stages of projects and failed to prioritise collaboration, resulting in a breakdown of communication and strained relationships.

Before the 2011 Christchurch earthquake, there was also a lack of collaboration between the Christchurch City Council and Ngāi Tahu. The government's past interactions with Ngāi Tahu concerning disaster response planning were minimal in terms of engagement and did not foster a robust and cohesive partnership designed to address the specific needs of the iwi. In response to the lack of prior engagement, Ngāi Tahu established the Māori Recovery Network within 24 hours of the Christchurch earthquake (Kenney et al. 2015). This response team was collaboratively established with Government ministries, local authorities, NGOs and various Northern iwi to facilitate a coordinated response to managing urgent disaster-related concerns (Kenney et al. 2015). Ngāi Tahu negotiated their involvement in the panel to ensure they had a say in the decision-making process of disaster response strategies and could influence the communication channels used. This collaborative approach enabled more effective communication between stakeholders, enhancing the coordination of logistical arrangements, including consolidating social and material resources. National inter-tribal networks were utilized to facilitate storing and transporting goods to Christchurch for efficient distribution to the community, resulting in immediate and comprehensive support (Kenney et al. 2015).

This collaborative approach enhanced the community's adaptive capacity as identifying problems and developing and implementing solutions occurred more rapidly. Collaborative engagement enhances social cohesion by building on community strengths and fostering inclusive decision-making processes. Focusing frameworks on these pre-existing strengths improves the likelihood of their use by the community. Furthermore, developing partnerships mitigates the potential of limited access to resources, social isolation, and inadequate infrastructure. If utilised correctly, collaborative engagement and partnerships enhance a communities response capabilities as trusted partners share specific response requirements. By involving Māori in the planning process and valuing their perspectives and experiences, trust can be built, leading to more effective disaster response and recovery. Table 13 provides specific guidance for achieving this for a Te Ao Māori community, which focuses on incorporating Māori cultural values into communication and information sharing. To effectively engage with the community, it is essential to have face-to-face interactions with appropriate leaders that are open, honest, transparent, and meaningful in their engagement. This engagement should start as early as possible in the planning process to ensure that Māori needs are thoroughly considered in response planning. By involving the community in this way, Māori cultural values can be better integrated into resilience frameworks, improving the community’s overall response to disasters by incorporating a more comprehensive range of perspectives and needs.

A significant criticism of the community resilience frameworks developed by the Wellington and Porirua City Council was the lack of proactive and holistic response planning. While both resilience strategies

aimed to address the immediate response needs of the community following an earthquake, they appeared to neglect the long-term sustainability of the community's resilience. Rather than investing in processes that enhance response capabilities and minimise disruptions, the response plans prioritised coping strategies until critical infrastructure is restored. This generalised the response strategies, which led to these frameworks failing to account for the unique needs of Māori in the Wellington region. Ngāti Toa recommended a more holistic planning approach that considers the community's well-being, social context, cultural diversity, economic state, spirituality, and environmental aspects to address this. Such strategies must be initiated proactively, enabling the root causes of vulnerability to be addressed rather than merely responding to emergencies as they arise. This will enable the community to build long-term resilience and sustainable solutions tailored to the local contexts and needs of Ngāti Toa. Furthermore, this initiative supports previously mentioned processes of diversifying response strategies through cultural integration and collaboration, which empowers Māori to actively participate in the response rather than rely on external intervention as a sole mitigation strategy.

It is also essential to reduce the dependency of Ngāti Toa on fragile infrastructure systems and by-passes the need to solve socio-economic depravity. The only mitigation process to achieve this and revive the resilient lifestyle of Ngāti Toa is by implementing collaborative engagement strategies that raise awareness of how Porirua's vulnerabilities affect them personally. Without this awareness, Ngāti Toa would not feel the need to prepare for an earthquake. General frameworks like the WENIRP are insufficient as they assume Ngāti Toa only values their need to restore critical lifeline services. Although Ngāti Toa depends on these services to sustain them, they are not the most valued process, as participants indicated that a greater focus is required to reunite them with their whanau. By raising awareness of how the vulnerabilities of Porirua affected them personally, participants will develop response strategies that address their needs without requiring a resolution for their socio-economic depravity and bypassing their dependency on modern infrastructure to sustain them. This means engineers can adopt more supportive roles to refine strategies suggested by Māori and empower them to produce solutions that adequately address their needs.

8.2.3 Integrating Māori Cultural Values

This research's key theme was identifying Māori cultural values that reflect the resilience principles proposed by Bruneau (2003) and Norris et al. (2007). A range of historical and contemporary Ngāti Toa principles related to community resilience was identified, enabling the development of a more holistic perspective of those concepts proposed by Bruneau (2003) and Norris et al. (2007). The principles identified range from cultural values, tikanga, kaupapa and mātauranga. Incorporating these principles is vital to improving their resilience as it promotes a more inclusive, culturally responsive, and interconnected approach to resilience building (Kenny et al. 2015). It enhances the adaptive capacity of response plans by

drawing on traditional Māori knowledge and practices derived from constant changes in the natural and built environment (Potini, 2022). This versatility promotes a more holistic and integrated approach to community resilience.

Kenny et al. (2015) highlight this approach's advantage to community resilience in their research following the 2011 Christchurch earthquakes. The research integrated Māori cultural values into the immediate response plan following the earthquake in collaboration with Ngāi Tahu. The main principle adopted for the response strategy was aroha nui ki te tangata which translates to love all people. The enactment of the Māori value aroha nui ki te tangata signalled that local Māori intended to support the entire community, not just the local Māori community (Kenny et al. 2015). Subsequently additional values were identified as necessities to uphold this value, such as kotahitanga, whānau, whakapapa, whakawhanaungatanga, marae, manākitanga, and kaitiakitanga. The specific use of whanaungatanga (relationships) enhanced communication linkages and the coordination of resources while reducing the duplication of services to the community (Kenny et al. 2015). Furthermore, using kotahitanga or unity paired with whakapapa links enabled the willing support of prepared whanau who can access response resources to less prepared individuals. Incorporating these values enabled a more rapid response as the coordination efforts were holistic and provided a pathway for Ngāi Tahu to be more actively involved in the restoration of Christchurch.

Māori knowledge values and practices are interrelated and actioned as cultural technologies to facilitate disaster risk reduction and community resilience, hence why integrating cultural values empowers Māori, especially Ngāti Toa. The principles identified in this research reflect the unique needs of Ngāti Toa. Although other iwi, hapū, and whanau may share similar values, their driving motivating principles vary depending on their local historical and contemporary experiences. It is important to note that integrating cultural values is not intended to replace existing literature on community resilience but rather to supplement it and enhance a community's response capacities, particularly those communities with a Māori presence. By harmoniously integrating Te Ao Māori community resilience with the traditional concepts proposed by Bruneau (2003) and Norris et al. (2007), communities' resilience can be bolstered.

8.2.4 Technological Solutions

After analysing the potential impacts of a seismic event on Porirua, the participants expressed their interest in incorporating disaster risk reduction technologies into future resilience strategies. The use of disaster risk reduction technology is a valuable tool that can be used to analyse data on previous disasters to identify patterns and improve response strategies for the future (Dawson et al. 2019). Creating the Ahi ka calculator shows the desire for technologically derived resilience strategies. The calculator provides a comprehensive analysis of Ngāti Toa resilience by identifying a range of strengths and weaknesses concerning the response

capabilities of the iwi. Moreover, using Ngāti Toa principles as indicators reinforces the integration of cultural values into resilience strategies and through a technological medium. This approach ensures consistent and ongoing support for Ngāti Toa in analysing their resilience levels, essential for sustainable resilience strategies. Ngāti Toa better understands their resilience capacities and develops more informed and practical approaches to disaster management and preparedness using this community resilience calculator.

The sudden onset of the Christchurch earthquake necessitated the rapid development and implementation of response strategies. Despite this urgency, technological solutions remained a top priority through the establishment of an earthquake information and advice service. Immediately following the earthquake, Ngāi Tahu listed their telephone number as an emergency contact centre for accessing assistance (Kenny et al. 2015). Ngāi Tahu provided telephonists with 24-hour coverage to ensure information was readily available, and support was constantly dispatched to address the wider community's immediate needs. More proactive strategies are also being collaborated on by Ngāi Tahu and other local stakeholders by integrating historical and epistemological knowledge into risk management strategies to enhance disaster preparation and aid in the rebuilding of Christchurch (CERA et al., 2012). Kenny et al. (2015) exemplify this strategy as Ngāi Tahu share their mātauranga of the local geological strata, which includes intergenerational knowledge about land composition, stability, and the location of underground watercourses. This information has been gathered and used to create a digital geophysical index, which will inform urban and rural planning, facilitate environmental sustainability, and contribute to community resilience throughout Canterbury (Kenny et al. 2015).

Culturally sensitive technologies promote Māori resilience through dynamic processes specific to the local conditions of iwi. This facilitates rapid urban recovery, social resilience, and regional sustainability. Developing technology through a culturally sensitive lens can support Māori decision-making processes and empower them by providing the necessary information to create targeted strategies and interventions to enhance their resilience.

8.2.5 Māori Models of Unity

The whare kai model is a Māori unity model specific to Ngāti Toa that describes the process of Whanau and Iwi coming together with the shared purpose of supporting each other. This model enables unity development without needing economic resources, as the Ministry of Social Development (2021) noted in its recommendations for developing social capital. The model enables the active involvement and participation of Ngāti Toa members within various disaster scenarios, regardless of their response capabilities. The whare kai model is initiated by the gathering of Ngāti Toa at their marae following a disaster. Community members come together at their ancestral home to support their whanau (family) by

actively participating in marae activities or simply being present to grieve together. Resilience is subsequently enhanced as the kotahitanga (unity) and whanaungatanga (relationships) are strengthened. This insight into the impact of hardships or disasters on Ngāti Toa reveals a fascinating phenomenon: an immediate increase in resilience despite disruption to the community, with whakapapa (genealogical ties) and whanau relationships being the key drivers. Whether it is a tangi or a disaster, the iwi quickly mobilises to support their whanau, setting aside any conflicts or grievances that may hinder their resilience. This approach enhances their initial response to manage an unfolding disaster and strengthens their long-term resilience by promoting trust and reliance on one another through shared experiences of hardship.

The social connectedness or unity of Māori is not limited to kinship connections (iwi, hapū, or whanau). Kenny et al. (2015) explain that when viewed through a Te Ao Māori lens, kinship connections extend to include their tribal homeland, which includes both the physical and social elements of the environment. Ngāi Tahu illustrates this further through their collaboration with Environment Canterbury in developing new environmental initiatives that address iwi resource protection. The Mahanui Iwi Management Plan brings together cultural conservation practices and statutory responsibilities to help ensure the sustainability of natural resources in the Canterbury region (Environment Canterbury, 2013). This sustains community resilience through the long-term availability of natural resources. The process of sustainable environmental management is community led and is a collective responsibility held by Ngāi Tahu as kaitiaki (guardians) of the region. This moral obligation is imposed on iwi regardless of social position, subsequently promoting the well-being of the environment, land and people following disasters. An array of Māori models of unity is context specific to the local environmental (social and natural) conditions of each iwi, hapū, and whanau within Aotearoa. Identifying and integrating these processes into community resilience frameworks will provide Māori additional alternatives to developing resilience through culturally appropriate mediums that address their needs while considering their response capabilities.

8.2.6 Retrofitting Marae

Building upon the Porirua City Council's utilisation of community hubs as a resilience strategy, participants recommended the retrofitting and mobilising marae as support centres. This includes equipping marae with abundant resources and technologies to support the well-being and recovery of the iwi following an earthquake. Marae is a refuge for Ngāti Toa, where their traditional values and principles are upheld. For Māori, the strength of marae lies in the shared experiences of hardships among whānau members, strengthening their unity. As a physical gathering place, the marae supports the community's physical needs while serving as a spiritual sanctuary, strengthened by the connections established through whakapapa relationships. Marae, therefore, creates a sense of connectedness, belonging and unity that promotes the well-being of Māori. If marae is enhanced with the appropriate technology, they can rapidly mobilise

resources and responses for their community following disasters. These experiences will lead Māori to congregate in their ancestral homes following a disaster, which enables the marae to become a place of refuge and fellowship that will support the immediate needs of iwi while providing a space to share resources.

Following the aftermath of the 2011 Christchurch earthquake, the Ngāi Tahu marae Rēhua was designated an Earthquake Recovery Assistance Centre, while the Ngā Hau E Wha marae became an outreach hub for displaced government agencies, the banking sector and various community organisations (Te Puni Kōkiri, 2011b). These marae were appropriately designated as an assistance centre and outreach hub because the marae is a physical place for the community to gather and a spiritual space of safety. Ngāi Tahu eventually opened an additional 12 marae for shelters for displaced residents to provide extended hospitality and support to the broader community (Kenny et al. 2015). This supported a sense of connectedness that promoted the community's well-being and enabled a rapid mobilisation of disaster responses. These localised community hubs became regular locations for debriefing meetings to ensure that community needs and issues and alterations to logistical arrangements were communicated to responders (Kenny et al. 2015). The wider community was subsequently regularly updated about response initiatives through the marae, which led to delivering food, water, and other necessities to over eighteen-thousand households in Christchurch (Solomon, 2012). The essential needs and requirements would not have been met if the marae had not been utilised as community centres.

The Māori approach to disaster management can be characterised as community-led and community-centred, with marae at the centre of these initiatives. Marae is the default emergency shelter for Māori because of the historical relationships developed and strengthened there. However, many maraes may not have sufficient resources to manage many people who require aid during an emergency. Therefore, it is crucial to retrofit marae with the capacity to support the broader community following a disaster. This will help the community to adapt their responses to suit changes in the environment (natural and built) and meet the specific needs of the people in both a social and physiological context. Furthermore, this addresses Ngati Toa's dependencies on fragile infrastructure systems and critical lifelines. Retrofitting marae creates a self-sufficient community that supports Ngati Toa in reviving the hazard-resilient lifestyle lost due to colonisation but also sustains the long-term preparation and response to a disaster.

8.2.7 Overview

This thesis sought to analyse the traditional perspectives of community resilience and compare these to perceptions held by Māori. The guiding principles influencing these perspectives are science and mātauranga Māori, respectively. Compared to science, mātauranga Māori extends beyond Māori knowledge to include culture, values, and worldview. However, Hikuroa (2018) claims that mātauranga is

ignored or disregarded by the scientific community because it seems to comprise mere myths and legends. However, mātauranga Māori includes knowledge generated using techniques consistent with scientific methods but explained according to a Māori worldview. Within this mātauranga lies a range of knowledge depicting traditional and modern Te Ao Māori resilience processes. Differentiating this resilience is not aimed at invoking a paradigm shift of community resilience literature; instead, it aims to support the claims of Norris et al. (2008), where community engagement is needed to identify the differences in needs, vulnerabilities, and strengths between different groups within a community. Te Ao Māori resilience merely conveys the processes of resilience employed by Māori to meet their disaster management and preparedness needs.

Therefore, their resilience can be raised by merely engaging with Māori to understand their needs. Integrating mātauranga Māori describes the collaborative approach required to identify Māori needs and develop processes that meet them. The existing resilience processes and those employed historically by Māori reflect their needs within the context of the state in the natural and built environment of the time. Because of this, the researcher of this study claims that there is no difference between Māori and traditional community resilience. There is only community resilience. The specific processes and practice of resilience have been adapted to suit the community's specific needs concerning the subsequent changes in the community's local built and natural environment. Norris et al. (2008) proposed that community resilience frameworks must address equity and social justice issues by considering a community's social, economic, and political contexts. To improve equity, Norris et al. (2008) emphasised the need for community engagement and recognition of the differences in needs, vulnerabilities, and strengths between different groups within a community. Through this recognition, decision-making in the resilience-building process can better reflect the community's needs. Hence, community resilience merely pertains to the capacity of a community to effectively fulfil its needs during a disaster in the manner most suitable to its unique circumstances. Through this analysis, several key learnings can be utilised to improve the resilience of Ngāti Toa and potentially another iwi, hapū, and whanau throughout Aotearoa.

Chapter 9 – Conclusion

This chapter summarises the outcomes of researching the possibility of integrating Te Ao Māori community resilience into traditional resilience frameworks. This chapter will summarise the key barriers and opportunities in integrating Te Ao Māori resilience into modern resilience frameworks. The critical findings of this research will be evaluated against the research questions to show how the questions are addressed. Finally, it has covered several suggestions for enhancing the resilience of Māori communities throughout Aotearoa.

9.1 Overview of Key Outcomes

This study has taken a qualitative approach to meet the aim of this research: **to conduct a critical examination of the historical and current perspectives of resilience among the local Iwi Ngāti Toa, which will yield insights into the future of Te Ao Māori resilience by informing how mātauranga, tikanga, and kaupapa Māori can be integrated into community resilience frameworks**. This research studied community resilience literature within the context of Aotearoa in the Wellington region. The definition of community resilience and the primary factors that influence it were established. This provided insights into the primary methods for measuring and building community resilience. This informed the questioning used to derive the historical Te Ao Māori community resilience principles employed by the local iwi Ngāti Toa in the city of Porirua within the Wellington region. A realistic earthquake scenario was posed to the iwi to identify the existing Ngāti Toa perspectives of community resilience. This depicted the current understanding of Ngāti Toa's community resilience and their knowledge of the local vulnerabilities of their communities. This informed the measures that Ngāti Toa would develop to enhance their resilience while addressing their needs following a disaster. This information was used to provide recommendations on processes that can be used to enhance the community resilience of another iwi, hapū, and whanau nationwide.

9.1.1 Research Question: What are the vulnerabilities and community resilience principles utilised within Porirua, a city in the Wellington region of New Zealand?

It was identified that the Wellington region is highly susceptible to earthquake hazards due to various factors. Porirua is situated on steep hillsides, which can cause landslides and rockfalls following an earthquake. Additionally, the Wellington Fault directly runs under the city, making it vulnerable to a 7.5 magnitude earthquake, identified by the civil defence as a probabilistic scenario that could strike the Wellington region in the foreseeable future. Porirua is also at risk of liquefaction, which can cause significant damage to buildings and infrastructure. Most of the city is on the coast and is at risk of a significant tsunami following an earthquake. The soft, loose sediments the city is built on can amplify the

effects of ground shaking. The city's population density, infrastructure concentration, and significant socio-economic status disparities make it vulnerable to earthquakes. Furthermore, the city's multicultural population, particularly Māori and Pacific communities, is likelier to experience disruptions to their homes, employment, and social networks following an earthquake.

A standardised approach was adopted to address these vulnerabilities of Porirua. Resilience concepts proposed by Bruneau (2003), Norris et al. (2007), and Maslow's Hierarchy of Needs (1943) were employed to address Porirua's needs. These include robustness, redundancy, rapidity, resourcefulness, adaptability, economic development, social capital, information and communication, community competence and the sequential fulfilment of individual community needs (physiological, safety, love and belonging, esteem, and self-actualisation). However, it was identified that the specific frameworks designed to address these vulnerabilities, Porirua City Council Earthquake Response Plan and WENIRP, failed to adequacy incorporate those principles proposed by Bruneau (2003), Norris et al. (2007) and Maslow (1943). The frameworks primarily focused on the initial response of Porirua following the disaster. Investment strategies focused on reactively preparing instead of employing proactive interventions to limit disruptions. Strategies included designating community hubs and providing essential information to self-govern their response strategies. However, this proved inadequate as participants indicated low preparedness and capabilities to respond effectively to the earthquake.

The frameworks utilised for Porirua failed to address the needs specific to Porirua following an earthquake. This led to the creation of inequitable frameworks, exacerbated further by the limited participation of Ngāti Toa. The frameworks failed to consider the resilience capabilities and perspectives of Ngāti Toa, which led to insufficiently incorporating their Māori cultural values and practices into the design and implementation of these frameworks. It was also identified that Ngati Toa lacked trust in the government's resilience strategies and indicated that Porirua is ill-prepared to respond to and manage a disaster effectively. This exacerbates the vulnerability of Porirua due to the divide caused by a lack of engagement and trust between the different constituents within the community.

9.1.2 Research Question: What were the historical Te Ao Māori resilience processes employed by Ngāti Toa?

A variety of waiata, whakataukī, whakairo, and pūrākau was evaluated to determine the historical resilience processes of Ngāti Toa. It was identified that education on disaster risk reduction using traditional Māori knowledge or mātauranga. Emergency response training began early and involved transmitting roles across generations, incorporating observational learning to prepare individuals for future responsibilities. Ignorance in disaster response training often led to death. Therefore, members within Ngāti Toa were competent in disaster response strategies.

During pre-colonial and post-colonial times in Aotearoa, Ngāti Toa was in a constant state of war, resulting in adopting a hazard-resilient lifestyle that required them to be in a state of preparedness at all times. To ensure survival, Ngāti Toa members had to possess diverse skills such as building, hunting, gathering, weaving, and fighting, which were mandatory for a good quality of life and survival. The constant state of preparedness of Ngāti Toa underscores the importance of community competence and holistic and proactive disaster preparedness, which supports a hazard-resilient lifestyle, making community resilience more than just a framework but a way of life.

The survival of Ngāti Toa depended on partnerships and alliances, an essential principle for developing community resilience for Māori. Modern challenges require innovative solutions that extend beyond the capacity of Māori, and partnerships can provide ongoing support and resources to address complex needs. By leveraging collective expertise and resources, communities can develop approaches that reflect their needs and address complex issues.

Employing technology was crucial in Ngāti Toa's conquest of their new ancestral home in Kāpiti. Ngāti Toa utilises suitable technology to anticipate, mitigate, and handle disasters is essential for enhancing their community resilience. Technology can help identify threats, facilitate communication and coordination of response planning, and promote greater unity through technological mediums to improve disaster management preparation. Te Rauparaha would not have been able to conquer Kāpiti without the introduction of technology by Pakeha.

Implementing community resilience within Ngāti Toa depended on integrating Māori cultural values specific to their iwi. These values included mātauranga (knowledge & technology), kotahitanga (unity), kaitiakitanga (guardianship), whanaungatanga (relationships), rangatiratanga (leadership), and mahia te whare (fostering capabilities). These principles addressed the specific needs of Ngāti Toa in a disaster and aided in the development of sustainable long-term resilience that adapted to constant changes in the natural and built environment.

9.1.3 Research Question: What are the existing community resilience perspectives and processes used within Ngāti Toa?

A significant issue identified within Ngāti Toa is the lack of awareness of the vulnerability of Porirua to earthquake hazards and the lack of disaster response plans to address these vulnerabilities. Strategies to intervene and prepare Ngāti Toa have inadequately raised the extent of damage an earthquake is expected to cause. The wānanga raised these issues to Ngāti Toa. When the extent of the expected damage caused by an earthquake was understood, strategies were immediately developed to address these vulnerabilities and the needs of the Ngāti Toa community.

Ngāti Toa resilience is characterised by unity, focusing on community-led processes where responsibilities are shared collectively. Participants disagree that economic development is first required before social capital and community resilience can be developed. This perspective is held because the primary strength of Māori is their unity, which has been developed without using economic resources. The whare kai model is a definitive process used with Ngāti Toa that underpins this unity and describes the primary process used to develop community resilience. The whare kai model is unique to Māori and involves Whanau and Iwi coming together to support each other during a tangi. Tasks are delegated naturally without formal delegation, and specific responsibilities are passed down through generations. Each Mātauranga supports the grieving family and ensures the tangi operates according to appropriate Tikanga and Kaupapa. Active participation in the marae develops skills relevant to disaster risk reduction, including hangi preparation, kai moana gathering, traditional construction methods, carving, food preparation, hunting, and management skills. Ngāti Toa did not have specific response strategies for an earthquake. However, Ngāti Toa indicated that the immediate response following the earthquake would be congregating at the marae and initiating their long-held cultural tradition of the whare kai model.

No detailed response plan could be derived as it would require the coordination and participation of all iwi members with the relevant Mātauranga needed to respond to the earthquake effectively. However, Ngāti Toa participants indicated that the response strategy to an earthquake involves reuniting families, assigning a leadership panel, securing personal resources, congregating at a marae, securing communication with civil defence planners, designating responsibilities, supporting emergency response services, enhancing community safety, establishing travel routes, providing financial assistance to vulnerable groups, following government instructions, establishing school and work opportunities, and organizing wānanga for recovery planning and unity.

The primary community resilience processes and perspectives employed by Ngāti Toa were translations of the concepts proposed by Bruneau (2003) into corresponding Māori principles. Robustness was redefined as mana (power), which is integrated throughout the design holistically by sustainable sourcing of local materials, using relevant technical & cultural knowledge, and adhering to appropriate spiritual customs. Redundancy was redefined as mana motuhake (self-determination), where the primary process used to implement it is personal redundancy plans. Rapidity was redefined as kotahitanga (unity), implemented by sharing responsibilities and creating a collective purpose. Resourcefulness was redefined using a variety of principles, including kaitiakitanga (guardianship) and whakatika te he (accountability). The development of resources (supplies, equipment, and trained personnel) is a personal responsibility and a moral obligation as kaitiaki (guardians) to manage the environment to sustainably source resources. Adaptability was

redefined using the Ki wai wiwi ki wai wawa (flexibility), which describes the need for plans to adjust to changing circumstances and adapt their strategies to overcome these challenges.

The principles proposed by Norris et al. (2007) were also translated into corresponding Māori principles to indicate the existing community resilience perspectives and processes within Ngāti Toa. Economic development was redefined as kia takatu tatou (enhanced well-being), which describes holistic wealth through long-term sustainable mental, physical, economic, and social development. Social capital was redefined using the principles of kotahitanga (unity) and Whanaungatanga (relationships). These principles describe forming and enhancing relationships to foster a sense of belonging that enhances the trust between whanau members. Information and communication were redefined using a variety of principles, including na te kakano (from the seed), kei mou mou taima (open and meaningful), and ko te tumanako (transparent). These principles describe the need for engagement processes to be face-to-face with appropriate leaders that are open, honest, transparent, and meaningful. This engagement should start at the earliest possible stage. Community competence was redefined as mahia te whare (fostering capabilities), where the iwi supports the development of individual response skills to ensure the collective capacity and capability are enhanced.

9.1.4 Research Question: What measures should be taken to optimise the community resilience of Ngāti Toa?

Several measures need to be taken to optimise the community resilience of Ngāti Toa. Firstly, principle-based community resilience frameworks should be implemented as they are flexible and adaptable. Principle-based resilience reflects the Te Ao Māori worldview as it supports integrating Māori cultural values, which addresses the specific needs of Ngāti Toa. A more holistic planning approach is recommended that extends beyond the response phase of disaster management. Frameworks developed for Ngāti Toa should consider implementing resilience strategies that support the well-being, social context, cultural diversity, economic state, spirituality, and environment of Ngāti Toa. This holistic preparation can be achieved by incorporating Māori cultural values into community resilience building. Collaborative engagement is recommended as a strategy to optimise the resilience of Ngāti Toa as it enhances their adaptive capacity and response capabilities. Collaborative engagement will lead to more effective disaster response and recovery by directly addressing their needs through face-to-face interactions with appropriate leaders that are open, honest, transparent, and meaningful. The incorporation of Māori models of unity, like the whare kai model, is also essential as it is a primary strength of Ngāti Toa.

Furthermore, marae should be retrofitted and mobilised as support centres to enhance the response and recovery capability of the Ngāti Toa following a disaster. Marae is a refuge for Ngāti Toa as it is a physical gathering place that supports their physical needs while serving as a spiritual sanctuary, strengthened by

the connections established through whakapapa relationships. Therefore, retrofitting marae to improve their response capabilities will enhance the resilience of Ngāti Toa. They will naturally congregate in these places following a disaster. Here, their significant vulnerabilities of socio-economic depravity can be addressed by providing a location to share resources and utilise existing resilience technologies or strategies integrated into the upgraded marae. Finally, disaster risk reduction technology should be used to improve response strategies for future seismic events in Porirua. In collaboration with Ngāti Toa, a vulnerability matrix and community resilience calculator were developed. These tools identify the strengths and vulnerabilities of individuals in the community and provide a baseline for tracking progress and evaluating existing efforts. Ngāti Toa can use this information for targeted interventions and disaster management, enhancing their resilience capacities. The calculator specifically empowers the decision-making processes of Ngāti Toa as the technology is developed with a culturally sensitive lens that supports targeted strategies and interventions to enhance their resilience.

9.2 Recommendations

The historical and current perspectives of Te Ao Māori community resilience were analysed within the context of the iwi Ngāti Toa. These perspectives informed of measures to enhance their resilience and address their unique needs following a disaster. This section will suggest recommendations to enhance the resilience of another iwi, hapū, and whanau in Aotearoa.

- Ngāti Toa is reliant on infrastructure systems to sustain them in a disaster. With high socioeconomic depravity within Māori communities, their response options are limited if infrastructure systems are disrupted. Engagement strategies must raise awareness within Māori communities of how disasters will affect them personally. If done correctly and culturally appropriately, Māori will develop strategies that address their needs and vulnerabilities in a disaster without requiring a resolution for their socio-economic depravity. Raising awareness will also mitigate the need for engineers to be culturally competent in Māori tikanga to ensure disaster response plans consider their values.
- Many iwi, hapū and whanau may be unaware of their communities' vulnerabilities to various hazards. The lack of awareness leads to response frameworks that do not adequately address the needs of Māori in a disaster. This is further exacerbated by the socio-economic depravity of Māori, which often means Māori cannot address these vulnerabilities when their immediate needs are physiologically derived. Resilience strategies should aim to improve engagement methods to raise awareness of vulnerabilities in Māori communities. Raising awareness using a culturally appropriate method will ensure response strategies reflect the needs of Māori and address their vulnerabilities through their active involvement.

- Principle-based community resilience frameworks will bolster the resilience of Māori communities following disasters, as these frameworks are more flexible and adaptable. The iwi Ngāi Tahu's response to the 2011 Christchurch earthquake exemplifies how principle-based resilience can be implemented, as they used traditional principles specific to their iwi to address the community's needs. Principle-based resilience reflects the Te Ao Māori worldview, and implementing such frameworks will benefit another iwi, hapū and whanau in Aotearoa, as traditional Māori principles govern these communities.
- Further investigation into a more holistic planning approach to implementing community resilience is recommended by considering the unique needs of Māori, including cultural integration and collaboration. Collaborative engagement enhances the community's adaptive capacity and response capabilities, leading to more effective disaster response and recovery. It is essential to involve Māori in the planning process early on and have face-to-face interactions with appropriate leaders that are open, honest, transparent, and meaningful in their engagement. The initiative should focus on long-term resilience and sustainable solutions tailored to the local contexts and needs of the Māori.
- The incorporation of Māori cultural values into community resilience building is recommended. Integrating Te Ao Māori community resilience with traditional concepts proposed by Bruneau (2003) and Norris et al. (2007) can enhance a community's response capacities, particularly those communities with a Māori presence, by drawing on traditional Māori knowledge and practices. The principles identified in this research reflect the unique needs of Ngāti Toa but could be applied to another iwi, hapū, and whanau with similar values.
- The use of disaster risk reduction technology is recommended to improve response strategies for future seismic events in Porirua, as demonstrated by the creation of the Ahi ka calculator for Ngāti Toa. Culturally sensitive technologies should be developed to promote Māori resilience and empower decision-making processes for targeted strategies and interventions that enhance resilience.
- Māori models of unity, like the whare kai model, should be investigated and implemented. Unity is a primary strength of Māori that promotes resilience, but each iwi, hapū, and whanau have models unique to their local conditions. Using kotahitanga, whanaungatanga, and other Māori models of unity will address the unique needs of Māori while integrating their strengths to optimise their response capabilities. This approach enables the active involvement and participation of Ngāti Toa members within various disaster scenarios, regardless of their response capabilities, and sustains the long-term resilience of the community.

- The final recommendation of this research is to enhance the resilience of Māori communities by retrofitting and mobilising marae as support centres to enhance the response and recovery capability of the community following a disaster. Marae can serve as physical and spiritual sanctuaries that strengthen the community's unity and promote well-being. The Māori approach to disaster management is community-led and community-centred, and marae plays a central role. Retrofitting marae with adequate resources and technology will enable them to rapidly mobilise resources and respond to the community's needs following a disaster.

9.3 Areas for Further Research

This study examines the opportunity and challenges of integrating the Te Ao Māori worldview into community resilience frameworks. However, the results only analyse the mātauranga, tikanga, and kaupapa specific to the iwi Ngāti Toa. Further research could include evaluating each iwi, hapū, and whanau within Aotearoa, as there will be variations in processes specific to their local conditions. Evaluating these variations in processes and principles will improve community resilience frameworks to ensure the specific needs and vulnerabilities of Māori are accurately addressed.

Future research should aim to address the socio-economic depravity of Māori. Improved engagement strategies should be developed to raise awareness of different disasters in communities in Aotearoa. If Māori are involved in a culturally appropriate manner, they will lead the design of resilience strategies that adequately address their needs and vulnerabilities.

9.4 Conclusion

The history of Ngāti Toa has seen resilient practices weaved into the very fabric of their culture. This provides an opportunity to reimagine how community resilience is practised within New Zealand and how the frameworks created for Māori can more accurately address their needs and vulnerability. Te Ao Māori community resilience has survived through the oral transmission of waiata, whakataukī, and pūrākau but requires deciphering to understand how it was practised within the culture entirely. Māori have a complex understanding of their communities' vulnerabilities. They developed unique methods to mitigate, prepare, respond, and recover from disasters, naturally incorporating the foundational principles of community resilience without directly defining them. Deriving this information from a people so aligned and immersed in nature is the knowledge required to improve existing disaster response frameworks and expand the fundamental knowledge of community resilience, which will provide an equitable pathway for vulnerable communities to participate using the methods that best accommodate their needs. Identifying and weaving Māori and traditional community resilience practices together will enable communities globally to live in harmony with nature regardless of the changes that may occur. Community Resilience

is not a switch for Māori activated in emergencies but a lifestyle refined and expanded through generational additions of individual Mātauranga. Therefore, why not derive frameworks from those who practise them so regularly and effortlessly?

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Appendix

Appendix A: Calculator Summary

Table 18: Resilience Calculator - Summary of Calculator Components

Controllability level	Disaster Cycle Phase	Variable	Variable Subdomain	Definition	Indicator
1	Mitigation	Resilient Housing	Robustness	Housing has the structural capacity to withstand disaster event	- Year of construction (2004 building act – any house built to these standards) - Detailed LIM report – a collation of information on the property, including history and upgrades - Location of the house concerning natural environment (slope, low-lying coastal area, fire zone, earthquake hazard zone, flood zone, community boundary) - Simplified method: the house is not an unreinforced masonry building and was built before
1	Mitigation	Affordable and uncrowded houses	Economic development	The capacity of a community to provide affordable housing which is not crowded	- Low community decile score on the New Zealand Index of Deprivation scale (NZDep 2018) - Low on the housing affordability index - Either no kitchen, no plumbing, high cost, or overcrowding - Simplified method: High room-to-people ratio, renting, and low income - The employment rate in the city
1	Mitigation	Crime & Conflict reduction	Social Capital	The development of social cohesion and unity through the	- Crime rate - The trend in crime rate - Self-assessment - Simplified method: the sense of safety and willingness to interact

				reduction of crime	with neighbours/community
1	Mitigation	Secure community food and water supply	Resourcefulness	The capability of a community to provide and sustain access to safe and sufficient food and potable water	- Number of grocery stores per 1236 people (average population size of community) - Number of grocery stores per 132km^2 (Average size of the community in New Zealand) - Simplified method: number of grocery stores in the community
2	Mitigation	Well-being and preventative health care	Social Capital	Good physical and mental health	- High well-being score for community - Median income earner - High community trust index - Homeowner - Three meals are eaten a day every week - Self-reported excellent or excellent health - A low number of mental distress and health disorders - Simplified method: self-assessment
1	Mitigation	Access to health services	Robustness	Equitable, quality, and accessible pre-hospital (EMS), emergency, primary, speciality, and long-term medical and mental, and behavioural health care, including the inpatient and outpatient treatment of urgent and chronic medical and mental, and behavioural health conditions.	- Number of resilient hospitals/health centres in the community that can operate post-disaster event - Affordable consultation fees for health facilities

2	Mitigation	Number of relatives near	Adaptability, Community Competence, and Social Capital	The number of people considered family within travelling distance of household who would support post-disaster	- Number of relatives outside of the household but within the community
1	Mitigation	Access to Financial Services	Economic Development & Resourcefulness	The ability to access financial resources and services post-disaster	- Number of bank branches in the community that can operate post-disaster and distribute cash
1	Mitigation	Relevant technical risk assessment	Information & Communication and Adaptability	Qualified technical risk assessment of relevant disaster being planned for and access to that information	- Number of technical assessments conducted - Access to information (knowledge of technical assessment)
2	Mitigation	Mātauranga; Relevant community risk assessment	Information & Communication and Adaptability	Participation in local community disaster planning	- Number of community assessments conducted
2	Mitigation	Kaitiakitanga; sustainable environmental management	Robustness, Resourcefulness and Adaptability	The active practice of saving water, energy, and materials to reduce negative environmental impacts	- Self-assessment
2	Mitigation	Access to naturally sourced food & water	Resourcefulness, Community Competence, and Adaptability	The ability to obtain safe food and water from natural sources within the community	- Number of natural food sources available to the community - Community's ability to access natural resources
1	Mitigation	Access to critical infrastructure (development and maintenance)	Robustness	Access to relevant critical lifeline infrastructure on a day-to-day basis	- Robust electricity supply to the community with appropriate backup systems - Robust 3-water infrastructure with appropriate backup systems - Robust telecommunication

					service with appropriate backup systems - Low timeline for restoration of lifeline
1	Mitigation	Transportation (services and infrastructure)	Adaptability	The capacity of a community to allow for safe and efficient movement of persons or resources around, into or out of an area.	- The number of operational public transport services (buses, uber, taxis, etc.) - Number of alternate transport methods, including public e-bikes and scooters - Number of cars per household
1	Mitigation	Emergency services	Rapidity and Resourcefulness	The capacity of emergency services to respond to the widespread need in the community	- Number of emergency service facilities in the community
1	Mitigation	Zoning and land use management	Redundancy and rapidity	Regulated or reserved areas for the use of disaster response	- M^2 of land reserved for disaster response - Self-assessment (reduction of environmental risks, conserving natural resources, supporting economic stability, and enhancing community health)
1	Mitigation	Secure communication channels	Information & communication, redundancy, adaptability	The capacity of a community to provide secure communication pre and post-disaster	- Number of direct communication lines within the community to civil defence channels - Number of radio devices - Number of active social media channels distributing DRR information - The ratio of community population to defence media channels following
2	Mitigation	Income or asset identification and protection	Robustness	The capacity of a community to provide	- Self-assessment
3	Preparation	Inclusion of minority and vulnerable groups in planning	Adaptability and Community Competence	The inclusion of underrepresented, minority, and impoverished	- Number of active participation of women and children in planning - Expansion of plan to include neighbours

				groups within the planning	- Sourcing information outside of the cultural norm - Simplified method: self-assessment
1	Preparation	Distribution of relevant DRR information	Information & Communication and Rapidity	Access to relevant resources and information related to the disaster. Both technical resources and community-led information	- Number of communication channels distributing DRR information
3	Preparation	Secure Individual food and water supply	Resourcefulness & Redundancy	The capability of an individual/household to store food and potable water	- Quantity of food (Kg) and water (L) - The number of days food and water storage will sustain
2	Preparation	Community response plan	Information & communication and Rapidity	The development and awareness of a community response plan for a disaster	- Several response plans relative to disaster (evacuation plan, disaster hub management plan, communication plan etc.) - Awareness of the response plan - Timeline of review of the plan
1	Preparation	Emergency critical infrastructure backups	Redundancy & Resourcefulness	Access to critical lifelines, necessities, and emergency resources	- Ownership of personal water storage, generator, pumps, lighting, power tools, etc. - Neighbours' ownership of personal water storage, generator, pumps, lighting, power tools, etc.
2	Preparation	Education of DRR and health & safety	Community Competence and Information & Communication	The capacity of a community to provide relevant educational services on DRR and preparedness	- Number of courses of DRR and preparedness offered in the community - Attendance % of DRR and preparedness courses - Self-assessment on personal education in DRR and preparedness

3	Preparation	Living a hazard-resilient lifestyle	Community Competence and Information & Communication	Actively practising, preparing, and staying informed on the relevant information required for DRR	- Self-assessment (awareness of up-to-date assessment DRR information, updating personal response plan, educating family, strengthening connections with neighbours)
2	Preparation	Resilient Education System	Robustness	Stable educational services, to open schools, and maintain academic programs and extracurricular activities that can operate post-disaster event	- The pupil-to-teacher ratio at public schools - Number of graduating students from high school - Distance of school to home - Number of schools in the community - Number of schools to children population ratio
3	Preparation	Living and promoting healthy lifestyles	Community Competence & Adaptability	Protection of health by living healthy lifestyles, disease and injury prevention, and detection and control of infectious diseases	- Promotion of healthy living in the community - Number of smokers - Number of physically active
2	Preparation	Leadership delegation & volunteering capability	Adaptability and Social Capital	The assignment of leaders pre-disaster event and delegation of subsequent responsibilities to individuals involved in post-disaster response	- Self-assessment - Community leadership panel for disaster response
2	Preparation	Partnerships for DRR and recovery	Social Capital, Adaptability, and Community Competence	The collaboration with either industry-led DRR services or local community members to aid in immediate	- Number of agencies that will mobilize post-disaster - Number of agencies in planning and response plans

				post-disaster response and recovery	
1	Preparation	Early warning systems	Adaptability, Information & Communication	Relevant technology to warn and disseminate appropriate information pre and post-disaster event	- Number of early warning systems and disasters they cover - Number of social media outlets distributing DRR information
2	Preparation	Development and review of community recovery plan	Information & Communication, Rapidity, and Social Capital	The development and awareness of a community recovery plan with a subsequent review of pre-disaster preparation	- The number of plans developed for the community (including building back better plans, etc.) - Plans annually reviewed
3	Preparation	Disaster equipment and medical supplies	Resourcefulness	The capability of an individual/household to store medical supplies and equipment relevant to disaster response	- Quantity of medical supplies stored - Quantity of equipment relevant to disaster response stored
1	Preparation	Community disaster equipment and medical supplies	Resourcefulness	The capability of a community to secure medical supplies and equipment relevant to disaster response	- Quantity of medical supplies stored - Quantity of equipment relevant to disaster response stored - Number of pharmacies in the community - Number of building retail stores in the community
3	Preparation	Volunteering	Community Competence	The development of opportunities for the community to participate in disaster response programs	- Number of community programs specific to disaster response - Number of participants in disaster response programs - Number of partnerships with the community that specialize in disaster response

1	Preparation	Temporary shelter and settlement camps	Adaptability, redundancy	The capacity of the community to provide temporary shelter and housing following the initial impact of the disaster	- Number of community hubs in the city - Number of resilient housings in the community
3	Preparation	Kotahitanga and Whanaungatanga development	Social Capital	The capacity of the community to develop and maintain relationships and unity in the community	- Number of social spaces in the community - Number of community events held annually - Community trust index
3	Preparation	Seismically secure house	Robustness	The development of a seismically secure household by the homeowner	- Self-assessment (furniture secured to the wall, etc.)
2	Preparation	Support services	Social Capital	The capacity of a community to provide support services post-disaster	- Number of counselling services available post-disaster
2	Preparation	Temporary Housing	Redundancy	The capacity of a community to provide temporary housing during the recovery and reconstruction of the community	- Number of social housing available to the community - Number of hotels & motels in the community
2	Preparation	Community Competence	Community competence, resourcefulness	The capacity of a community to provide relevant training in disaster risk reduction skills	- The number of training programs offered to the community (fire warden, first aid, operator license, labouring skills, etc.) - Higher education institutions in the community - Schools in community - Scholarship and funding to provide training

Appendix B: Resilience Classification Scheme

Table 19: Resilience Calculator - Resilience Scale

Score (%)	Level	Category	Description
0-20	1	Minimal Community Resilience	Inability to prepare for, respond to, and recover from disruptive events, leading to significant loss of life and property damage.
21-40	2	Low Community Resilience	Low capacity to prepare for, respond to, and recover from disruptive events, but is still vulnerable to significant loss of life and property damage.
41-60	3	Moderate Community Resilience	Developing some capacity to prepare for, respond to, and recover from disruptive events can somewhat mitigate the impact of such events.
61-75	4	Acceptable Community Resilience	The minimum level of resilience required to prepare for, withstand, adapt to, and recover from disruptive events, to prevent significant loss of life and minimise the impact on the community's well-being and livelihoods.
76-90	5	Desired Community Resilience	The ability to prepare for, withstand, adapt to, and quickly recover from disruptive events, minimizing the impact on the community's well-being and livelihoods.
91-100	6	Resilient Community	The ideal state is to prepare for, withstand, adapt to, and recover from disruptive events, focusing on minimizing the impact on the community's well-being and livelihoods and achieving long-term sustainability.

Appendix C: Controllability Matrix

Table 20: Resilience Calculator - Controllability Matrix

Level	Description
1	Low controllability. Minimal options within individual control to influence/improve the state of the variable
2	Moderate controllability. Multiple options within individual control to influence/improve the state of the variable

3	High controllability. A wide variety of options individuals can implement to improve the state of the variable

Appendix D: BRANZ Earthquake Zones Map

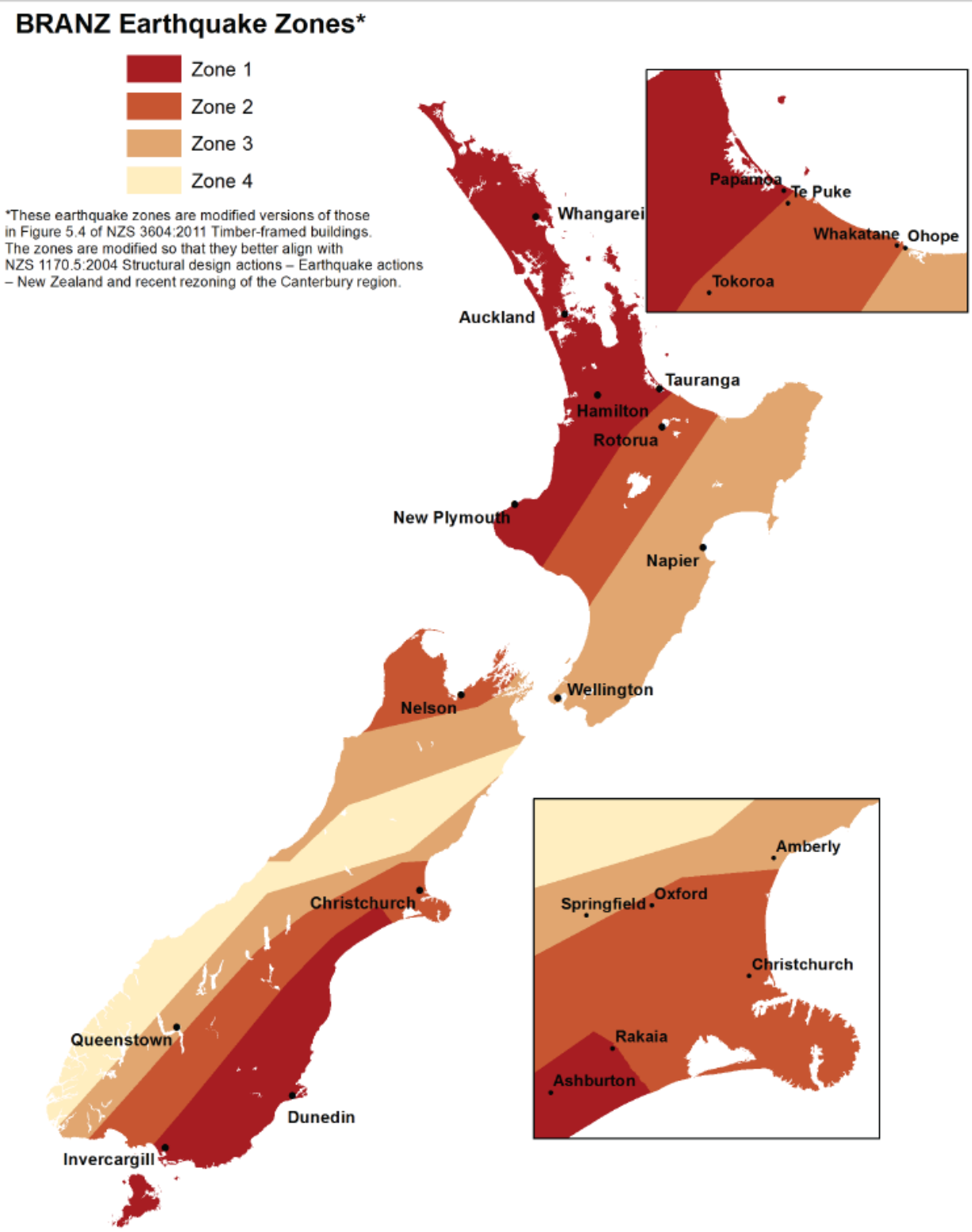

Figure 16: BRANZ Earthquake Zones Map

Appendix E: Porirua City Resilience Baseline Summary

Table 21: Baselining Porirua City Resilience

Variable	Score (1-5)	Description
Crime & Conflict reduction	3	The crime rate of Porirua is measured by the number of crimes reported to the police per 10,000 people. In the year ending June 2021, the crime rate for Porirua was 102.9 per 10,000 people. This was higher than the national average of 77.5 per 10,000 people—New Zealand Police and Council Plan in place to reduce this.
Community food and water supply	3	The city's water supply is regularly monitored and tested to meet national drinking water standards. Emergency water supply is also expected to be operational eight days following a seismic event. Three significant supermarkets are nearby (New World, Countdown, and Pak'n Save). However, these are located in the CBD, which is expected to be destroyed. There is also a large number of convenience stores within the community.
Access to health services	2	There are eight health clinics within Porirua. However, only one (Kenepuru Hospital) has sufficient capacity to support an influx of people following an earthquake.
Access to Financial Services	2	There are five banks in Porirua, but they are in the city centre, which will be unsafe to access following an earthquake.
Relevant technical risk assessment	3	Comprehensive investigations of the seismic hazard and risk an earthquake poses to Porirua have been conducted, but the relevant information has not been appropriately distributed.
Sustainable environmental management	1	An investigation is being conducted to clean the Porirua harbour, but no evidence exists of sustainable environmental management.
Critical infrastructure	3	Porirua has provided critical infrastructure (power, water, communications, etc.).
Emergency services	2	New Zealand Police, Wellington free ambulance, New Zealand Fire & Emergency, and Search & Rescue are all available to Porirua following a disaster. However, these services are understaffed and rely on region-wide services to respond.
Land use management	1	No evidence of securing environmental risks, conserving natural resources, supporting economic stability, or enhancing community health.
Secure communication channels	1	There is no evidence of secure communication lines between Porirua and Civil Defense. Current communication is through the Civil Defense Facebook page.
Distribution DRR information	1	All participants were unaware of any DRR information and response plans provided by Porirua City Council.
Community response plan	2	There is no Porirua-specific response plan—only guidelines on establishing community hubs following a disaster. Knowledge of the plan is expected to be low as all participants in the study were unaware.
Backup critical infrastructure	2	The expected restoration of lifelines has been provided (21 days for all). However, insufficient resources to cope until these are restored.
Leadership	1	No Iwi leaders or clear government leaders in the community for response planning.

Partnerships	1	No evidence of partnerships with agencies that will be dispatched to support the community following an earthquake.
Early warning systems	2	Early warning system for Tsunami and fire hazards. No transparent early warning systems are in place to support earthquake response.
Recovery plan	1	No evidence of a recovery plan for Porirua.
Community Resources	2	The community has two large home improvement/building stores and five pharmacies. However, three pharmacies are located in the CBD, making travel unsafe following a seismic event.
Temporary shelter	3	Porirua City Council has identified several locations for emergency shelters, including community centres, schools, and other public buildings. New Zealand Hotel Owners Association, has approximately 60 hotels and motels in the Porirua region and five designated community hubs that will act as shelters.
Support services	2	No specific number of social services could be identified in Porirua. Exiting services are located in the CBD, which is expected to be inoperable following the earthquake. However, over 50 churches and places of worship in Porirua City, New Zealand, will provide social support following an earthquake.
Temporary Housing	3	The Porirua Emergency Housing Service (PEHS) is a community-based organization that partners with the Porirua City Council to provide temporary emergency housing to needy individuals and families. They provide short-term accommodation in motels, emergency housing units, and other temporary accommodation options while people work with support services to find long-term housing solutions. New Zealand Hotel Owners Association, there are approximately 60 hotels and motels in the Porirua region.

Appendix F: Household 1 Assessment Resilience Score Summary

Table 22: Assessment 1 Resilience Score Summary

Controllability level	Disaster Cycle Phase	Variable	Score (1-5)	Desired Score
1	Mitigation	Resilient Housing	3	3
1	Mitigation	Uncrowded houses	5	5
1	Mitigation	Crime & Conflict reduction	3	3

1	Mitigation	Community food and water supply	3	3
2	Mitigation	Well-being	4	5
1	Mitigation	Access to health services	2	2
2	Mitigation	Number of relatives near	5	5
1	Mitigation	Access to Financial Services	2	2
1	Mitigation	Relevant technical risk assessment	3	3
2	Mitigation	Community risk assessment	1	2
2	Mitigation	Sustainable environmental management	1	2
2	Mitigation	Natural resources	2	3
1	Mitigation	Critical infrastructure	3	3
1	Mitigation	Transportation	4	4
1	Mitigation	Emergency services	2	2
1	Mitigation	Land use management	1	1
1	Mitigation	Secure communication channels	1	1
2	Mitigation	Asset protection	3	4
3	Preparation	Inclusivity	3	5
1	Preparation	Distribution DRR information	1	1
3	Preparation	Individual food and water supply	1	5
2	Preparation	Community response plan	2	3
1	Preparation	Backup critical infrastructure	2	2
2	Preparation	Education of DRR and H&S	3	4
3	Preparation	Living a hazard-resilient lifestyle	2	5
2	Preparation	Resilient Education System	2	3
3	Preparation	Healthy lifestyle	4	5
2	Preparation	Leadership	1	2
2	Preparation	Partnerships	1	2

1	Preparation	Early warning systems	2	2
2	Preparation	Recovery plan	1	2
3	Preparation	Personal Resources	2	5
1	Preparation	Community Resources	2	2
3	Preparation	Volunteering	1	5
1	Preparation	Temporary shelter	3	3
3	Preparation	Kotahitanga and Whanaungatanga	4	5
3	Preparation	Seismically secure house	3	5
2	Preparation	Support services	2	3
2	Preparation	Temporary Housing	3	4
2	Preparation	Community Competence	3	4
Total			**91**	130

Appendix G: Household 1 Resilience Web Diagram

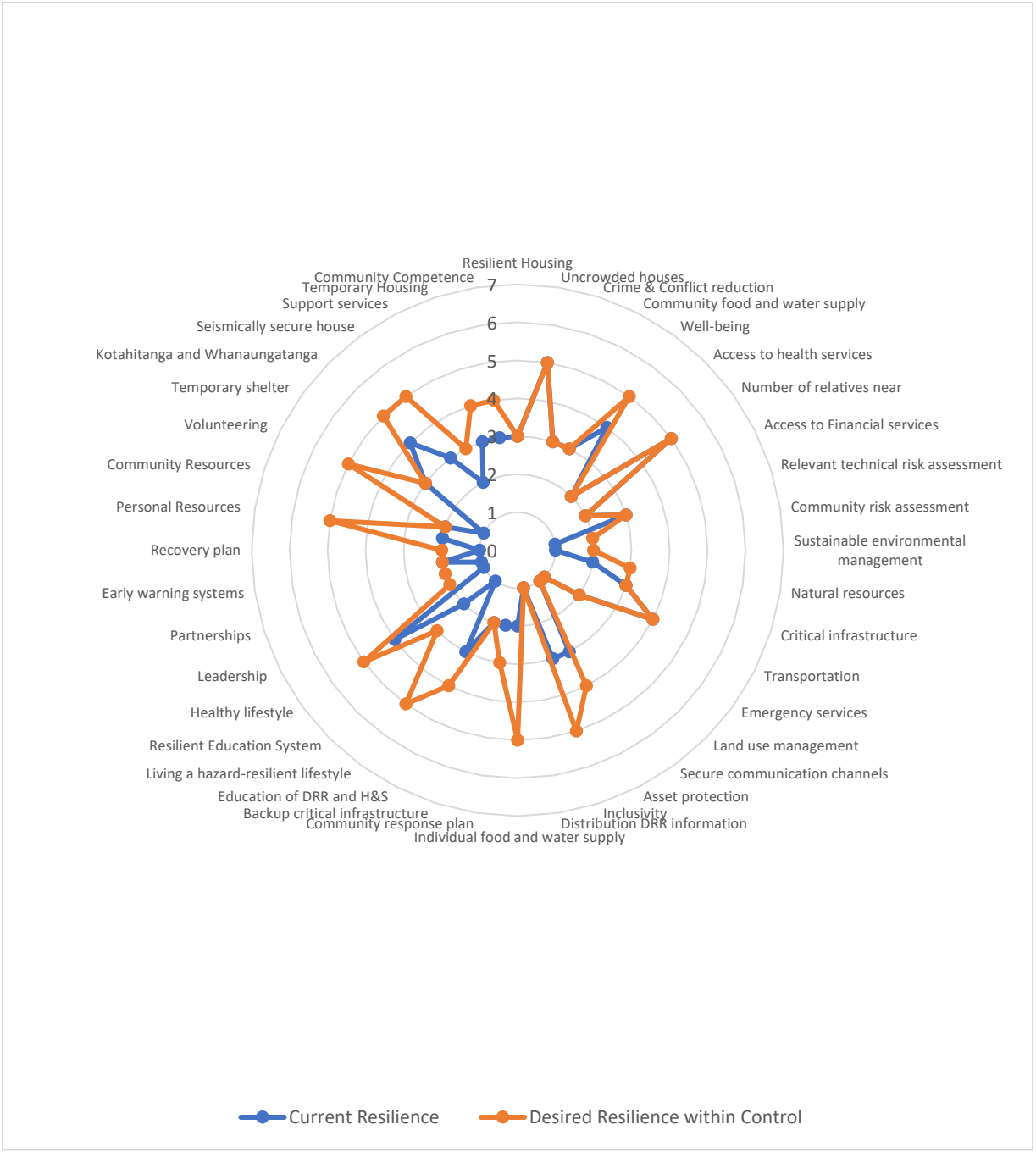

Figure 17: Household 1 Resilience Distribution

Appendix H: Household 2 Assessment Resilience Score Summary

Table 23: Assessment 2 Resilience Score Summary

Controllability level	Disaster Cycle Phase	Variable	Score (1-5)	Desired Score
1	Mitigation	Resilient Housing	3	3
1	Mitigation	Uncrowded houses	2	2
1	Mitigation	Crime & Conflict reduction	3	3
1	Mitigation	Community food and water supply	3	3
2	Mitigation	Well-being	2	3
1	Mitigation	Access to health services	2	2
2	Mitigation	Number of relatives near	5	5
1	Mitigation	Access to Financial Services	2	2
1	Mitigation	Relevant technical risk assessment	2	2
2	Mitigation	Community risk assessment	1	2
2	Mitigation	Sustainable environmental management	1	2
2	Mitigation	Natural resources	2	3
1	Mitigation	Critical infrastructure	3	3
1	Mitigation	Transportation	3	3
1	Mitigation	Emergency services	2	2
1	Mitigation	Land use management	1	1
1	Mitigation	Secure communication channels	1	1
2	Mitigation	Asset protection	1	2
3	Preparation	Inclusivity	1	5
1	Preparation	Distribution DRR information	1	1
3	Preparation	Individual food and water supply	1	5
2	Preparation	Community response plan	2	3

1	Preparation	Backup critical infrastructure	2	2
2	Preparation	Education of DRR and H&S	1	2
3	Preparation	Living a hazard-resilient lifestyle	1	5
2	Preparation	Resilient Education System	1	2
3	Preparation	Healthy lifestyle	2	5
2	Preparation	Leadership	1	2
2	Preparation	Partnerships	1	2
1	Preparation	Early warning systems	2	2
2	Preparation	Recovery plan	1	2
3	Preparation	Personal Resources	1	5
1	Preparation	Community Resources	2	2
3	Preparation	Volunteering	1	5
1	Preparation	Temporary shelter	2	2
3	Preparation	Kotahitanga and Whanaungatanga	4	5
3	Preparation	Seismically secure house	2	5
2	Preparation	Support services	2	3
2	Preparation	Temporary Housing	3	4
2	Preparation	Community Competence	2	3
Total			75	116

Appendix I: Household 2 Resilience Web Diagram

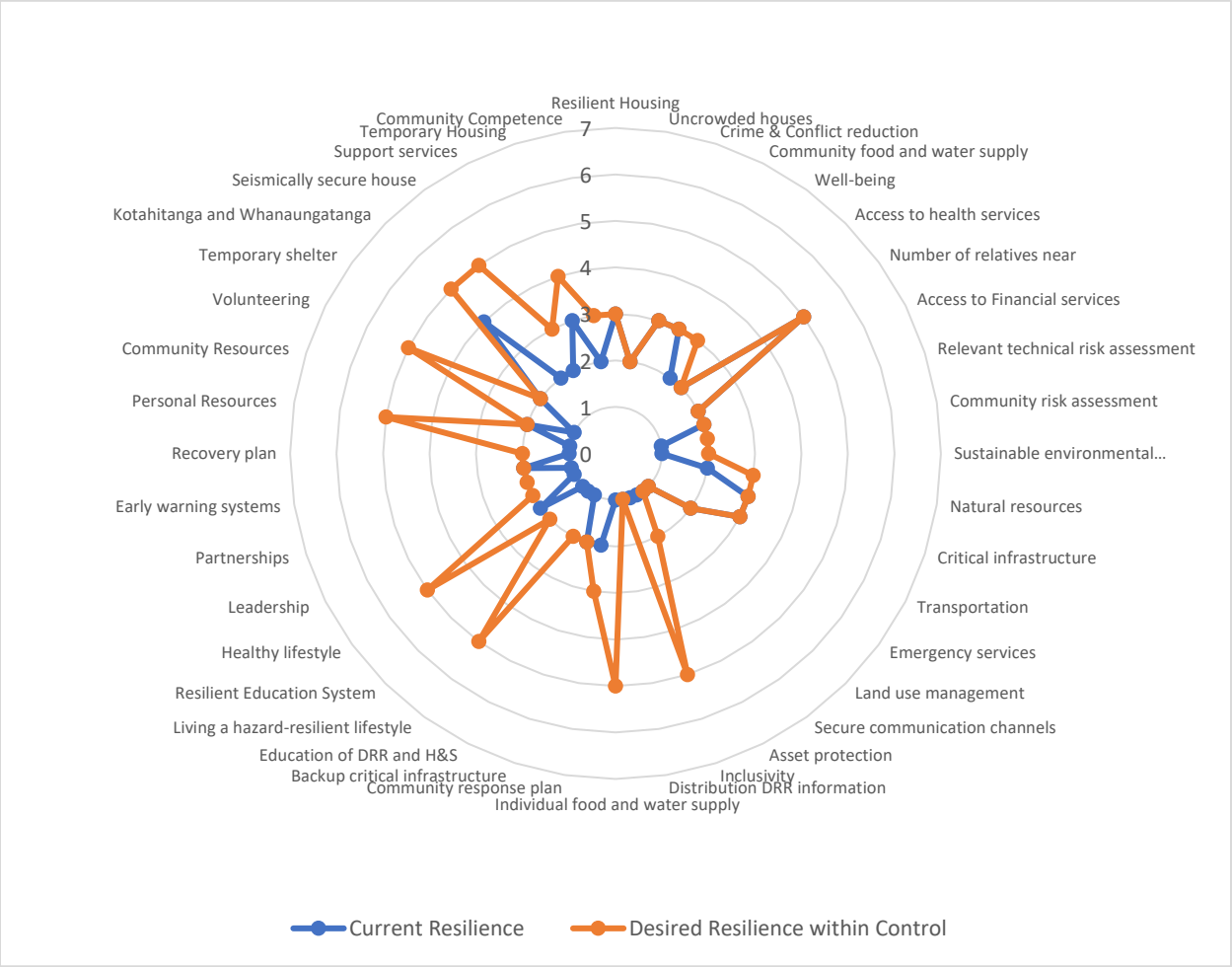

Figure 18: Household 2 Resilience Distribution

Appendix J: Combined Porirua Hazard Map

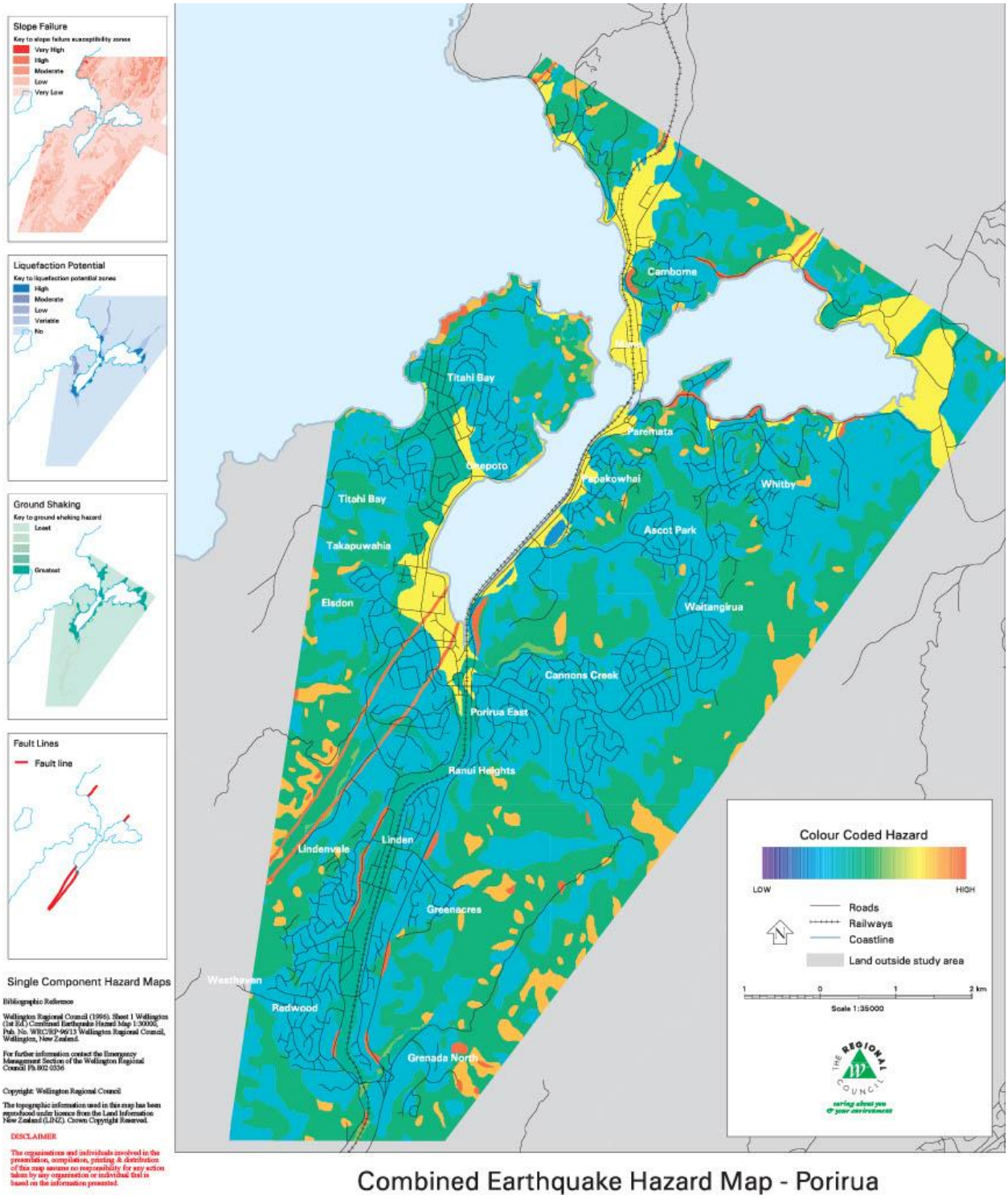

Figure 19: Combined Porirua Hazard Map (Porirua City Council, 2022)

Appendix K: Wellington Tsunami Evacuation Zone

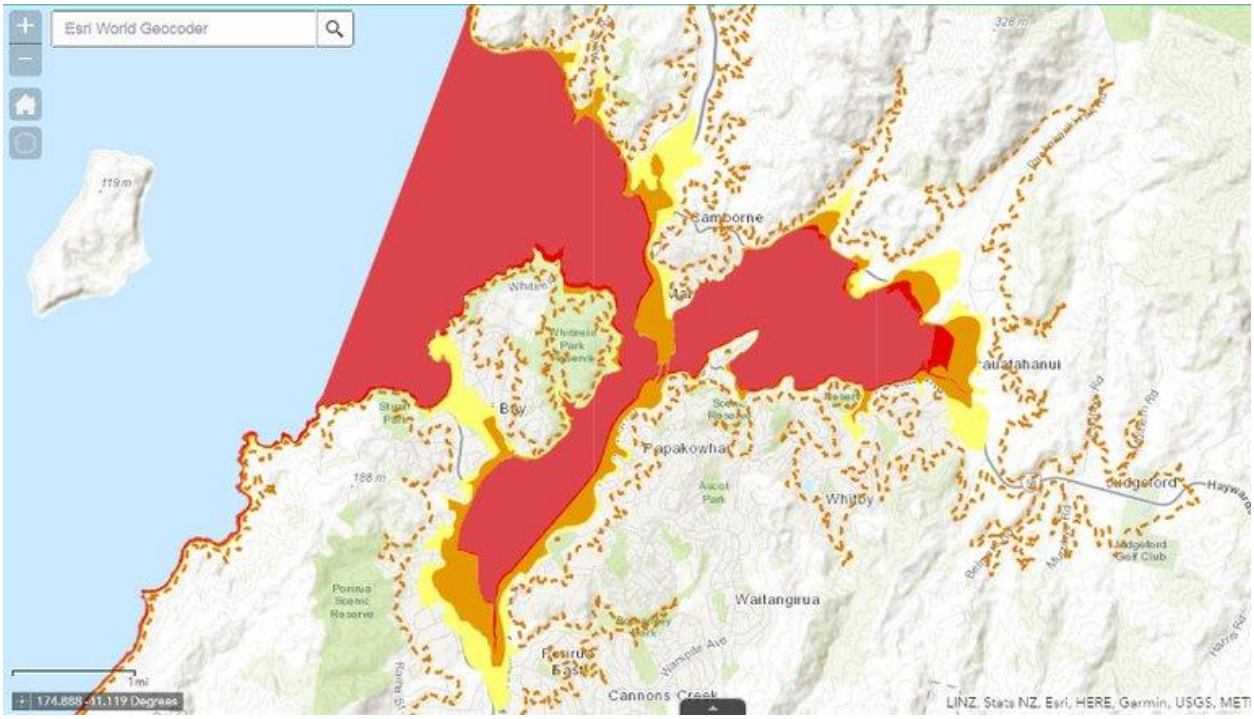

Figure 20: Wellington Tsunami Evacuation Zone (Porirua City Council, 2022)

Appendix L: Wellington Road Restoration Timeline

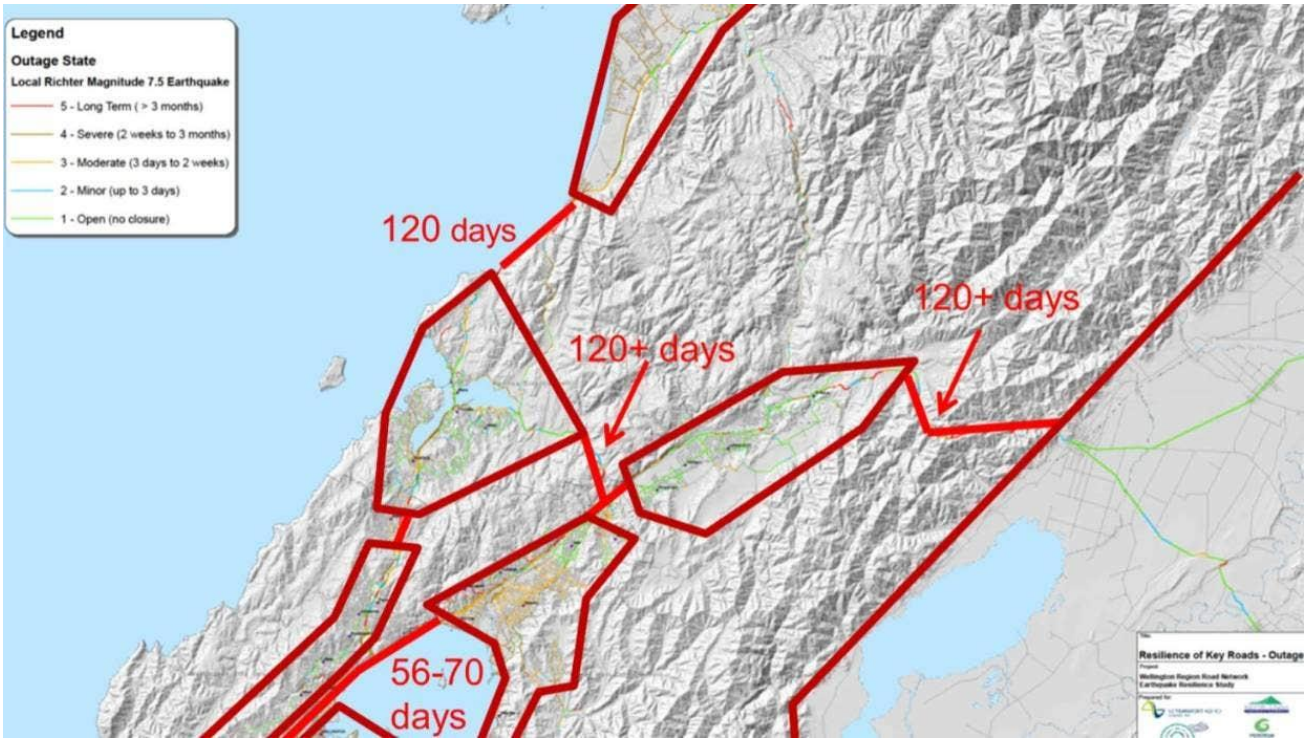

Figure 21: Wellington Road Restoration Timeline