Current and future climate change adaptation of a vulnerable coastal community on the Coromandel Peninsula, New Zealand

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For Daniela and Lucia

companions in adventure

In the rise of mist from the estuary and the fall of rain, in the movements of the incoming and outgoing tides, I see a reflection of the deepest mystery and most sustaining pattern in all of life: that of arrival and departure, of death and regeneration. And, in seeing them I feel satisfaction. Without being sure of precisely to whom one owns gratitude, I am thankful that this piece of the earth exists and we upon it, to see it and to experience these things (M. King, 1993).

ABSTRACT

Scientific as well as anecdotal evidence indicate that climate change impacts are being experienced and are affecting communities vulnerable to climate change along the Coromandel Coast. It is therefore imperative to deepen understanding about adaptation to predicted changes, vulnerability and environmental governance efforts in the context of an ephemeral world and given distinctive local conditions, values, interests and experiences. Effective climate change adaptation requires authentic public participation and integration of scientific and local and traditional environmental knowledge. The aim of this research is to recognise the impacts of climate change on a coastal community on the Coromandel Peninsula and analyse the guidance required to facilitate effective adaptation. The approach chosen examines the relationship between local perceptions and national and international guidance in order to identify key principles for meaningful local adaptation. This thesis outlines key principles to manage climate change impacts based on a process of adaptation, sustainability, avoidance, remedy or mitigation of adverse effects, adoption of the precautionary principle, kaitiakitanga, local and traditional environmental knowledge, education and public awareness, governance, responsibility and liability, mainstreaming of climate change information, vulnerability, risk and preparedness for planning and policy decisions. The applied focus is on the local scale to establish an understanding of how vulnerable coastal communities like Te Puru, on the Coromandel Peninsula, New Zealand, are affected by projected climate change and how adaptation can be achieved meaningfully and successfully. This research thus contributes to a comprehension of local relevance of climate change and identifies key factors in the light of national and international climate change guidance.

ACKNOWLEDGMENTS

This venture began while I was working for the Department of Conservation studying the impact of introduced mammalian predators on the indigenous fauna and flora of the Coromandel Peninsula. The Peninsula Project of which I was the Technical Support Ranger at the time is about both improving the health of the environment as well as reducing flood risks for vulnerable communities. It was during this time that I asked myself how vulnerable are the communities on the Coromandel Peninsula really? What exactly makes them vulnerable and what if conditions change? Subsequent questions included what the future will hold for these communities and what impact climate change will have.

I like the idea that everything happens for a reason and people who are meant to meet will eventually do so. When I attended the *Emergency Management and Social Science Disaster Research in New Zealand* Workshop on the 8th of December 2008 and heard Associate Professor Bruce Glavovic speak, I took the opportunity to introduce myself and point out my interests after the workshop. Bruce accepted me as one of his students so I resigned from what most people I know referred to as a 'dream job' and enrolled as an extramural Master's student at Massey University Manawatu. Bruce challenges my way of thinking and provides intellectual stimulation that has significantly influenced my reasoning far beyond vulnerable communities and climate change. By giving me the opportunity to write this thesis, Bruce has influenced not only my thinking but my life.

I must thank the Thames Coromandel Regional Council. I especially thank the council's hazards planner Peter Wishart who always had time for my questions and helped to establish other contacts as well as 'our' Mayor Philippa Barriball, Steve Ruru, Peter Mickleson as well as the Coromandel's Civil Defence Officer Ron White. I am

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During the final write-up phase of this research my father passed away after long-standing illness and suffering. I wish to thank both my parents for their continuous support and encouragement. Knowing that my father was always proud of me and of what I did (despite often not even knowing what I was up to) often gave me the strength needed to stay focused. I wish he could have still seen this final version of my thesis.

Finally, I dedicate this thesis to my two favourite people in this world: my daughter Lucia and my partner Daniela. Both add meaning to my life in ways that words cannot describe. Daniela has supported me in every step of this work and accepted many hardships for herself and our family as a result. Lucia always reminds me what a great place this world is!

[1] Māori word for grandchild

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CHAPTER ONE

INTRODUCTION: CLIMATE CHANGE IN A COASTAL COMMUNITY CONTEXT

The Coromandel Peninsula is made up of many small communities dotted along the coast bordered by steep and rugged terrain to the one side and the sea to the other. M. King (1993) points out that this part of New Zealand has an appearance, a history and a lifestyle that sets it apart from the rest of the country and contributes to what can be regarded as distinctive New Zealand subculture.

When I moved to the Coromandel working for the Department of Conservation I was completely ignorant of what imprint this land would have on me. My partner and I moved into a small old kauri[2] cottage within a stone's throw of the sea and were expecting a baby girl soon after. The local community welcomed us with their arms wide open and I have since realised that it is for the human relations as well as for the scenic beauty and the history of the Coromandel that people hold this part of New Zealand so dearly. After living in a certain area for a while one cannot help but identify with it to a certain extent which is what got me interested in the history of the communities, those who live there, why they live there and what the future holds for these places some of which almost seem locked away in time. Never before in the history of these communities has the future been so uncertain, with climate change representing a major contributing factor, as this research will demonstrate.

[2] Kauri (Agathis australis) is the largest and most renowned coniferous timber tree found in the northern part of New Zealand north of a line from Kawhia in the west and Tauranga in the east. Heavy logging has considerably decreased the number of kauri trees (Reed, 1953).

Just as experiences that I made and insights I gained left an impact on me I realise how history has shaped the character and values of the coastal communities that I am now a part of. I was, and still am, fascinated by what is still so alive and present and I cannot help but ask myself what the future will bring as things seem to be changing and are predicted to change at an accelerated pace. The social and cultural patterns which have developed on the Coromandel Peninsula are a direct consequence of the region's history, particularly of its association with the bonanza years of gold and timber extraction. Contemporary attitudes – towards climate change, farming, horticulture, fishing, tourism, mining, coastal development and environmental questions in general – are all shaped by the experience of the past 150 years (M. King, 1993). Climate change will arguably be the greatest challenge coastal communities like Te Puru on the western side of the Peninsula will face over the 21st century. Being merely a few feet above sea-level on a fluvial delta backed by steep catchments already resulting in frequent floods, the projected climate will bring unprecedented challenges.

This thesis tells the story of climate change and how a small coastal community on the Coromandel Peninsula can adapt successfully with the help of relevant guidance. It is inspired not only by the history of the first Polynesian and European colonists of New Zealand but particularly by settlers of communities like Te Puru. The first colonists had no experience with the environmental risks of their new environment coupled with severely limited settlement options given the narrow coastal edge bordered by steep catchments to the east and the sea to the west. Vulnerability has therefore been inherited from the first settlers in this region and now demands meaningful adaptation taking into account a future including increased unpredictability, uncertainty and unquantifiability of impacts in the form of storms, coastal erosion, sea-level rise, floods and droughts (EW & TCDC, 2003).

1. Overview

This chapter provides an overview of the five chapters and locates the thesis in the wider research context of adapting to climate change to demonstrate the significance of this research. It describes the structure of the thesis and explains how the different chapters tell the story of what climate change entails for a coastal community on the Coromandel Peninsula. The following section outlines the research aim and objectives. Section three provides an introduction to the significance of climate change and explains the underlying predicament of having to adapt to an uncertain future.

1.1. Chapter Two: Adaptation to Climate Change in New Zealand

Chapter two underscores the significance of climate change as an overarching practical, moral and ethical predicament facing humankind from the local to global levels. It highlights the importance of integrating scientific understanding about climate change with local and traditional environmental knowledge, and stresses the imperative to ensure that local stakeholders participate actively in adaptation planning and decision-making. The local relevance of climate change is highlighted and definitions of adaptation, mitigation, vulnerability and resilience are explored. Attention is also focused on who adapts to what and why. Further consideration is given to adaptation decisions and what effects these might have on the future. The main finding of this chapter is the need to adopt a people-centred environmental governance approach to building resilience and adapting to climate change. Such an approach also needs to integrate scientific understanding about climate change with local and traditional environmental knowledge (TEK). In the case of this thesis TEK is used against the background of Māori culture and traditions while local knowledge

does not necessarily imply a Māori component. This distinction is further discussed in section 4 of this chapter.

The essence of Chapter Two lies in integrating adaptation options into a holistic understanding of climate change. Chapter Two:

- Identifies the research problem;
- Reviews existing work on climate change, vulnerability, mitigation, adaptation and resilience;
- Examines the significance of implications of climate change on a national scale;
- Develops a revised sustainable social-ecological systems framework in order to demonstrate the relevance of governance in sustainable climate change adaptation;
- Outlines the relevance to adaptation endeavours of local and TEK, the genealogical interconnectedness of the world's elements and its relevance with regard to climate change and adaptation; and
- Introduces national and international climate change adaptation guidance.

1.2. Chapter Three: Research Methods

Chapter Three provides an overview of the research methods employed in this research. It introduces case study research as the overarching mode of research and outlines the various specific methods used to develop the case study, and explains the reasons for their selection. Advantages and disadvantages, ethical considerations and the methods of data collection are discussed. The key informant involvement process is explained and research assumptions introduced. Reasons are given for adopting a qualitative approach. Participant observation was found to be invaluable in seeking to understand community concerns about climate change and

the challenges and opportunities for adaptation. Reasons are also given for the selection of Te Puru as case study and the key informants. The interview processes and data analysis are furthermore described in detail. The policy narrative approach reflects on the role of the stories presented and assists in deepening understanding about climate change adaptation.

1.3. Chapter Four: A coastal community case study for Te Puru

Chapter Four analyses interview data gathered from key informants. The insights are structured along five 'key themes' including:

i. Perception of climate change salience;
ii. Anticipated climate change impacts and vulnerability;
iii. Adaptation already underway;
iv. Governance roles and responsibilities and future adaptation prospects; and
v. Local and traditional environmental knowledge.

The key informant groups participating in this research include:

i. Thames-Coromandel District Mayor;
ii. Senior council policy and planning staff;
iii. Iwi[3] representative;
iv. Local Civil Defence manager;
v. Local coastal scientist;
vi. Local coastal property developer;
vii. Te Puru beach front property owners;
viii. Local kaumatua[4];

[3] Iwi is the largest social unit in Māori populations (māori.org.nz, 2004)

ix. Long-time community members.

Chapter Four presents stories and perceptions about the local relevance of climate change and outlines views about the climate change adaptation issue. This chapter reveals how the Te Puru community, despite its inherent vulnerability given its location, is adapting to the uncertain effects of climate change. The unprecedented changes in local climate experienced by key informants are discussed. The significance of climate change guidance as well as the importance of paying greater attention to local perspectives and insights as well as integrating science with local and TEK is highlighted.

To my knowledge, the key informant insights outlined in this chapter represent the first study of local coastal community climate change adaptation on the Coromandel Peninsula, if not the whole of New Zealand. At this point in time there are no case studies on this topic in published academic journals.

1.4. Chapter Five: Guidance required: How to achieve meaningful and sustainable adaptation

Chapter Five reveals the relationship between the three core research elements as illustrated in Figure 1.1 and Figure 1.2. Figure 1.1 illustrates the relationship between the three research elements in a clear and simplified way and underlines their significance with the help of three leading questions. Figure 1.2 describes the three elements in depth alongside 'key themes', 'groups of principles', and 'guidance measures' leading to 'best practice' and further refines the three questions adjoining the research elements. The three elements comprise local perceptions and

[4] Kaumatua are Māori tribal elders who are the keepers of knowledge and traditions of the family, sub-tribe and tribe (Barlow, 1991). A true Kaumatua will not have to tell anyone what they are as everyone knows just like "the kumara does not talk about its own sweetness" (māori.org.nz, 2004).

experience (1), 'Preparing for climate change' (MFE, 2008b), a climate change guide for local government (2), and seven international climate change adaptation guides (3). The 'key themes' (A) along which the local perceptions and experience are structured stands in direct relationship with 'Preparing for climate change' in that the guide's raison d'être is to lead to successful climate change preparation. The question asked is how adequate the guide is for the Te Puru community that constitutes this case study. The assumption is that the guide's 'groups of principles' (B) mirror local conditions albeit to varying degrees given that it is about national guidance for local governments. In order to compare New Zealand's guidance with international guidance, the 'key themes' together with the 'groups of principles' are analysed and synthesised in a set of seven 'guidance measures' (C) that juxtapose New Zealand's climate change adaptation guidance with selected international publications (3).

Figure 1.1: The relationship between the core research elements (simplified)

A juxtaposition of this kind deploying integrative 'guidance measures' assists in answering the question of the extent to which New Zealand's guide incorporates international best practice as reflected in the guides selected and how successful

climate change adaptation of a vulnerable community can be achieved. The answer makes it possible to develop and elevate the 'key themes' (A), the 'groups of principles' (B), and the 'guidance measures' (C) to best practice guidance (4). Chapter Five concludes with a summary of the main findings of this research.

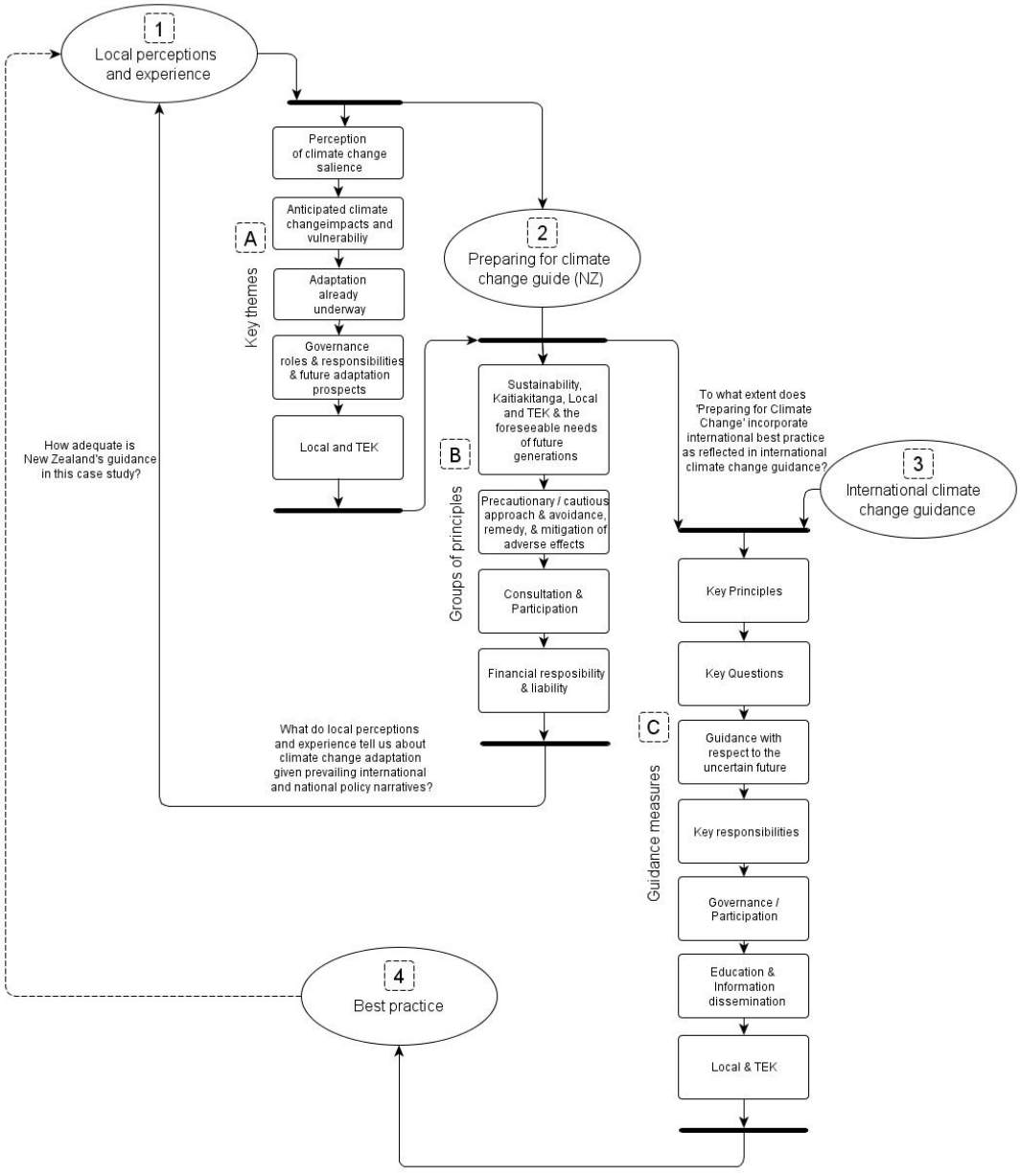

Figure 1.2: The relationship between the research elements

2. Aim and Objectives

The aim of this research is to understand how a coastal community on the Coromandel Peninsula is likely to be affected by and could successfully adapt to projected climate change; and how climate change guidance can assist in the adaptation. The primary research question is: What guidance do coastal communities, such as Te Puru, need to enable them to adapt to climate change? In answering this question, the research endeavours not only to comprehend the local relevance of climate change but also to identify key factors for reducing vulnerability and building resilience and adaptive capacity. In order to pursue this aim, five objectives will be met:

1. Characterise vulnerability, mitigation, adaptation and resilience on global, national and local scales in the context of governance and TEK in order to lay the foundation and provide the context for local insights and experience and national and international guidance narratives (Chapter Two);

2. Develop 'key themes' based on local key informant's insights and perceptions and apply these to the Te Puru community in order to frame key informant narratives (cf. Figure 1.1) (Chapter Four);

3. Identify the guidance necessary to enable local communities to adapt to climate change in the light of insights from key informants (Chapters Four and Five);

4. Provide a critique of New Zealand's climate change guidance, analyse key international climate change guidance from western developed countries, define 'guidance measures' and juxtapose insights in relation to those

measures in order to establish the relationship distinguished in Figure 1.1 (Chapter Five);

5. Establish a set of best practice key principles for essential climate change adaptation in New Zealand based on insights from key literature, informant's insights and national and international adaptation guidance to identify what needs to be done to enable a vulnerable community to adapt meaningfully (cf. Figure 1.2) (Chapter Five).

3. Research context

Patterns of extreme and unprecedented weather such as flooding, storm events, and droughts are causing widespread damage not only throughout New Zealand (NIWA, 2009) but throughout the world and it is now widely accepted that the climate is changing and will have or is having significant implications for societies (Adger, 2006; Bruce, Lee, & Haites, 1996; Houghton, et al., 1996; IPCC, 2007a; Watson, Zinyowera, & Moss, 1996). The 1992 United Nations Conference on Environment and Development (UNCED) which developed the Framework Convention on Climate Change (UNFCCC) signed by 154 countries, many of whom now have adaptation guides to address climate change, provides a forum for states and other key stakeholders to grapple with the climate change 'issue' and reflects international concerns over the consequences (Smithers & Smit, 1997). In its fourth Assessment Report 2007, the Intergovernmental Panel on Climate Change (IPCC) drew on a series of modelling approaches to estimate the global parameters of future change. An expert assessment, based on the combination of available constraints from observations and the strength of known feedbacks simulated in the models used to produce the climate change projections, indicates that the equilibrium global mean surface air temperature warming at a doubling of

atmospheric carbon dioxide (CO2), or 'equilibrium climate sensitivity', is likely to lie in the global range of 2°C to 4.5°C, with about 3°C being most likely. An all-scenario average for New Zealand based on the IPCC report suggests a temperature increase of 0.9°C by 2040 and 2.1°C by 2090 (MFE, 2008a) thus leading to a range of associated changes such as increases in storm events, alterations in precipitation patterns, sea-level rises, winds etc. (Table 1.1). The same report, together with the World Meteorological Association, also points out that, although climate has always undergone changes, it is 'unequivocal' that contemporary global warming and associated climate change is linked to human activity. The response to this climate change by the United Nations Framework on Climate Change (UNFCCC) has been a focus on mitigation in form of the reduction of greenhouse gases. Yet no mitigation effort, even the most ambitious agreement aimed at reducing greenhouse emissions, is going to prevent climate change from continuing in an economy based almost exclusively on carbon productivity (Pittock & Jones, 2000). Emissions are constantly rising as a result of human population growth and growing affluence in a carbon-based economy. The world population has doubled in 40 years in the period from 1959 to 1999 and it is estimated that it will take a further 42 years to increase by another 50% stabilising after 2200 at just above 10 billion people (Lutz, Sanderson, & Scherbov, 2001; UN, 1999). Humans have changed ecosystems more rapidly and extensively over the past 50 years than in any other comparable period of time in human history (Millenium Ecosystem Assessment, 2005).

Nationally (RMA, 1991) as well as internationally (Agenda 21, UNFCCC) there are policies and undertakings in place to ensure that resource management systems and human development patterns become more sustainable and acceptable in the face of climate change. The UNFCCC attributes climate change "directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"

(UNFCCC, 1992, Article 1, p.1). The very slow progress in the reduction of human activity altering the composition of the atmosphere, linked with differential impacts superimposed on dissimilar vulnerabilities in a rapidly changing world (O'Brien & Leichenko, 2000) has led to new climate policy solutions. These are proposed not only by bodies such as the IPCC but also the Global Humanitarian Forum, the parties to the UNFCCC and regional as well as local governments asking the question how vulnerable communities can cope with the challenges they are facing and adapt accordingly in a world increasingly characterised by uncertainties triggered on a global - but ultimately experienced on a local - scale.

New Zealand's National Institute of Water and Atmospheric Research (NIWA) points out that the potential impacts of climate change for New Zealand are likely to be substantial without further adaptation. The most vulnerable sectors are natural systems, water security and coastal communities. New Zealand is already experiencing impacts from recent climate change (very confident – cf. Table 1.1) (NIWA, 2008b). Furthermore it is pointed out that unprecedented development of the coast has resulted in a 'dramatic' increase in risks associated with climate change. Strategies for adaptation require the integration of local, community based, economic systems, technologies, environmental systems and many other factors. This complexity presents a major challenge which is further complicated by the inherently interdisciplinary nature of adaptation issues and the 'pulsed' nature of change processes (Gunderson & Holling, 2002): the pressure for change arises, as a general rule, only immediately after crises. This window of time, however, dissipates almost as rapidly as it emerges. What might be classified as extreme at this point in time in a certain area could become normal in a future context.

Table 1.1: Main features of New Zealand climate change projections based on IPCC (2007a) projections (MFE, 2008a).

Climate Variable	Anticipated Change
Mean temperature	Average increase (****) with an all-scenario average of 0.9°C by 2040 and 2.1°C by 2090 (**)
Precipitation pattern	Varies around New Zealand. A decrease is expected for Northland, Auckland, Coromandel, Gisborne, Hawkes Bay (**)
Extreme rainfall	Heavier and / or more frequent extreme rainfalls (**)
Wind	Increase in the annual mean westerly component of wind flow across New Zealand (**)
Strong winds	Increase in severe wind risk possible (**)
Storms	Increased storminess possible, but little information available for New Zealand (*)
Sea-level	Increase of at least 18-59cm (New Zealand average) by 2090 (****)
Waves	Increased frequency of heavy swells in regions exposed to prevailing westerlies (**)
Storm surge	Storm tide elevation will rise at the same rate as sea-level (**)
Ocean temperature	Increase similar to mean air temperature with patterns close to the coast affected by winds, upwelling and ocean current changes (**)

The degree of confidence placed by New Zealand's National Institute of Water and Atmospheric Research (NIWA) on the projections is indicated by the number of stars in the brackets:

**** Very confident, at least 9 out of 10 chance of being correct. Very confident means that it is considered very unlikely that the estimate will be substantially revised as scientific knowledge progresses;

*** Confident;

** Moderate confidence, which means that the estimate is more likely than not to be correct;

* Low confidence, but the best estimate possible at present from the most recent information

The best way to adapt to uncertain future climate is therefore to improve adaptation to present-day variability and its possible extremes (Smit & Pilifosova, 2001). Vulnerability and risk reduction may thenceforth depend on a society's ability to recognise current extremes and long-term change processes and take advantage of the 'brief windows of opportunity' for bringing about fundamental change following a crisis (Moench, 2007).

4. Why the Coromandel – why Te Puru?

All climate variables anticipated to change listed in Table 1.1 directly affect coastal communities like Te Puru on the Coromandel Peninsula. Te Puru already holds the highest 'Annualised Lives Risk' of all communities on the western side of the Peninsula with the level of individual risk in high flood hazard zones 'above desirable levels' (EW & TCDC, 2003).

The short steep catchments behind Te Puru have streams that carry high quantities of sediment during floods. Such sediment, soil or gravel is deposited in a wide delta near the stream mouth. The community that has developed on these deltas is vulnerable to not only floods generated by short bursts of high intensity rainfall but also to rising sea-levels, storm surges etc. The stream itself is also unstable and easily clogged during floods as a result of the high sediment loads (EW & TCDC, 2003). The 'weather bomb' in June 2002 and the Easter flood event in April 2003 emphasised the urgent need to address flooding and catchment management issues for coastal communities like Te Puru. During these flood events, one person died and about NZ$13 million worth of damage was caused to private homes, campgrounds and local infrastructure (EW, 2009). These areas are predicted to be even more exposed and vulnerable as a result of the predicted climate change (MAF, 2010). Given the steepness of the land, moving settlements further away from

deltas to higher ground is not an option which is why most investments are going into raising and strengthening existing structures such as bridges and roads as well as animal pest control (possums, goats, and rodents) based on the assumption that healthier forests lead to enhanced catchment-stability.

Coastal communities like Te Puru pose a remarkable major attraction for residential development, tourism and associated facilities, lifestyle / cultural combinations of wage labour and subsistence activities, agriculture as well as aquaculture and last but not least recreation. Property sales on the Coromandel Peninsula have more than trebled in the period 2001 to 2005 with now more than 75% of the beaches and dunes subject to human developments and over 70% of all beachfront development setback less that 100m from the sea (ARC, 2004). Populations like those in Whitianga on the eastern side of the Peninsula are projected to double by 2020 (Beston, 2005). Te Puru is rather out of the ordinary for its combination of long-standing and relatively basic housing as well as recent exclusive developments. Beachfront housing now ranges from basic family baches[5] to mundane holiday housing and includes both Māori[6] as well as Pākehā[7] owners / residents.

While the changes in weather patterns, despite inherent uncertainties in the projections, are physically relatively well understood, the question needs to be asked what the anticipated changes mean on a local level and how they lead to vulnerability. The cumulative choices the government and communities like Te Puru make with regard to the use of its resources and its willingness to adapt to changing

[5] A bach (pronounced 'batch') is a New Zealand beach house or holiday home. Baches are an iconic feature of New Zealand's coastal communities symbolising a beach holiday lifestyle that started becoming more accessible to the middle class in the mid 20th century (Phillips, 2009).

[6] Māori is derivative from 'tangata whenua' meaning 'ordinary people' referring to the descendants of the country's first Polynesian immigrants. The term relates closely to 'tangata whenua' meaning 'people of the land' (M. King, 1985)

[7] While the term 'Pākehā' originally refers to the early European settlers of New Zealand, today it is used to describe peoples of non-Māori or non-Polynesian heritage. According to Ranford (2009) the term is not an ethnicity but a way to differentiate between the historical origins – the Polynesians and the Europeans.

conditions will ultimately determine the extent of its losses (Mileti, 1999; Wisner, Blaikie, Cannon, & Davis, 2004). Many factors such as economic systems, land use patterns, communications, transport, formal and informal methods of risk-sharing, demographics, history, cultural values to name but a few come into play. While these local factors ultimately determine who is and will be affected by climate change and in what way, adaptation, as this thesis highlights, requires guidance shaped around these local factors including the integration of scientific understanding and local and traditional environmental knowledge (TEK) and the translation of robust understanding into practical adaptation measures through clear governance roles and responsibilities.

TEK refers to long-standing insights, traditions and practices and represents a knowledge-practice-belief evolving by adaptive processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and with their environment (Berkes, 2008). In the case of this research TEK is used against the background of Māori culture and traditions while local knowledge does not necessarily imply a Māori component. Both forms of knowledge can complement scientific findings on the projected impacts from climate change and provide information about the impacts of climate-related events. Local responses to the impacts, in turn, provide insights about adaptations, opportunities and challenges (Berkes, 2008). The value of local and TEK lies in knowledge that is built up over time based on prevailing circumstances and experiences and, in order to be sustainable, must consider the future. Including local and TEK in vulnerability and adaptation assessments can establish the changes that community members see over time, how they perceive them and how they explain these changes in the context of livelihoods (Riedlinger & Berkes, 2001). The adaptation techniques that the first human inhabitants of New Zealand brought with them around 800 years ago, and subsequent lessons learned, provide in-depth

knowledge about the environment and have considerable potential for meeting new environmental challenges. Māori in particular (Wilson, Raakjær, & Degnbol, 2006) have developed highly specialised skills and knowledge with regard to the environment because of a close relationship with the land, waterways and other natural resources, something which remains of importance in communities on the Coromandel even today. This is expressed through *kaitiakitanga* or the guardianship of the environment that supports humans (Kawharu, 2000). Local and TEK and observations of unprecedented climate change paired with place-based research need to be integrated with scientific understanding. However, while local Māori and long-time residents are experienced in dealing with their environment, including climate variability will require new strategies to ensure long-term sustainability in the context of climate change (D. King, Penny, & Severne, 2010). This thesis furthermore highlights that adaptation to climate change will require the active involvement of all local stakeholders and institutional adjustments will inevitably have to focus on community reorganisation and initiative (Adger, 2003; Folke, Hahn, Olsson, & Norberg, 2005; IPCC, 2007a). In conclusion, this research aims to deepen understanding about how vulnerable coastal communities like Te Puru can successfully adapt to projected climate change. The following four chapters provide answers to the main research question of how and in what form climate change guidance can lead vulnerable coastal communities like Te Puru to essential adaptation.

CHAPTER TWO

CLIMATE CHANGE, ADAPTATION AND VULNERABILITY IN NEW ZEALAND

Our climate and our world are undergoing unprecedented changes. Observed impacts of climate change on the Earth's systems are a forerunner of things to come (Adger, Arnell, & Tompkins, 2005) and the need to adapt is now widely recognised. Article Three of the UN Framework Convention on Climate Change, for instance, encourages governments to adapt to climate change. The Delhi Ministerial Declaration on Climate Change and Sustainable Development, issued at the Eighth Conference of the Parties of the Framework Convention on Climate Change (UNFCCC, 2002) states that adaptation is of "high priority for all countries" and that adaptation requires "urgent attention and action on the part of all countries".

Précis from Hennessy et al. (2007) biophysical climate change impacts in New Zealand have become evident in water supply, agriculture, ecosystems as well as the loss of at least a quarter of glacier mass. Projected climate change will add to existing stresses on sustainable land use, urban infrastructure, coasts, conservation and biodiversity. Multiple stresses include population growth, increasing water and energy demand, social change and increases in extreme events.

Apart from moral obligations to reduce the ever increasing ecological human footprint created by our ephemeral and hugely arrogant ambitions to live outside the laws of nature and thermodynamics (Porrit, 2009) and having changed ecosystems more rapidly and extensively over the past 50 years than in any other comparable period of time in human history (Millenium Ecosystem Assessment, 2005) there is a responsibility nationally under section seven of the Resource Management Act (RMA, 1991) and internationally under Agenda 21 and the UNFCCC

to ensure that resource management systems and human development patterns are sustainable and acceptable in the face of climate change and, as pointed out in the IPCC Science report, economic and social aspects of climate change are addressed (IPCC, 2007b).

The Intergovernmental Negotiating Committee working on the draft of the UNFCCC (1992) established two main responses to climate change: mitigation and adaptation. The concept of mitigation follows the idea of reducing greenhouse gas emissions with the aim to stabilise atmospheric greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic interference with the climate system". Adaptation is defined as adjustment in natural and human systems in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001). Adaptation is partly reactive, in the sense that it is triggered by past or current events, but it is also anticipatory in the sense that it is based on some assessment of conditions of the future (Adger, Arnell, et al., 2005). This in itself is a predicament because we cannot assume that everything will be as it was in the past and that this experience will give us the required insights to plan for the future. Adaptation is a process in which global agreements as well as individual choices incorporating a wide range of conflicting values and ambitions including local and traditional environmental knowledge (TEK), management systems and their dynamics need to be involved. Insight into this process will reduce vulnerability, facilitate adaptation and prove valuable, regardless of climate change.

Adaptive capacity, in this context, refers to the ability of society to mitigate the worst impacts and allow for the necessary learning and innovation to cope with a new climate regime (Berkes, 2007). It furthermore attempts to explore how local and TEK can complement governance emerging from a wide range of actors in the state-society complex. Governance is a form of structures and processes by which

people make decisions and share power, expressed through subtle norms of interactions such as influencing agendas and shaping contexts in which actors contest decisions and access resources (Folke, et al., 2005; Lebel, et al., 2006).

The first part of this chapter draws on scholarship and literature in order to illuminate understandings of vulnerability, mitigation and adaptation. The second part examines the implications of climate change on a NZ scale while the third part addresses the relevance of governance in sustainable adaptation by presenting a revised sustainable social-ecological systems framework. The fourth part offers insight into TEK and its potential contribution for responding to climate change. The fifth part illustrates the genealogical interconnectedness of the world's elements and its relevance in the climate change 'issue'. The sixth and final part offers an introduction to adaptation in the context of local development and presents a comparison between different adaptation responses in form of guidance literature as well as key adaptation insights from different organisations.

In summary this chapter highlights the significance of climate change as an overarching moral and ethical predicament by identifying ways of amalgamating locally evolved TEK and participation into adaptation. First, however, it is fundamental to clarify the local relevance of climate change as well as analyse definitions of adaptation, mitigation, vulnerability and resilience. It is indispensable to review who adapts to what and why. In this context it is essential to examine on which basis decisions should be made and how these might affect the future.

1. Vulnerability, mitigation, adaptation and resilience: the background

The Oxford Dictionary describes vulnerability as the ability to be wounded or injured [Latin vulnus = wound]. It is shaped by social processes such as people's resources

and behaviour as well as social and political structures. The development of vulnerability indicators is a relatively small area of research (Dwyer, Zoppou, Nielsen, Day, & Roberts, 2004) and the geographic discrepancies in social vulnerability and its temporal and spatial changes in the future requires a revised approach to preparedness, response, recovery, mitigation and adaptation in reducing local vulnerability (Cutter & Emrich, 2006).

According to Smit and Pilifosova (2003) vulnerability is a positive function of a community's exposure and a negative function of a community's adaptive capacity. Vulnerability furthermore is a part of the resilience of the system experiencing a hazard (B. L. Turner, et al., 2003). Resilience, in this context, is defined as the capacity of a system to absorb disturbance and reorganise while undergoing change in order to retain essentially the same function, structure, identity and feedbacks (B. Walker, Hollin, Carpenter, & Kinzig, 2004). However, the feedbacks of interlinked social-ecological systems, the ones that cause vulnerability and those that build resilience, how they interplay, match and mismatch across scales and the role of adaptive capacity in this context remain unclear (Folke, 2006). Building resilience into social-ecological systems is nonetheless an effective way to cope with change characterised by future surprises or unknowable risks (Tompkins & Adger, 2004) thus paving the way for thinking about policies for future environmental change, an important consideration in a world increasingly characterised by unprecedented hazards and transformations (Folke, et al., 2002).

The IPCC, the UNFCCC and the Kyoto Protocol's eighth Conference of the Parties have divided climate change responses broadly into *mitigation* and *adaptation*. Mitigation, involves taking action to reduce greenhouse gas emissions and to enhance sinks aimed at reducing the extent of global warming. Adaptation consists of initiatives to reduce the vulnerability against actual or expected climate change effects; local or community-based adjustments to deal with changing conditions

within the constraints of the broader economic-social-political arrangements (Smit & Wandel, 2006). Adaptive capacity refers to the ability of the actors in a system to influence or manage resilience (B. Walker & Meyers, 2004). Adaptive management may be viewed as the scientific analogue of TEK because of its integration of uncertainty into management strategies and its emphasis on practices that confer resilience (Berkes, Colding, & Folke, 2003). While some empirical studies have focused directly on adaptation (Glantz & Ausubel, 1988; Liverman & O'Brien, 1991; Smit, McNabb, & Smithers, 1996) there has been little explicit examination of the triggers, the how, when, why and under what conditions adaptations actually occur (Smithers & Smit, 1997). Equally important as examining the triggers is to ask how adaptation is facilitated.

Adaptation is made up of actions by a wide range of stakeholders who are simply those actors with something to win or lose in the governing process including civil society, the private sector and government bodies at local, regional and national levels as well as international agencies either for their own benefit or as a method of protection (Jentoft, 2007) with local-level responses representing the key to effective adaptation (Tompkins & Adger, 2004). Governance systems at this level have the potential to provide for a tighter coupling of monitoring and response so that decisions are not made detached from where impacts are being experienced (Adger, Hughes, Folke, Carpenter, & Rockstrom, 2005).

The UNFCCC includes adaptation in only five clauses. New Zealand's Ministry for the Environment's 'Preparing for Climate Change' (MFE, 2008b) guide for local government fails to mention adaptation entirely under its key principles. Kenny (2005) points out the need for further research to understand how local communities can shape adaptation in New Zealand. While little work has been published as yet in New Zealand, understanding adaptation has received increased attention in New Zealand in recent years. Countries vulnerable to climate change are

now seeking adaptation support from the international community (Burton, 2003) and recent developments such as the National Adaptation Programme of Action identify the "urgent and immediate needs to adapt to the present threats from climate change" (NAPA, 2007).

Reasons for why adaptation has not received the deserved amount of attention include the view that it can be regarded as a form of 'fatalism' or 'passive acceptance', uncertainty in the prediction of climate impacts at regional or local scales (Brunner, 1996; Henderson-Sellers, Gates, & Boer, 1996), the idea that adaptation excludes mitigation activities as well as conflicting human values and interests coupled with the difficulty of incorporating adaptation in policy processes. "Believing that we can adapt to just about anything is ultimately a kind of laziness, an arrogant faith in our ability to react in time to save our skin" (Gore, 1992). A UNFCCC Report (1996) stresses the difficulty of assessing adaptation costs when the regional impacts of climate change remain uncertain. The fact that the 2009 United Nations Climate Change Conference in Copenhagen did not deliver the agreements the world needs to address climate change "just makes the matter more urgent" said UNFCCC's Executive Secretary de Boer (2010).

Things change quickly and it is now acknowledged that adaptation and mitigation are no longer alternatives but rather 'two sides of one coin' (Brooks, 2003; Schipper & Burton, 2009). However, the two responses do not share the same scale: adaptation takes place locally, whereas mitigation needs to be aggregated at the global scale to properly assess its potential benefits in reducing climate hazards (R. N. Jones, Dettmann, Park, Rogers, & White, 2007). Denying the importance of adaptation is particularly difficult in New Zealand, being vulnerable to both climate change and variability as the following section will demonstrate. The main focus of an island-nation like New Zealand has to be on reducing vulnerability and enhancing resilience which goes beyond the scope of the UNFCCC or other global treaties. A

vulnerability assessment in terms of who and what is vulnerable, to what stresses, in what way, and what capacity exists to adapt to climate change (Burton, Huq, Lim, Pilifosova, & Schipper, 2002; Smit & Pilifosova, 2003) poses a major challenge not least because the decisive factors are embedded in not only historical but socio-economic, social-ecological and cultural conditions.

2. Climate change on a New Zealand scale

While climate change impacts are often presented and projected at the global, continental or national levels, they are ultimately felt at the local level (Paavola & Adger, 2006). Communities vulnerable to ongoing climatic variability are most affected. Not surprisingly around 75% of the NZ$1.5 billion insurance payout for damages from natural hazards in New Zealand over the last 40 years was for weather related hazards with risks expected to increase in the future because of climate change, perhaps even more so if international efforts to reduce greenhouse gases continue to be poor (NIWA, 2009). Some of the predicted impacts include increases in average temperature, sea-level rise and altered rainfall patterns, (as previously discussed in Table 1.1). The implications of socio-economic and environmental impacts are even further complicated by the damage caused by introduced species, human population growth, environmental degradation and globalisation which are often indirect and only partly understood (N. J. Turner & Clifton, 2009).

Under the New Zealand Resource Management Act (RMA, 1991), local authorities are obligated to ensure the "avoidance or mitigation of natural hazards". The New Zealand Coastal Policy Statement[8] (NZCPS, 1994), which contains policies aimed at

[8] Several policies in the NZCPS address the effects of climate change: Policies 1.1.2 to 1.1.5 address features and components of natural character; Policies 3.2.1, 3.2.2, 3.2.4 consider subdivision and

achieving the sole purpose of the RMA, includes specific reference to a rise in sea-level. Where development pressure is high, the potential increase in vulnerability is large unless adaptive measures are taken (IPCC, 2000). Without further adaptation, New Zealand's National Institute of Water and Atmospheric Research (NIWA) (2007) points out, the potential impacts of climate change for New Zealand are likely to be 'substantial' with a 'dramatic' increase in risk. According to its 'Coastal Adaptation to Climate Change' report (2007) little effort has been invested to raise the public's awareness of adaptation to climate change with a duty to better understand what is valued by stakeholders. There is increased acknowledgement of the urgency to develop and foster a new sustainability ethic that takes cognisance of the needs and freedoms of both current and future generations as well as the intrinsic value of nature (Glavovic, 2008b). Wratt (2009) points out that the values of stakeholders will be impacted by climate change and that specific adaptation methods are required to meet cultural needs in New Zealand. A report by MFE (2001) points out the obligation for 'timely' and 'proactive' adaptation to climate change in order to avoid loss of productivity from erosion and the 'biggest negative impact' – an increased frequency of floods and droughts. The adaptation mechanisms needed to cope with 'irregular but extreme droughts and floods' differ from those required to cope with gradual change (J. W. Handmer, Dovers, & Downing, 1999).

Despite the global nature of climate change, its impacts will be felt locally, and interaction will occur with existing hazard patterns, the product of even more localised social-ecological[9] processes (Kelly & Adger, 2000). There is a strong need to determine effective means of promoting remedial action to limit impacts by facilitating adaptation and understanding ways in which communities are really

use and development of the coastal environment; Policy 3.3 addresses the precautionary approach and Policy 3.4 recognises natural hazards. All of these policies relate to coastal hazards, including sea-level rise.

[9] The term social-ecological, moulded by Berkes and Folke (1998) emphasises the integrated concept of humans in nature and stresses the delineation between social and ecological systems as arbitrary.

vulnerable. While the processes that determine vulnerability are manifest at all scales from local to global, vulnerability itself is associated with a specific population (Adger & Kelly, 1999). Coastal areas like those on the Coromandel Peninsula for example tend to be of high traditional and cultural importance and are often fundamental to Māori in their identity as *tangata whenua* (people of the land), not to mention the important role as food source. Many communities in New Zealand continue to harvest food traditionally and uphold cultural practices to the present thus offering a form of knowledge that is both traditional and contemporary, representing the experiences of many generations in New Zealand (D King, Goff, & Skipper, 2007). It does not come as a surprise that knowledge of ecosystem dynamics and associated management practices exist among people of communities in New Zealand that, on a daily basis and over long periods of time interact for their benefit and livelihood with ecosystems (Berkes, Colding, & Folke, 2000; Fabricius & Koch, 2004). These ecosystems are ultimately affected by climate change and as a consequence will affect communities.

3. The relevance of governance in a social ecological system

Shaping local pathways of development through governance has the potential to enhance adaptive capacity and reduce vulnerability. Governance can mean many things; it can refer to the creation of conditions of ordered rule and collective action (Stoker, 1998) or institutions of social coordination (M. Lee, 2003). Societies are governed by a combination or interaction of governing efforts by all kinds of participating actors and entities, public as well as non-public (Kooiman, 2003). Governance enables societies to develop social systems and adaptive capacities to shape change – an important component of resilience in a social-ecological system (Berkes, et al., 2003). One such local example, although not focusing on climate

change directly, is the process that gave rise to the *Coromandel Blueprint,* a living document shaping our future landscape and prosperity (TCDC, 2010).

Healy (2006) and Lane (2005) argue that recent planning efforts have increasingly focused attention on meaningful stakeholder participation. Nonetheless, 'meaningful' participation in which stakeholders have a 'real say' in the planning outcome is a challenging endeavour (Glavovic, 2008b) and not easily achieved. Mastering this challenge however, can give communities the opportunity to overcome the crisis of unsustainability which, above all else, is a crisis of governance (Adger & Jordan, 2009). Thus, an analysis of integrated social-ecological systems to improve our ability to respond to change (Berkes, et al., 2003) is required.

A framework presented by Glavovic (2008b) provides insight into social-ecological systems by drawing on scholarship from ecological economics (Costanza & Wainger, 1991; Daly, 2005), resilience studies (Berkes, et al., 2003; Berkes, et al., 1998; Gunderson & Holling, 2002), and sustainable livelihoods (Carney, 1998; Chambers, 1987; Chambers & Conway, 1991). The framework highlights three features crucial to understanding the nature of resilient and sustainable communities by illustrating not only social-ecological interactions but also human interaction with others with respect to their interaction with the environment. The three features are as follows:

i. Cultural and natural systems are enmeshed with the economy being a sub-system of socio-political systems;
ii. Human-in-nature systems are characterised by complex interconnections, diversity, dynamism, unpredictability, non-linearity, evolutionary behaviour and critical feedback loops;
iii. An implementation of emerging understanding into practice emphasises the role played by governance institutions in mediating access to resources. Governance institutions mediate access to critical livelihood assets and

consequently frame the opportunities for and constraints on user groups in their pursuit for adaptation. These choices, in turn, have implications on resource use and therefore the impacts on the source and sink functions of ecosystems which ultimately have implications on the livelihood assets available.

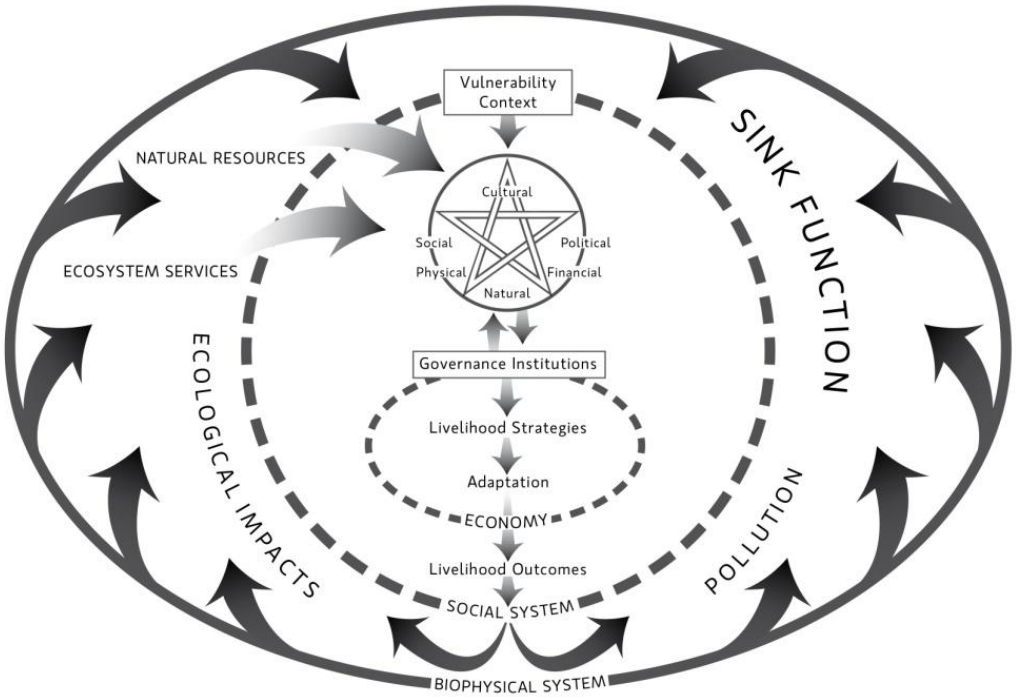

Figure 2.1: Sustainable social-ecological systems (adapted from Glavovic, 2008a).

Ultimately, Glavovic (2008b) argues, governance institutions and social processes play a more fundamental role in determining sustainability and resilience than biophysical factors and hazard threats. Many of the current uses of resilience acknowledge reciprocal interactions between human and natural systems. Adger & Jordan (2009, p.1) point out that “the relationship between humans and their

environment and, ultimately, the relationship between us all... has to be a full part of any solution to the almighty mess that we as a human race now face." However, social and environmental systems are complex systems and our knowledge of them and our ability to predict future changes will never be complete, even after a great deal of research (Berkes, 2007).

So why is it that governance for adaptation to climate change is still in a fledgling stage in New Zealand? Do stakeholders not hold sufficient legitimate concern and understanding about climate change? Do stakeholders not hold aspirations for the governing system's ability to address their concerns? The answer might be that if there is little to no awareness of the sustainability conundrum, no societal problem is identified resulting in no stakeholder participation. Dryzek (1987) refers to this phenomenon as 'ecological problem displacement'. A precondition in order for stakeholders to take action and form communities of interest is that they must be in a position to feel actual loss or gain and feel that they can make a difference (Jentoft, 2007). A shift in perceptions of the environment can change human behaviour without requiring changes in social dynamics and political behaviour (McCay, 2002). Over time the changes in human behaviour then become reflected in political behaviour. Perceptions of vulnerability can provide a context for the potential of adaptation and are therefore further critical elements of vulnerability assessments (Heijmans, 2004; Hilhorst & Bankhoff, 2004; Parker & Harding, 1979). The link between perception, knowledge and behaviour (intent) has shown to be important in understanding attitudes towards climate change (O'Connor, Bord, & Fisher, 1999) and has a significant effect on the outcomes of planning processes (Gow & Otway, 1990; Krimsky & Plough, 1988). A current study conducted by NIWA aims at comprehending this link and how to prepare and adapt to climate change (Rouse, 2010).

There is no excuse about not knowing what climate change will bring and how we can shape resilient and sustainable communities; science, modelling and scenario building, together with the internet, make any further denial impossible despite high levels of uncertainty (O'Riordan, 2009). Climate change is fraught with uncertainty and is not likely to follow predictable paths. Moreover, we have no external models of the planet to compare one treatment or cure with another (O'Riordan, 2009). In addition, the effects of human development are not only unevenly distributed but future generations will be the ones most exposed to the effects of our current actions in a world in which for the first time in history "every local place is strongly influenced by global dynamics" (Young, 2002, p. 53).

4. Old knowledge in an ephemeral world

Management, as argued by Westley (1995) is about bringing together old knowledge from diverse sources into new perspectives for practice. Management of social-ecological systems requires the ability to observe as well interpret processes and variables in dynamics to develop the capacity to respond to environmental feedback and change (Becker & Ostrom, 1995; Berkes, et al., 1998; Carpenter, Walker, Anderies, & Abel, 2001). While, as discussed, climate change impacts are often presented and projected at the global, continental or national levels they are felt at the local level (Paavola & Adger, 2006) and whereas climate is an abstract scientific concept, weather is time- and place-specific, a phenomenon experienced first-hand (Riedlinger & Berkes, 2001). In this context climate change gives us the opportunity to make use of the potential contributions of local and TEK which, according to Turner & Clifton (2009) can affect human behaviour, and hence, may prove valuable when responding to climate change.

Despite Indigenous Peoples' in general and Māori Peoples' in particular environmental knowledge and experience of change over many generations, they have been to date "…largely ignored or marginalized by the IPCC and in the climate change discussion as a whole" (Ethnoecology and Climate Change symposium background, Environmental Change Institute, University of Oxford, 2007). Inviting Indigenous People's participation into climate change research, policy, and decision making makes sense from both ethical and practical viewpoints (N. J. Turner & Clifton, 2009). From a social justice perspective, the United Nations Declaration on Rights of Indigenous Peoples clarifies the requirement of promoting Indigenous People's "full and effective participation in all matters that concern them" while it acknowledges that New Zealand had "one of the largest and most dynamic indigenous minorities in the world" (United Nations General Assembly, 2007).

TEK is a knowledge-practice-belief evolving by adaptive processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and with their environment (Berkes, 2008). This definition further recognises that TEK is an attribute of societies with historical continuity in resource practice use (Dei, 1993; Williams & Baines, 1993). It can be viewed as a 'library of information' on how to cope with dynamic change in complex systems (Berkes, et al., 2000). Knowledge of ecosystem dynamics and associated management practices exists among people of communities that, on a daily basis and over long periods of time interact for their benefit and livelihood with ecosystems (Berkes, et al., 2003; Fabricius & Koch, 2004).

Older members of the society are considered key knowledge carriers since many have extended experience in a location and have observed changes that have occurred throughout their lifetimes (N. J. Turner, 2005). Along with memory of past events, elders can provide the wisdom to interpret rare events (Berkes, 2008). Their knowledge does not simply reflect the existing environment, but also grasps its

historic development and its interaction with social and cultural changes within the community (Baumwoll, 2008). Past coping experiences and perceptions of change can reveal insight into future adaptive capacity (Riedlinger & Berkes, 2001). As we are increasingly faced with risks of climate change that are at the boundaries of human experience (cf., e.g. IPCC, 2001; R. N. Jones, 2001; Kelly & Adger, 2000; Schneider, 2001; Vaughan & Spouge, 2002), there is an urgent need to learn from past and present adaptation strategies as well as adaptive capacities to understand both the processes by which adaptation takes place and the limitations of the various agents of change (Adger, 2003). Strengthening adaptive capacity is probably the single most useful approach to enhance the prosperity and sustainability of present and future generations (J. W. Handmer, et al., 1999). However, given that predicted climate change impacts are projected to result in unprecedented conditions, there is little to draw from in past experience. The risk is that TEK is no longer capable of providing the required knowledge base.

Even though climate scientists are now able to predict climate change and its potential impacts clearer than ever before; our understanding of adaptive processes and strategies in order to help prioritise and improve possible adaptations within this rapidly changing environment remains in its infancy. Decisions about the future will be made in ignorance (J. W. Handmer, et al., 1999) which is a rather disturbing situation for western culture underpinned by belief in the certainty and resolving power of science and technology (Ravetz, 1986). As this pervades every aspect of climate change and variability, Smithson (1991) emphasises the importance for a need to develop policy responses which are robust in the face of the many types of uncertainties. Local insights and experience are significant in this regard because they fill in the gaps of global science and provide insights regarding local impacts and adaptations (Berkes, 2002). The practice of TEK is largely dependent on local social mechanisms (Berkes, 1989). It is value-laden and made up of observations,

experience, beliefs, and philosophies which affect human behaviour, and hence have a "specific role to play in responses to climate change" (N. J. Turner & Clifton, 2009, p. 181), management, science, and governance. In order to understand climate change, a phenomenon that is unpredictable and far-reaching, the wise approach is to take a pluralistic view (Riedlinger & Berkes, 2001) and look into the potential of TEK thus allowing it to influence our considerations of what climate change is, its effects and ways to adapt to and remediate its impacts (N. J. Turner & Clifton, 2009).

The effectiveness of adaptation actions and the reduction of sensitivity to a physical hazard depends not only on the future climate but also on the future – unknown – state of the world (Adger, 2006). Management therefore does not require a precise capacity to predict the future, but a qualitative capacity to devise systems that can absorb and accommodate future events (Lugo, 1995). It is fair to say that neither western science nor TEK, as pointed out by Riedlinger & Berkes (2001) is sufficient in isolation to address all the complexities of climate change.

5. TEK in the youngest country on Earth

New Zealand as 'the youngest country on earth' (M. King, 2003; Tourism New Zealand, 2010) was the last land mass to be colonised by humans and all adaptive options had to be acquired and constantly reshaped. Hence the history of the first colonists of New Zealand constitutes a natural experiment allowing us to study human adaptation (Diamond, 1997).

New Zealand was initially settled between the 13th and the 14th century AD. The environment and climate was entirely beyond knowledge and expectation. Ways to deal with what could be described as 'super exposure' to an entirely new

environment had to be devised. People were forced to adapt to their new environment not without considerably altering it too – in the form of habitat destruction, the introduction of mammalian predators and species extinctions (Duncan, Blackburn, & Worthy, 2002). The transformational impact of Māori was significant and while the habitat transformation executed by Māori happened over a longer time-period it was nonetheless consequential. In the mid 19th century however, European colonists went to the extreme in their attempt to create a 'neo-Europe', a place that looked and felt very much like the one they had left behind (M. King, 2003). In this process not only the appearance of the landscape was completely transformed over the following two decades but the economic, demographic and political changes severely impacted what has become Māori.

New Zealand's distinctive settlement history has the potential to provide valuable insight into past environmental conditions from which conclusions can be drawn about how communities traditionally deal with the effects of change and exposure. For this it is essential to have a closer look at how Māori traditionally view their place in the world and how the process of decision-making is structured if we are to learn from TEK. Māori conceptualise humans "as part of a personified, spiritually imbued 'environmental family.'... Earth's bounty is considered to be a gift necessitating reciprocity on the part of human users in order to maintain sustainability" and requiring a sense of *kaitiaki*[10] (Roberts, Norman, Minhinnick, Wihongi, & Kirkwood, 1995, p. 14). Krupnik & Jolly (2002) make mention of *kincentric ecology*[11] a concept regarding humans as an integral part of ecosystems which in turn are an integral part of peoples' *whakapapa*[12] (Manaaki Whenua,

[10] guardianship – a Māori way of managing the environment (TeAra.govt.nz, 2009)

[11] an awareness that life in any environment is viable only when humans view the life surrounding them as kin (Salmon, 2000). Other forms and parts of life, biotic or abiotic are regarded as having human traits and related to us in one way or the other.

[12] Whakapapa is "genealogical descent of all living things from the gods to the present time" further defined as "a basis for the organisation of knowledge in the respect of the creation and development of all things" (Barlow, 1994, P. 173)

2009). If humans value their environment as kin it can be argued that they not only look after it better but have an intimate understanding of its processes and functions which can prove significant when assessing climate change. A manuscript entitled *Nga Tama a Rangi* (The Sons of Heaven), written in 1849 by Wī Maihi Te Rangikāheke, gives a clear and systematic account of Māori beliefs about the origin of ecosystems and kincentric ecology.

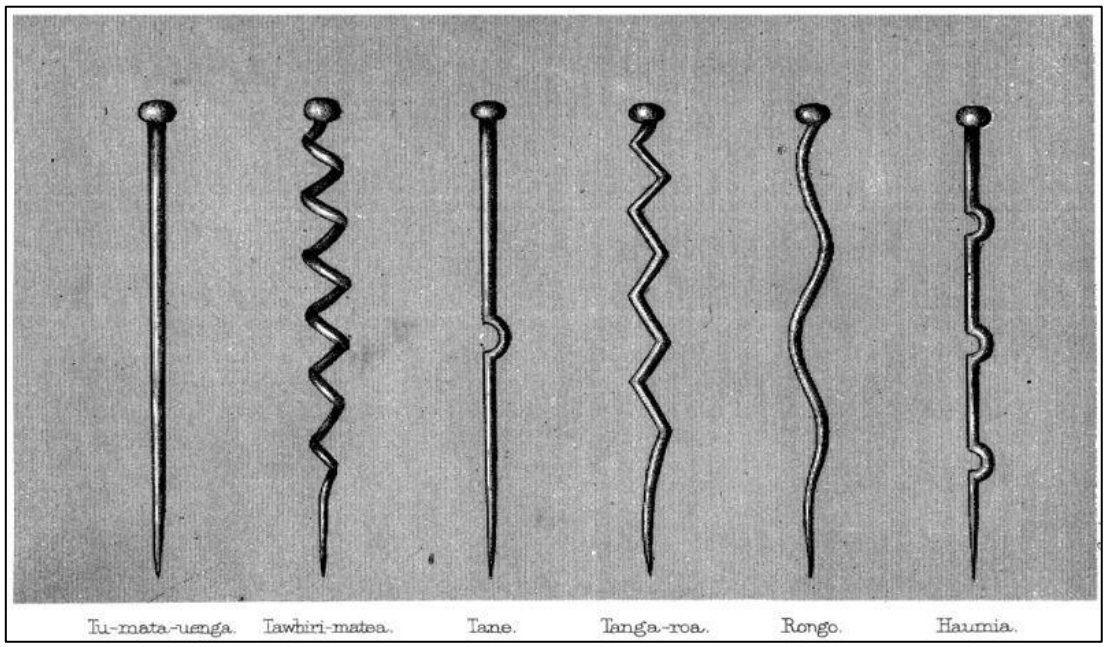

Figure 2.2: Carved sticks representing the Māori gods Tūmatauenga (god of war), Tāhirimātea (storm god), Tāne (god of forests), Tangaroa (sea god), Rongo (god of cultivated plants and peace), and Haumia (god of wild food plants) (White, 1887).

Figure 2.3: A contemporary example of carved sticks representing Māori gods at Hot Water Beach on the Coromandel Peninsula (photo taken by author).

"According to Europeans, God made heaven and earth and all things. According to the Māori, Heaven (Rangi) and Earth (Papa) are themselves the source" (Biggs, 1966, p. 449). A phrase synonymously used with wisdom is *Mātauranga Māori*, which can be defined as 'the knowledge, comprehension, or understanding of everything visible and invisible existing in the universe'. This definition is usually extended to include past, current and local knowledge; systems of knowledge transfer and storage; and the goals, aspirations and issues from an indigenous perspective (Manaaki Whenua, 2009), which reflect its relevance to climate change.

Māori practice collective decision making at all levels of their society where a consensus is reached following robust discussion with the debate often including social, cultural, spiritual, economic, and political dimensions to the environmental issue under discussion (Manaaki Whenua, 2009). Given the difference in Māori and European approaches it does not come as a surprise that misunderstandings can

arise by traditional Māori stakeholders participating in the governance process. Possibly added different levels of education and literacy and the need to comprehend scientific approaches complicate matters further. While there are provisions in decision-making processes aiming at giving voice to indigenous knowledge and experience, participation for Māori in governance institutions and social processes can be experienced as restricted and disempowering due to a combination of social, economic, political, and cultural barriers (Rockloff & Lockie, 2006). Currently the integration of Māori values and information into decision-making processes is inadequate, which has resulted in very low participation rates by iwi and hapū[13] in local management processes (Blackhurst, et al., 2003; Whangapirita, Awatere, & Nikora, 2003). A reform of European decision-making frameworks which are presently incompatible with the Māori way of making decisions and TEK underscores the need for a 'level playing field' – different to the traditional approach regarding governance as unitary, single-minded, top-down and instrumental thus reducing governance to governing (Jentoft, 2007). On a 'level playing field' it is not power but reasoning that dominates the processes of policy development and implementation (de Roo & Porter, 2007).

6. Where to from here?

The long-term consequences of climate change for New Zealand cannot yet be predicted with certainty and our understanding of adaptive processes and strategies in order to help prioritise and improve possible adaptations remains in its infancy. An altered climate will have unforeseeable and unexpected consequences with respect to frequency and intensity of weather events and sea-level rise. These events themselves do not cause vulnerability though – vulnerability is the product of

[13] A hapū is a division of a Māori iwi representing a sub-tribe determined by genealogical descent (māori.org.nz, 2004)

social-economic forces shaping people's livelihood options and choices (Jesse C Ribot, 1995, p. 22). In order to comprehend this vulnerability, it is pivotal to look into local perceptions and experience and what they tell us about climate change adaptation given prevailing international and national guidance narratives. This chapter has identified the need not only to look into local climate change stories which are presented in Chapter Four, but for a close look at how national and international climate change adaptation guidance compares, as discussed in Chapter Five. The following Chapter introduces and explains the research method and gives reasons for the approach selected.

CHAPTER THREE

RESEARCH METHOD

Social science should be problem-driven as opposed to methodology-driven and employ the method that best helps to answer the research question for a given problematic (Flyvbjerg, 2006). The overarching mode of research introduced and discussed in this chapter is case study research. The aim of this study is to understand how a vulnerable coastal community is affected by projected climate change, thus representing the 'case'. The case is researched in depth to gain an understanding of what is required to adapt successfully. The approach is valuable for this research because it enables the use of 'tools' to study in depth complex phenomena in their real world context (Flyvbjerg, 2006; Yin, 2009). Kuhn (1987) emphasises the importance and necessity of thoroughly executed case studies. Such a thorough execution is best achieved by deploying a range of research 'tools'. The main 'tools' deployed for the purpose of this research include Narrative Policy Analysis (conducted by document analysis and key informant interviews), participant observation and a review of relevant policies, plans and 'grey literature' (i.e. council and professional documents / publications).

This chapter outlines specific methods used in this study, explains reasons for their selection as well as the modus operandi. Major advantages and disadvantages are highlighted and ethical considerations for interviewing community members as well as data collection methods are described.

1. Narrative Policy Analysis

Within case study research Narrative Policy Analysis represents a 'tool' to examine how stories influence public policy and vice versa. The use of Narrative Policy Analysis in this research is motivated by a desire to 'unpack' stories and represent local narratives and policy narratives as authentically as possible. Climate change and its effects is a subject about which politicians, policymakers, scientists and others have defined a wide range of certainties and uncertainties, sustaining the most contentious contemporary policy issues; thus making it virtually ideal for Narrative Policy Analysis (Roe, 1994). The study of narrative is inherently interdisciplinary and extends the 'interpretative turn' in the social sciences (Geertz, 1983; Rabinow & Sullivan, 1987). Riessman (1993) describes the narrative as the organising principle for human action complementing natural science methods proven limited for understanding social life (Bruner, 1990; Rosaldo, 1989; Schafer, 1992). Bruner (1990, 1991) even asserts that narrative is one of the two basic ways people use to perceive the world, the other being the 'logico-scientific'. People naturally live stories and in their telling of them, reaffirm and modify them and create new ones (Koch, 1998). The same can be said about policy stories: Because climate change is such a contentious contemporary policy issue, information and resulting guidance is updated and adjusted continuously to be up to date.

Narratives allow us to make sense of a socially constructed world (cf. Fischer, 1998; Hajer, 1993; Roe, 1994; Stone, 2002). Stone (2002) refers to the imperativeness of narrative research taking place within commons-problems and what constitutes the public good.

The application of Narrative Policy Analysis for this case study finds itself in an analysis of individual local narratives and climate change adaptation guides. In other words Narrative Policy Analysis serves to navigate the researcher through the

narratives. A fundamental question important to answer before explaining the exact procedure is 'what makes a narrative a narrative and how can stories represent real research?' According to Jones & McBeth (2010) there are four basic prerequisites:

i. Setting: There has to be a setting and a context bound by geography or institutional venue (Ney, 2006; Ney & Thompson, 2000; Verweij, et al., 2006). The setting in this case is a vulnerable community in the context of local climate change adaptation depending on adaptation guidance;
ii. Plot: There has to be a beginning, middle and an end (McBeth, Shanahan, & Jones, 2005; Roe, 1994; Stone, 2002) that determine the plausibility of the narrative (M. D. Jones & McBeth, 2010). Plots are essential to Narrative Policy Analysis in that they provide the relationship between component parts (e.g. characters and setting and structuring causal explanations). A common plotline, according to Stone (Somers, 1992; Stone, 2002) is the story of decline, as witnessed as part of a changing climate and local experience. In simple terms the state of the natural environment and the climate is changing, resulting in the need to adapt;
iii. Characters: While the characters can vary in their specific characteristics, they always include those who identify a problem and point out how it can be resolved ('heroes'), those who generate the problem ('villains'), and / or victims (those harmed by what is happening) (McBeth, et al., 2005; Ney, 2006; Stone, 2002). The 'hero' in this thesis is the New Zealand government seeking to create sustainable and well-adapted communities. The villains are, in a broad sense, those 'responsible' for an altered climate. The victims are those affected by climate change and forced to take action and adapt, i.e. beachfront property owners and community members affected by climate change. The victims however will become the 'real' heroes after adapting to climate change successfully;

iv. Moral or solution: The moral of a narrative comes in form of a prompt action (Stone, 2002) and / or as a policy solution (Verweij, et al., 2006). In this case both the moral as well as the solution are actions taken to adapt to climate change and deal with an uncertain future. The deeper moral of this narrative can be described as the need to prioritise long-term community safety and sustainability over short-term private gain. Actions giving effect to the deeper moral include national policy direction as well as local plans and adaptation measures.

Narrative can further be described as the primary means by which information is processed, organised and conveyed (cf. Berinsky & Kinder, 2006; Gerrig & Egidi, 2003; K. Klein, 2003). Information framed as a story affects what people remember and how this is structured as well as their opinions on government actions (Berinsky & Kinder, 2006). Narrative, Roe (1994) claims, is a force in itself, far more than merely a story. Narrative relies on language. Language not only mirrors the world but is also responsible for how the world is shaped to begin with (Roe, 1994). Apart from those already mentioned, the advantages are obvious: given that narrative is such a fundamental and interdisciplinary way to perceive the world, it enables the researcher to illuminate barriers and opportunities in both the stories people live as well as in policy implementation. Possible constraints or limitations lie in the perception of narrative as a mysterious and elusive concept, ...too superfluous to underpin theory building, and too nebulous to facilitate the empirical investigation of policy processes and outcomes (M. D. Jones & McBeth, 2010 pp. 330-331). Chapters Four and Five will clearly demonstrate that for the purpose of this study the advantages outweigh the disadvantages.

So how does the concept of Narrative Policy Analysis translate into the study of climate change adaptation using a case study and adaptation guidance and why is it

relevant for this research? The stories presented in this thesis come in the form of individual insights of people living in a part of New Zealand vulnerable to storm events and sea-level rise (EW, 2009) as well as the narrative of eight national and international climate change adaptation guides. These narratives provide an understanding of the perceptions, challenges and opportunities of climate change which in turn are viewed against the background of the Ministry for the Environment's 'Preparing for Climate Change' (2008b) guide and in the light of international adaptation guidance. Naturally the stories presented and insights gained are not the same. Each and every story is different because the world is experienced and perceived in different ways. Narrative reflects individuals' values, interests, and histories with respect to a particular subject (Kilduff & Mehra, 1997; Riessman, 1993; Winslade & Monk, 2000). In other words there is not one single all-encompassing reality. Grenz (1996, p. 109) describes this point of departure as follows: "The old objectivist position is no longer viable, and there is no single, timeless truth existing out there independent of particular perspective or method waiting to be discovered by means of scientific procedures". Rather there are multiple and divergent narratives: different stories and insights shared by local stakeholders and different stories presented in the guidance literature. Despite different stories and realities there is, as this research highlights, a "fusion of horizons" (Koch, 1998, p. 1189). This fusion together with the mix of certainty and uncertainty and the resulting controversy provides the right context for policy analysis and creates a platform enabling a juxtaposition of the shared reality of individual and guidance narratives. Hampton (2009) furthermore points out the particular usefulness of Narrative Policy Analysis as a method to understand public participation – a key factor of this thesis (cf. Figure 1.1) – throughout the policy development and planning process.

2. The application of Narrative Policy Analysis

The New Zealand Government alongside governments around the world is urged to take action to adapt to climate change and provide guidance. This will need to happen without knowing exactly what the changes will be and how these changes will be experienced locally. As explained in Chapter Two, at present it is highly complicated to quantify many of the climate variables in terms of either future absolute levels or rates of change (Pittock & Jones, 2000). Moreover, many such changes will vary spatially and produce highly location-specific impacts. Who exactly will be affected by anticipated climate change and in what precise manner remains unclear. This changing but uncertain setting lends itself to investigation through Narrative Policy Analysis. Climate change is inevitable, and something must be done to lead vulnerable communities to successful and meaningful adaptation. Measures need to be taken to avoid negative impacts (Barnett & O'Neill, 2010). Such measures include international and national adaptation guidance narratives such as those analysed in this research.

For the purpose of this thesis, local experience and perceptions and the Ministry for the Environment's (MFE) (2008b) 'Preparing for Climate Change' guide were juxtaposed with seven international adaptation guides introduced in Chapter Five. Fundamental questions asked include: 'what do the local perceptions and experiences tell us about climate change adaptation given prevailing international and national guidance narratives?' and 'how does the MFE narrative relate to local narratives?' In order to answer these questions 'key themes' framing the interviews were defined. The 'key themes' allowed for local narratives to be assigned thus offering key insights, experience and perceptions into climate change related adaptation:

i. perception of climate change salience;
ii. anticipated climate change impacts and vulnerabilities;
iii. adaptation already underway,
iv. governance roles and responsibilities and future adaptation prospects; and
v. local and traditional environmental knowledge.

Lives are lived, stories are told, risks, vulnerabilities and exposures are perceived and experienced, opinions and approaches are formed: All this is part of human activity and therefore initially takes place on a local level while climate change itself takes place on a global level as described in Chapter Two. Arguably the narratives from local key stakeholders make it possible to highlight and / or gauge the meaningfulness of a guidance narrative. Local narratives and guidance narratives are, to a certain extent, complementary. However, only by taking these narratives a step further, namely through international comparison, can conclusions be drawn about the meaningfulness and relevance of New Zealand's guidance narrative. The following logical question is therefore how the 'Preparing for Climate Change' (MFE, 2008b) narrative compares to international narratives? The global reality and the local effects of climate change underscore the value of comparing international, national and local narratives. The guides selected for this research represent narratives about various measures recommended to adapt to climate change in countries comparable to New Zealand. Both New Zealand's guide as well is the international guides serve this purpose. Target audiences range from local, regional and state governments to international role-players. All guides focus on western, developed countries facing similar challenges as New Zealand albeit in different ways. Only by means of comparison is it possible to come to conclusions about roles and responsibilities of such guides, define commonalities and – most importantly for a local New Zealand based case study research – explore the adequacy of New Zealand's guide in preparing for and adapting to anticipated climate change.

Climate change adaptation guidance needs to be 'grounded' in local reality and can only be effective if it resonates with local narratives. Local narratives relate to guidance narratives in a way that they quasi 'set the scene'. Just like the underlying principle of governance as described in Chapter Two, this 'scene' can be envisaged as a pyramid shape. Climate change is located at the top as the 'catalyst' of the realisation of the importance of adaptation. At the bottom of the pyramid, representing the local level, are the vulnerable communities like Te Puru affected by the effects of climate change. Guidance narratives must therefore reflect and directly relate to local narratives otherwise governance efforts are in vain. The same can be argued for the relationship between national and international narratives: The world is in the clutches of the crisis of unsustainable patterns of development that imperil global life-support systems as described in Chapter Two. As a result western developed countries have similar underlying 'morals of the story' albeit in different forms as they reflect culturally and geographically different settings. While the setting, plot and characters vary, similar villains and heroes (e.g. the state, private sector and civil society actors) within the 'moral' remain. Framing international guidance narratives with New Zealand's guidance and juxtaposing these with local narratives brings light to the meaningfulness and potential of contemporary adaptation narratives.

The greatest advantage of the research approach chosen is therefore the ability to compare the essences of key climate change narratives on national as well as international level with understandings evolved on a local level. The approach is two-fold: First New Zealand's guidance narrative is assessed in terms of its local relevance and applicability by contrasting local narratives with guidance narratives. Second New Zealand's guidance narrative is assessed in terms of the extent to which it reflects international narratives. International key guidance elements are distilled

enabling an investigation of the extent to which the elements are reflected in New Zealand's guidance narrative.

3. Case Study Selection

The community of Te-Puru lies on the western side of the Coromandel Peninsula in New Zealand, 37°2'48"S 175°31'18"E with a population of 942 in the 2006 census (Statistics New Zealand, 2007). Te Puru was selected as single site case because of its exposure to a wide range of natural hazards which, as described in Chapter Two, will be directly and indirectly altered by anticipated climate change. Further reasons include a mix of long-time residents, Māori and Pākehā, contemporary and preceding developments on the coast, the floodplain and the hills, long-time residents and newcomers – all affected by climate change, a phenomenon the community as such holds very little responsibility for.

The Te Puru Stream and 18 tributaries[14] drain a steep hilly area of the Coromandel Range which runs through the settlement and into the Firth of Thames. The community owes the stream its very existence and it is its biggest natural threat at the same time: the stream has deposited sediment in a fan-like delta over time on which people have settled and the community is found today. The river mouth offers the only flat land available for settlement in the area, leaving the community 'sandwiched' between the sea to the one side and very steep terrain to the other. The stream itself, mainly due to its short and steep catchment, is very unstable carrying large quantities of debris and sediment during high intensity storm events which turn it into a torrent. During such events the stream is frequently blocked resulting in flash-floods with the potential of severe destruction, as illustrated in the

[14] During periods of high intensity rainfall it takes water 75 minutes to get from the top of the catchment to the bottom (EW & TCDC, 2003).

river flood hazard map in Figure 3.1. An increase in extreme climate events resulting from climate change such as storms, floods, droughts and a rise in sea-level (EW & TCDC, 2003) will bring unprecedented changes (cf. Chapter Two). Not surprisingly Te Puru holds the highest 'Annualised Lives Risk' of all communities on the western side of the Peninsula with the level of individual risk in high flood hazard zones 'above desirable levels' (EW & TCDC, 2003).

Given its location, Te Puru will be affected by a wide range of the changes in relation to anticipated climate change as described in Chapter Two. These changes, together with the demographics explained in Chapter Four make this small coastal community virtually ideal for the research of climate change adaptation.

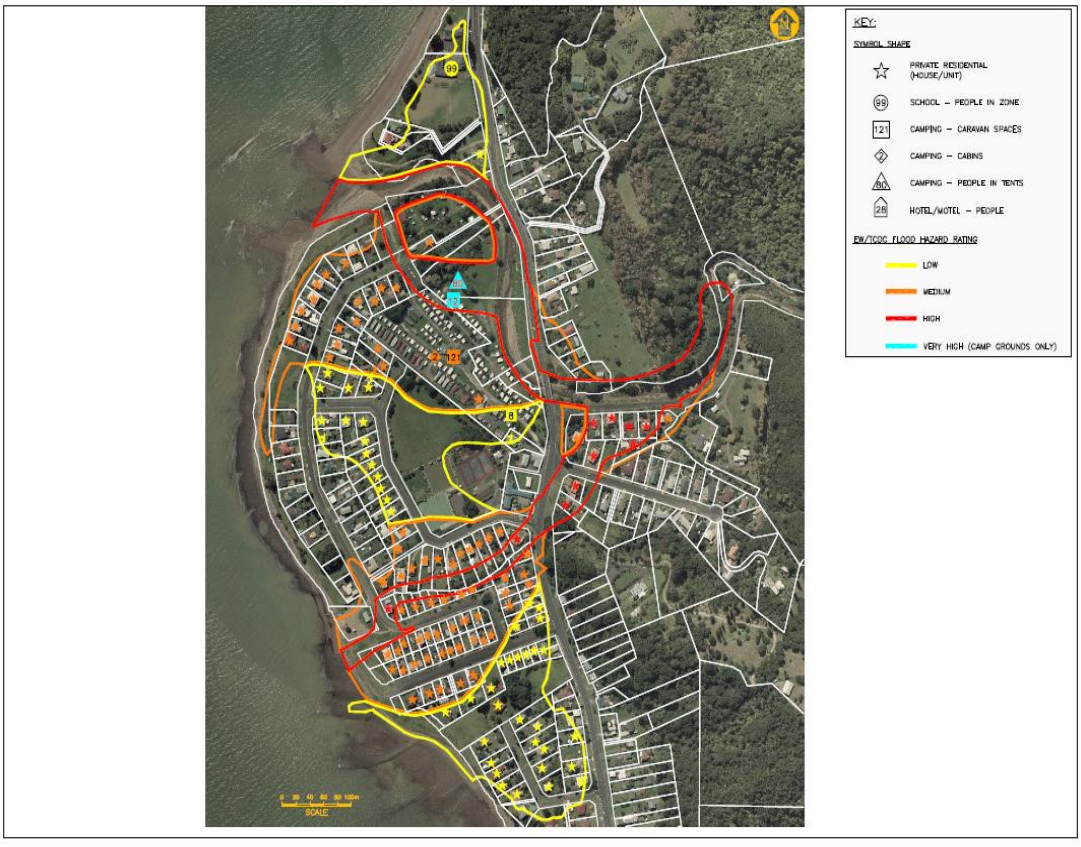

Figure 3.1: Te Puru flood hazard map (EW & TCDC, 2003)

4. The finger on the local pulse

As a member of the local community, living and working on the Coromandel Peninsula with the associated social networks and experiencing community life on a daily basis provides me with insights into community interactions and relationships as well as interactions between humans and their environment. Participant observation as a further research method deployed for this study enables close familiarity with the community. Hammersley and Atkinson (1983) point out that it is impossible to study the social world without being part of it. Participant observation consequently becomes less a method and more a characteristic 'mode of being-in-the-world' (Atkinson & Hammersley, 1994). Being based where the research takes place can be informative in comprehending community networks and adaptation efforts. Stories absent of setting can furthermore appear 'empty'. These main factors have contributed to the choice of Te Puru as case study site.

Understanding the prospects for adaptation to climate change requires understanding of the sensitivity of the impacted region (IPCC, 1996). Research is mostly undertaken by scientists based in universities abstracted from the land and the communities being researched. Although these research efforts result in valuable findings, the information may not necessarily address community specific contexts and the local relevance and implications of findings. Knowledge, insight und understanding is mostly time and place specific. Through interaction with the community on a daily basis, effective communication, application, and follow-through of relevant science are immensely facilitated (USGS, 2010). This is where a place-based approach to science can be invaluable. The U.S. Geological Survey (2010) states that place-based researchers become information brokers of the deep-rooted institutional knowledge that comes from being in a place long enough to learn its lessons and grow familiar with its cultural rhythms and history.

5. Key informant selection – why these and not others?

Given the relatively small size of the Te Puru community with 942 inhabitants, it was essential for this study to select the 'right' informants representing a diversity of views relevant to the focus of this research. Given the scope of this research only a limited number of interviews could be undertaken. Table 3.1 illustrates the 11 informant groups with relevance to climate change identified and the reason for their identification. Only a relatively small number of council-staff are involved with hazard management and hazard planning, there are two kaumatua with 'generational' knowledge in the community and only a relatively small number of long-time permanent residents. However, as Figure 3.1 highlights, there are comparatively many properties exposed to potential climatic hazards, but many of these are in absentee ownership.

The following considerations informed the selection of key informants contributing to this research. The eleven informant groups represent a diversity of views on climate change adaptation for a small community like Te Puru. The groups selected include:

i. **The Thames Coromandel District Mayor.** Given her role as Mayor and chair of the subcommittee for local government in New Zealand on climate change. "She is very much aware, up-to-date and involved with all the issues around climate change as it affects council and the community. This flows through in terms of staff too when you've got a Mayor you don't have to bring up to speed with what is happening. Sometimes she is more ahead of the game than some of us" (Council Policy and Planning Staff, 2010).
ii. **Three senior council staff members involved in policy and planning, natural hazards and climate change.** Council has responsibility for a range

of functions possibly affected by climate change. These range from natural hazards and resource management, land-use planning, building control, and the provision of infrastructure (MFE, 2008b).

iii. **The representative of Ngati Maru, the 12 Hauraki iwi.** Climate Change is likely to exacerbate many of the difficulties and disparities already faced by Māori (D. King, et al., 2010). It was considered important to understand climate change adaptation from an iwi representative point of view.

iv. **An insurance representative from IAG who was involved with underwriting the Coromandel as a special insurance case after the weather bomb in 2002.** While Climate Change poses potential threats to the insurance industry for example by increasing vulnerability and risk to natural hazards, there is also potential for innovation: "Just as insurers historically had a constructive role in the first fire departments, building codes, and vehicle safety testing, they have now an opportunity to develop creative products and services to minimise the causes and effects of climate change" (Energy Analysis Dept, 2009, p. 1).

v. **The Thames Coromandel District Civil Defence representative.** The role and responsibility of Civil Defence, as part of the local council, lies in the principles of reduction, readiness, response, recovery and all associated emergency operations. Projected climate change will ultimately affect all Civil Defence responsibilities by moving the focus from the occurrence of hazards to the "apparent increase in their frequency" (J W Handmer, 2003, p. 54).

vi. **A local coastal scientist.** Climate change, sea-level rise and the associated impacts pose a major challenge for understanding natural forces, adaptation and mitigation options. Amplified by climate change, coastal science deals with a wide range of uncertain and even unknowable fields of study. Coastal environments are fundamentally linked to climate in a wide

range of different ways. Demands on coastal resources are rapidly increasing, as shown for example by the fact that 70% of all beachfront properties on the Coromandel Peninsula are setback less than 100m from the sea (ARC, 2004). Often developments and infrastructure is located in areas vulnerable to coastal hazards projected to increase resulting from climate change making science an indispensable factor for adaptation und mitigation.

vii. **A local coastal property developer.** Public investment in coastal properties directly reflects an awareness and perception of climate change while local government's responsibility in the face of climate change directly affects coastal development. Coastal developers often create risks in opening up new development opportunities and while developers are not directly impacted by climate change those who buy property vulnerable to coastal hazards are resulting in a very uneven distribution of risks and benefits (J W Handmer, 2008). "Out of maybe 100 of our customers only one would ask about climate change and sea-level rise" (Coastal Developer, 2010).

viii. **Three beach front property owners already affected by climate change adaptation implemented by council.** Beach front property owners are directly affected by all climate and coastal hazards. On the Coromandel Peninsula beach front property owners are socio-economically diverse, ranging from families that have lived on the beach front for generations to multi-million dollar investments. The beach front property owners selected for this study reflect this 'diversity of vulnerability' as much as possible within the scope of this research.

ix. **Two kaumatua.** Traditional environmental knowledge as "a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission" (Berkes, 2008, p. 7), as discussed in Chapter Two, can contribute to local environmental

insights “at a finer and more detailed scale than conventional scientific knowledge...because it deals with outcomes and prediction... what people think will happen and why” (Usher, 2000, p. 187).

x. **Two long-time community members:** The assessments of change are based on cumulative knowledge of trends, patterns and processes, derived from generations of reliance on the land (Riedlinger & Berkes, 2001). In other words long-time community members are among the first to detect change and variations. The lack of accounting records on historical extreme events can furthermore be complemented with local knowledge. While these events were not documented in the past, long-time community members nonetheless have recollection.

xi. **Two local newspaper representatives:** While it is the media’s business and duty to inform the public about matters that might affect them, the role of the media is also to report on disasters, vulnerabilities and risks. In small communities like along the Coromandel Peninsula’s coast the local newspaper plays a vital role when it comes to informing and reporting. Local newspaper representatives, due to their responsibilities also have insight into community values, assets and ultimately what is of importance to local communities. The media furthermore plays a fundamental role in influencing local thinking and perception.

Table 3.1: Key informants selected and the reason for selection

Informant selected	Number of people interviewed	Reason for selection
Mayor	1	Chair of the sub-committee for local government on climate change in New Zealand and elected political representative of the local council.
Senior council policy and planning staff	3	• Direct involvement with council decisions with regard to climate change and the effects on the community in a planning and policy context; • Obligated to include climate change in decision-making; • Responsible for implementing climate change guidance from government.
Iwi representative	1	Manager of the 12 iwi of Hauraki with insights into TEK and the role of climate change from a Māori perspective
Insurance representative	1	• Direct involvement with underwriting the Coromandel as a special insurance case after the weather bomb in 2002; • Vital insights into community climate 'feel'; • Understanding of the costs of weather-related hazards; • Messenger of climate change implications through pricing and terms.
Civil Defence	1	• Local experience with weather-related hazards over time; • Insight into community vulnerability and who should be doing what and why as well as barrier and priorities.
Coastal scientist	1	Key knowledge carrier of coastal processes, the impacts of climate change and the effects on the community.
Coastal property developer	1	Reflects society's attitude towards coastal development and investor's awareness of climate change.
Beachfront property owner	3	Directly affected by coastal and weather related hazards and projected sea-level rise.
Kaumatua	2	• Potential insight into TEK with regard to climate change; • Key local knowledge carriers.
Long-time community member	2	• Insight into community vulnerability and the potential local implications of climate change; • Key local knowledge carriers.
Local newspaper reporter / manager	2	• Awareness of community values and how these could be impacted by climate change; • Finger on the 'pulse'; • Role in conveyance, dissemination and reporting of information regarding weather-related hazards and climate change.

Interviewees were first contacted either in person, over the phone or by email. They were then handed out or sent information about the study, providing background information and giving a brief explanation of what is involved in participating as well as the study's aims and objectives (cf. Appendix 1). The Information sheet introduced the researcher, explained what the project is about and outlined the 'key themes' in form of the framework questions asked. The initial personal contact with the interviewees turned out to be important and helpful as it created a personal platform and interviewees knew who they were 'dealing' with.

Some interviewees had previous 'bad' experience with participating in studies in form of never receiving any feedback, words taken out of context or information used against them. One key informant in particular was reluctant to be interviewed due to a fear that the information and insights given could turn out to be detrimental to the current negotiations with council. By taking the time to explain the study in person and pointing out the confidentiality of proposed interviews it was possible to overcome the fear. This informant turned out to provide particularly rich and significant insights which showed the importance of honest, ongoing, open and transparent communication. Unfortunately the newspaper representatives of the local 'Hauraki Herald' as well as one beach front property owner were not interested in participating in this study. The insurance representative based in Wellington could not make any time commitments during the time the interviews were conducted. The insights from these informants would, potentially, have been of high value for this research yet it was decided not to pursue the matter further with these informants after three failed attempts. The underlying approach is explained in Figure 3.1.

6. Ethical considerations and stakeholder involvement

To ensure that this research is respectful of the Coromandel Peninsula's culture, addresses ethical considerations and builds trust with the community, emphasis was placed on ongoing, open and transparent communication with local key stakeholders. Particularly with regard to Māori informants interviewed, guidance and advice was sought from Darren King as tangata whenua and one of the leading researchers working with Māori on climate change issues. Darren King works for New Zealand's National Institute of Water and Atmospheric Research (NIWA). Guidance was also sought from Kemara Tukukino, a local kaumatua with research experience and Ray Russek, a respected third generation Coromandel farmer in his seventies. Emphasis with regard to Māori participants was on the adherence to the principles of Kaupapa Māori Research – a research strategy related to Māori ownership of knowledge and acknowledgement of Māori backgrounds (S. Walker, Eketone, & Gibbs, 2006). The main principle of kaupapa Māori research is that of tino rangatiratanga, meaning sovereignty, self determination, governance, autonomy, and independence (Pihama, Cram, & Walker, 2002). Power and control over the research process, in this case the interviews conducted, rests within Māori understandings and practices (Bishop, Nikora, & Robertson, 1999). The project was additionally guided by literature on research with indigenous communities including Berkes (2008), Blackhurst et al. (2003), Harmsworth (2005), D King & Skipper (2006), Krupnik & Jolly (2002) and others. This research is committed to community and participant communication and rapport at all stages of the research process as highlighted in Figure 3.2.

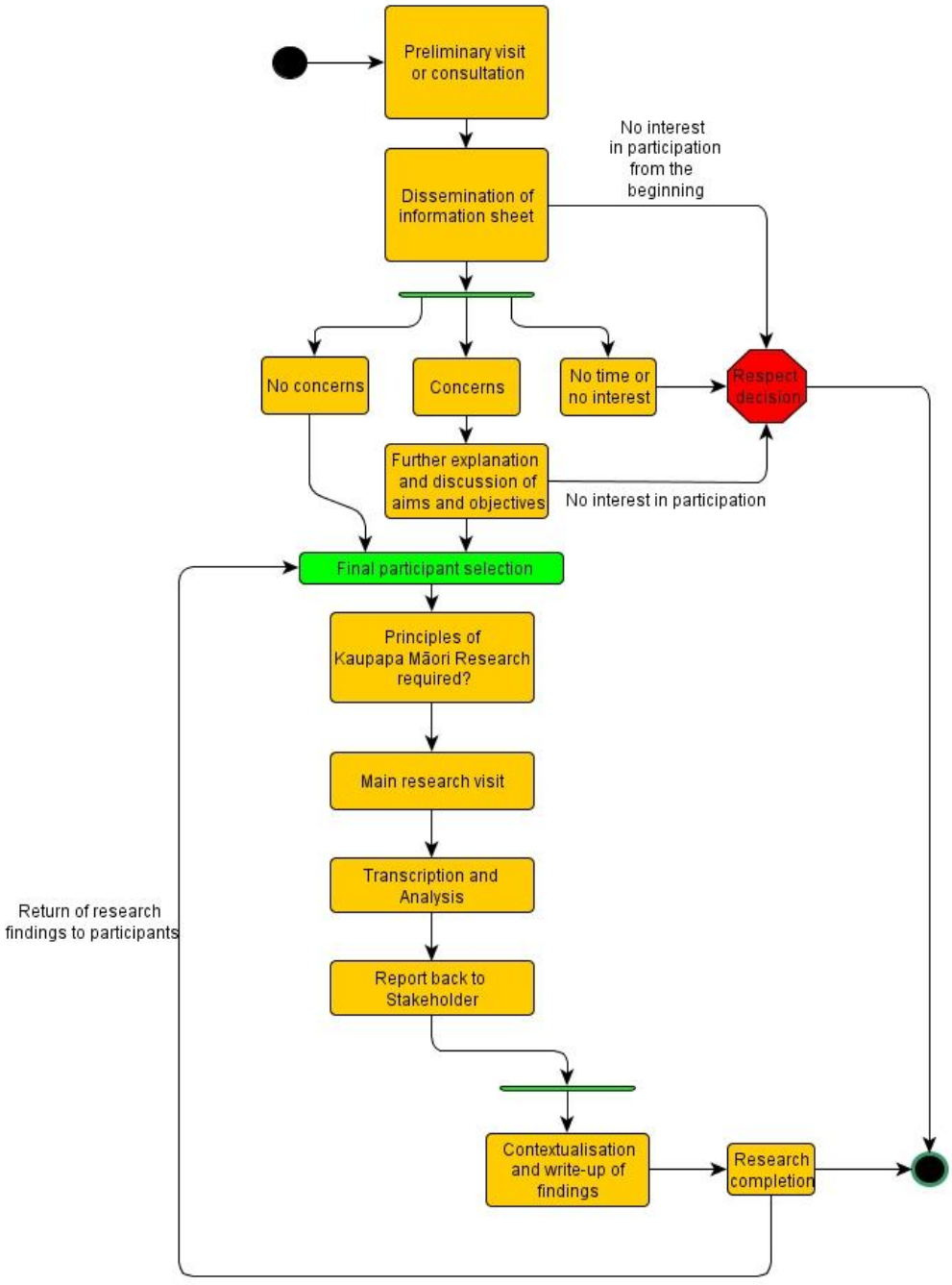

Figure 3.2: The key informant involvement process

7. Interviews

The interviews were semi-structured in order to allow for a certain degree of flexibility and for new questions to be introduced during the interview as a result of the respondent's answers. "Qualitative interviewing design is flexible, iterative, and continuous, rather that prepared, in advance and locked in stone... The continuous nature of qualitative interviewing means that the questioning is redesigned throughout the project" (Rubin & Rubin, 1995, pp. 43 & 47). The interviews were recorded in full using a mp3[15] recorder. The recording was then later transcribed. The approach adopted was informed by literature by Glaser & Strauss (1999) and Strauss (1987) on grounded theory, literature on context and content analysis (Babbie, 2006; Krippendorff, 2004), Narrative Policy Analysis (Roe, 1994) and qualitative data more generally (Bryman, 1988; Rubin & Rubin, 1995). This literature provided insight into the potential of qualitative field research and guidance on stakeholder selection, the interview process, the recording of observations and data analysis.

Substantiated by the literature review presented in Chapter Two, five 'key themes' emerged representing key factors relevant to local community climate change adaptation. The five 'key themes', as mentioned in Section Two of this chapter, include:

i. The perception of climate change salience;
ii. Anticipated climate change impacts and vulnerability;
iii. Adaptation already underway;
iv. Governance roles and responsibilities and future adaptation prospects; and
v. Local and traditional environmental knowledge.

[15] mp3 is a digital encoding format used for audio compression for transfer and playback (Fraunhofer IIS, 2005).

The interviews constitute a set of narratives that provide an understanding of local perceptions of challenges and opportunities for climate change adaptation which in turn is viewed against the background of the MFE guide and in the light of international adaptation guidance.

The questions were given careful consideration and it was ensured that leading questions were not included. Leading questions suggest answers or even contain the answers already. This would have been detrimental to the aspiration of recording stories. Babbie (2006) calls attention to the importance of how questions are phrased. There can be a subtle bias in the answers we get according to how the question is phrased. The respondent can be put under pressure to look good or the context of the question omits altogether the most relevant answers. So called 'double barrelled' questions such as questions two, three and five (cf. table 3.2) where the respondent could potentially be forced to rate attributes differently from their true insights or feelings were not considered problematic. These questions were used to trigger respondents to tell their own story about climate change related issues. The general direction of the interview was established through the five themes as mentioned before and presented in Table 3.2. Further specific topics during the interviews made it possible to 'dig deeper' and pursue specific topics. This approach helped to ensure that all stakeholders interviewed were presented with the same guiding framework on which they could articulate their own stories enabling a Narrative Policy Analysis, as described earlier in this chapter.

Table 3.2: 'Key themes' and their according questions used to attain narratives

'Key theme'	Question
Perception of climate change salience	Are we experiencing a change in climate already and how serious is the 'issue' for the Coromandel Peninsula?
Anticipated climate change impacts and vulnerability	What are the anticipated impacts and who is most vulnerable?
Adaptation already underway	What steps are already being undertaken to deal with climate change impacts?
Governance roles and responsibilities and future adaptation prospects	Who should be doing what and why? What do you see as barriers, opportunities and priorities for future action?
Local and traditional environmental knowledge	What insights do local and traditional knowledge provide when it comes to climate change and what can we learn from the past?

The purpose of the first key theme is to gauge the extent to which stakeholders already perceive climate change as a reality and how serious the 'issue' is. The second key theme serves to gauge respondents' understanding of who is or who is likely to be affected by climate change and in what ways. Key theme three attempts to shed light on adaptation and steps already underway. Key theme four explores roles and responsibilities as well as barriers, opportunities, and priorities. This theme furthermore addresses what needs to be done for communities to implement effective adaptation measures. Theme five deals with local and TEK and the relevance such knowledge could have in climate change adaptation at the local level. Is there an awareness of such knowledge? Is it of any use in the context of climate change? Is anyone making use of this knowledge? Does looking back into the past potentially prepare us better for the future or 'ain't the future what it used

to be' as the baseball legend Yogi Berra stated with respect to the uncertainties of the future.

8. Interview Protocol

All council staff including the Civil Defence Officer as well as the Mayor were interviewed in their respective offices in Thames. Ngati Maru's General Manager was interviewed at the 'Ngati Maru Runanga' base in Thames. Interviews with the local community stakeholders were conducted in their home settings, including the two Kaumatua which provided interesting insight into the family's history in the area in the form of displays, photos and drawings which would have gone unnoticed in a different setting. The coastal property development representative was interviewed at a weekend / holiday residence in Whitianga on the east coast of the Coromandel Peninsula. Prior to the interview the aim of the study was explained and consent forms were signed. The interviewee was asked in the consent form to specify whether the interview could be sound recorded and if he / she wishes the recordings to be returned. Interviews took between 15 minutes and two hours in length.

9. More than asking questions

The greatest advantage of conducting key informant interviews in home and work settings is the opportunity for the interviewer to immerse themselves into the actual life / work surrounding of the interviewee. This opportunity gives local stories meaning and content. More generally, "the greatest advantage of the field research method is the presence of an observing, thinking researcher on the scene of the action" (Babbie, 2006, p. 324). 'Going to the land' is how people are supposed to

learn about their environment. (Berkes & Jolly, 2002). Not only does this method allow for the interviewer to experience the actual life / work environment, it provides the opportunity for participants to introduce family members / work colleagues as well as to point out and show objects of importance like photos, maps and features within their local environment of relevance such as sea walls, observed geological processes and historical climate events.

Particularly memorable and informative aspects of the field work conducted were being shown the fruit and vegetable garden of one of the Kaumatua interviewed, the demonstration of a 'do-it-yourself' coastal defence structure by a beach-front property owner concealed as an ordinary fence, as well as a walk through the community with a local Te Puru stakeholder.

Participation observation about Te Puru community life was also facilitated by my involvement in my daughter's attendance at the Coastal Community Kindergarten where records of local observations are created by people's interaction with each other and with their environment. Such records are constantly reinforced and immediately tested in discussions with neighbours and experienced elders. Such observations are nonstop, daily, and intergenerational, without any granting agencies and science planning involved (Krupnik & Jolly, 2002).

10. Interview Analysis

Human speech vanishes unless it is audio-recorded or transcribed and social situations are lost unless witness accounts of them are preserved (Krippendorff, 2004).

During the interview process notes were taken in order to better analyse the data. Notes included observations of the surroundings and the participant. Field and

Morse (1985) describe this process as taking 'memos' which can include anything that could be of possible relevance to the study. In order to become completely familiar with the data collected, transcripts were analysed. As described by Burnard (1991) the researcher attempts to become fully aware of the 'life-world' of the respondent. Examples of this 'life-world' could be different understandings of natural hazards and how these could be potentially linked to climate change such as tsunamis (shortly before the interviews were conducted the Coromandel Peninsula was issued with a tsunami warning as a result of the 2009 Samoa earthquake, a 8.1 M_w submarine earthquake that took place in the Samoan Islands region on September 29, 2009 (USGS, 2009)). While a tsunami is not linked to climate change directly, an elevated sea-level in combination with a storm surge and flooding is a likely consequence of anticipated climate change.

Transcripts were analysed twice in order to detect similarities in the responses and establish 'open code' categories (Berg, 2009). Table 3.3 offers examples of open coding. Similar categories were then grouped together in order to reduce their numbers. An example of this reduction into higher-order headings (Burnard, 1991) is 'seasonal changes' which includes open codes such as

- *The seasons are more erratic*;
- *Winters used to be winters and summer were summers*;
- *We have not had proper frosts for a few years now*.

A list of categories was produced including all codes after a transcript re-analysis. The 16 main categories created are:

i. Climate change salience;
ii. Vulnerability;
iii. Roles and responsibilities;

iv. Barriers;

v. Opportunities;

vi. Priorities for future action;

vii. Adaptation;

viii. Sustainability;

ix. Local knowledge;

x. TEK;

xi. Weather events;

xii. History;

xiii. Information;

xiv. Seasonal changes;

xv. Changes in frequency and magnitude of weather events; and

xvi. Perceptions.

Table 3.3: Open coding from the interview transcript

Interview Transcript	Open coding
"*Just in my life-time I can definitely notice a change in the seasons. Sometimes you see the fruit trees not knowing what to do. This hasn't had a great effect on my life but I guess you just slowly adapt to those changes yourself*".	Notice of change in seasons Trees don't know what to do No great effect on life Slow adaptation to changes

The context of open codes determines and clarifies the meaning of what has been said during an interview which is why particular emphasis was placed on its preservation. Removing codes from their context can potentially lead to misrepresented information as the following interview example illuminates: "*I can't say with certainty that* ***I believe that the changes we observe now can all be attributed to climate change*** *or if some changes could be part of natural fluctuations*". If the words in plain font were left out, the sentence would have an entirely different meaning. Once all categories were appropriately assigned the findings were written up and linked to key findings from the climate change adaptation guides, the 'key themes' as well as existing literature.

11. Constraints and limitations

Research methodology frames the way data is collected, analysed, presented and ultimately interpreted and understood. Various research methods including case study based on Narrative Policy Analysis, participant observation, key informant interviews, document analysis and a review of relevant policies, plans and 'grey literature' have been deployed. Narrative Policy Analysis provides the conceptual framework for constructing interviews and guidance literature as narratives and for data analysis. Narratives were then used to assess the relevance and applicability of guidance literature.

As much as an awareness of the advantages of chosen methodology is crucial, it is equally important to be aware of possible constraints and limitations. One difficulty in this process – as would be the case with any qualitative data analysis – was to decide which information and insights to include and which to exclude. While the focus of the research framed the information / insights of relevance it is also important to note that every story has a setting, making an understanding of the context essential albeit complicating what to include or exclude. Ideally, Glaser & Strauss (1999) assert, all data should be accounted for. Unfortunately this is not practical due to the fact that there are parts of interviews that are simply not relevant or not useable. Burnard (1991) highlights that uncodable pieces of transcript interestingly only appear unusable at the analysis stage, whereas during the interview what was said appeared to make perfect sense. An example of interview data that was not included is: "*If it was this way or that way or maybe completely different, if you know what I mean*".

A further difficulty when dealing with such 'personal' data as insights and experiences is finding an answer to the question of how acceptable it is to compare one person's insights with that of another person? This is particularly challenging

when dealing with an inherently complicated and complex issue such as climate change, due to its mix of certainty and uncertainty and the resulting controversy. Documenting insights and understandings seems, on the surface, relatively straightforward with the methods established in the social sciences. Case study represents an entire 'tool box' of a wide range of different 'tools' that can be used to conduct research. Analysing and presenting the findings is the next step. The challenge here lies in the interpretation of the data collected. Presenting insights discloses observations but not necessarily understandings. The narratives are regarded as part of a 'system of knowledge', a point of origin different to 'facts'. The difference between knowledge systems and facts, as fittingly described by Huntington (2002), is akin to the difference between anatomy and physiology – knowing the parts does not tell you how they function and interact with each other in a living organism. It was found that the best way to do the variety of opinions and insights justice is to present them in accordance with the five 'key themes' in Chapter Four. A further constraining factor was the 'tight' time frame of this research coupled with limited funding.

The following Chapter Four presents the narratives of the local key informants interviewed for this research. A discussion of the role of New Zealand's climate change guidance narrative against the background of local narratives sets the scene for juxtaposition with international guidance narratives discussed in depth in Chapter Five.

CHAPTER FOUR

A COASTAL COMMUNITY CASE STUDY FOR TE PURU

The community of Te Puru, 12km north of Thames on the western side of the Coromandel Peninsula is bordered by the sea to the west and steep catchments to the east. The only road connecting the community, the Thames Coast Road, now takes traffic over a newly (2010) constructed bridge built to protect the community from one in one hundred year storm events. The low lying plain consisting of accumulated sediment at the stream mouth offers the only suitable land for settlement, despite creating a vulnerability to floods generated by short bursts of high intensity rainfall coupled with unstable streams which are easily clogged due to high sediment loads (EW, 2009). The biggest impact resulting from climate change in New Zealand is an increase in floods and droughts (MFE, 2001). If global efforts to reduce greenhouse gas emissions continue to be poor, high intensity weather events are expected to increase (NIWA, 2009) with a large potential growth in vulnerability and a dramatic increase in risk unless adaptive measures are taken (IPCC, 2000; NIWA, 2007). Projected sea-level rise of at least 18-59cm by 2090 (IPCC, 2007a) poses a further threat to the low lying areas of the community.

While the Te Puru area itself appears to be an ideal area for a settlement, sheltered and easily defendable, all initial Māori settlement (around AD 1600) was confined to a Pā[16] ('Te Aputa') on a hill that was not exposed to flooding or the prospects of sea-level rise. The fertile low lying land was only used for growing crops (Kopecky, 2002).

[16] A Pā is a traditional Māori settlement, village or hill fort (Davidson, 1984)

Scale: 1:1000.000 @ A3

Figure 4.1: Location of the Te Puru community in relation to the North Island of New Zealand (© Terralink International (NZ) Ltd).

Coastal and flood hazards pose a significant challenge for the settlement. Lifeline infrastructure is vulnerable as it is located along the narrow coastal edge. According to ARC (2004) the type of landform Te Puru was built upon may be substantially reworked in the process of coastal erosion and over 70% of all beachfront development is setback less that 100m from the sea. *"At the last perigean*[17]

[17] A perigean spring tide is when the moon is closest to the Earth during the spring tide and produces even higher than normal spring tides. Perigean Spring tides can produce high magnitude flooding along the coastal regions (cf. Duxbury, Duxbury, & Sverdrup, 2002; Easterbrook, 1998).

tide...the water was up to the tar seal down by the [Thames] wharf. It was just a calm normal day with no wind. It makes you realise that you're operating within very fine lines" (Civil Defence Management, 2010).

Since the 1960's the Coromandel Peninsula with communities like Te Puru has attracted development and holiday makers fuelled by the growth of Auckland and Hamilton and the expansion of their commercial activities (M. King, 1993). This is highlighted in Figure 4.2 in a photographic comparison between the Te Puru community in the early 1930's and today. Furthermore, Russek (2010, pers. comm.) points out that the Coromandel is "*perceived being a playground for Auckland and Hamilton*", underscoring the development pressure on small coastal communities.

Local narratives are indispensable when researching the effects of climate change and gauging the adequacy and meaningfulness of guidance narratives. This is the level where lives are lived and stories told thus providing the raison d'être for policy narratives. As discussed in Chapter Three, local narratives and guidance narratives are in a way complementary. Guidance narratives about how to adapt to climate change successfully need to be assessed against a backdrop of their local relevance and applicability.

Figure 4.2: A photographic comparison: Te Puru today (top) and in the early 1930's (bottom) (photo: Civil Defence, Thames).

This chapter features an overview of stories and insights into the local relevance of climate change adaptation thus clearing the way for a juxtapositioning with national and international guidance narratives. The following six sections provide vivid stories of community members potentially affected by projected changes in climate, professionals from the public and private sector, as well as people with local and TEK thereby articulating local perceptions of the nature of climate change and barriers to

and opportunities for adaptation. Successful adaptation guidance efforts must, arguably, be informed by international 'best practice' and include local narratives. The following sections highlight the essential relationship between local and guidance narratives in meaningful climate change adaptation. A 'bottom-up' approach providing insight into local perceptions against the background of guidance narratives (presented in Chapter Five) can support cognisance about the adequacy of adaptation guidance.

1. Perception of climate change salience

Individuals perceive the same world differently depending on their values, interests, and histories (Kilduff & Mehra, 1997; Riessman, 1993; Winslade & Monk, 2000) which is why some key informants perceive more change than others, some think that it is a serious issue and others put their observations down to natural cycles. Local narratives are shaped by changes observed in the physical, biological, and social realms to develop a coherent view of the world (Krupnik & Jolly, 2002). This section of Chapter Four highlights that climate-related changes are already experienced by local key informants. Observations include changes in season and weather patterns like heavier outbursts of rain in the form of tropical downpours, trees "*not knowing what they are doing and when to flower*" (Long time Te Puru resident, 2010), more frequent extreme weather events, less frosts and relatively warm temperatures throughout winter (Civil Defence, 2010), generally a more erratic climate (Council Planner, 2010) and many other considerations from the general to the specific. The scientific findings for the region tend to focus on predictions, are more generic and are not necessarily location specific, again highlighting the need to draw upon local insights and experience.

The environment on the Coromandel Peninsula in general and in communities like Te Puru in particular is highly variable due to its geographic location dominated by both the Coromandel Range with its short and steep catchments and the sea. Climate variability is further attributed to dominating westerly weather systems and changes in the phases of the Interdecadal Pacific Oscillation (IPO) affecting long-term fluctuations (cf. Salinger, Renwick, & Mullan, 2001) as well as the El Niño-Southern Oscillation (ENSO) (MFE, 2009). ENSO is the periodic warming of the surface waters in the eastern tropical Pacific while IPO refers to the fluctuation in air pressure between Darwin, Australia and Tahiti (Patt, 2009). The local changes observed and presented in this section however, seem unprecedented and beyond the region's general variability.

Things are gradually going to deteriorate and we need to understand what that might mean, plan for it and be cautious about what we do today. The consequences of natural disasters have increased – it's getting quite devastating for property owners with properties directly affected by it, both psychologically as well as the actual loss of treasured possessions as well as the physical damage those events cause. The question that has got to be asked is "is it acceptable for people to continue being exposed to these sorts of hazards?" People don't necessarily want to grapple with those sorts of issues because in a lot of the communities people have been there for a very long time: those are very special places

to them. They don't want to give up or have to accept that things are changing and will affect their lives in those communities (Council Planner, 2010).

Climate variability is the real concern. It is what has caught most of our communities out in the sense that we have built communities or undertaken development without awareness of the degree of variability that occurs. Whether it is shoreline movement, flood-cycles or what have you... and then we get a phase of significant erosion and a higher incidence of coastal storms and we get caught out quite badly (Coastal Scientist, 2010).

It seems reasonable to think that we are still comfortable here but we can expect to see the extremes that are currently happening overseas on our doorstep. There are some very low lying areas like Te Puru on the Coromandel. If we are going to get the projected rise in sea-level there will be an effect (Civil Defence, 2010).

A concern expressed by key informants seeking to understand climate change, is the difficulty to distinguish between what we see and what we are told. To what extent are the perceived changes a product of climate change or other occurring changes that take place over time?

It's easy to feel that everything is, say wetter than it used to be because everyone is saying that it is wetter. I don't recall being told as a kid 'this is the hottest day in, say 37 years or this is the windiest day in the last three years. There is a lot more information compared with my experience as a child. There is certainly a lot more influence from the media. It may be that the climate was just as variable when I was a kid. It could be that I didn't take notice of it or that I remember only the really hot days or the really wet days so I don't know whether that is a part of it. The intelligence side of me says that all the experts are telling me that the climate is changing therefore I should pay more attention to that. As a kid I thought summers were hotter and sunnier and drier. However as a kid, certainly over the six weeks over Christmas, I was outside everyday whereas now I am working. Definitely in the last ten years I have noticed the switch particularly around the spring / autumn where spring appears to be later. We tend to get wetter

> *weather right into December but by the same token the autumn appears later. We seem to be getting good weather into May where in the past that would be getting pretty cold* (Council Planner, 2010).

The key informant insights presented highlight that local key informants are not experiencing all scientific climate change predictions yet (cf. IPCC, 2007a; MFE, 2001, 2009, 2010; NIWA, 2008a). Scientific predictions include:

i. An average temperature increase of about 2°C by 2090;
ii. Drier conditions in the north and the east of New Zealand with the occurrence and significance of droughts;
iii. Sea-level rise of 18-59 cm by 2090;
iv. Increased intensity and frequency of storm events;
v. Increased natural hazards including flooding, coastal erosion and inundation.

But, as the interview excerpts demonstrate, key informants are aware of the anticipated impacts and some effects that are beginning to emerge, predictions like a rise in sea-level and an increase in temperature are not experienced (yet).

> *What we are experiencing now is an increased frequency and an increased severity of events. Because we have communities at high risk we will continue to see those communities threatened and that*

threat will grow [with a changing climate]. Many of our catchments are very short, steep and sharp so the ferocity of torrential rain is unimaginable (Mayor, 2010).

This concurs with Patt's (2009) assertion that, in terms of human experience, it is likely that people experience climate change not as a gradual rise in temperature, but rather as a shift in the frequency and intensity of particular weather events. Nonetheless the anticipated changes illustrated in Table 1.1 are "*something that will affect everyone*" (Kaumatua, 2010). This has direct consequences for adaptation: The adaptation mechanisms needed to cope with irregular but extreme events differ from those required to cope with gradual change (J. W. Handmer, et al., 1999).

2. Anticipated climate change impacts and vulnerability

The key informant insights presented in this section demonstrate an awareness and experience of the anticipated impacts. As discussed in the preceding section, people tend not to experience gradual changes taking place like warming temperature and sea-level rise.

There is a range of anticipated impacts: a rise in sea-level from the coastal perspective, river flooding, an increase in rainfall intensities to increased storm runoff which is particularly relevant to

communities like Te Puru with its small catchments with very high specific discharges. Floods are also really big... we are already seeing significant dynamic fluctuations of streamlines and shorelines. With an increased sea-level we could see progressive shoreline retreat and if we get more intense coastal storms then we could also see the scale of the dynamic fluctuations change. At the moment the durational phases are 'duration-limited' which means the storms aren't causing as much erosion as they are capable of causing. You get increased frequency, increased intensity, and increased duration or any combination of those factors then you could potentially increase the scale of your fluctuation as well as a result in the progressive trend. With sea-level rise we are going to see an increase in coastal flooding because events that have a return period of, say, 100 years will be events that you see a lot more often. Land elevations might change around the margins put in places like Te Puru the majority of the land is going to stay the same elevation (Coastal Scientist, 2010).

Pittock & Jones (2000) describe the importance of assessing anticipated impacts not only for the affected elements in isolation but in their context as part of a wider community well-being. An awareness of the anticipated impacts and those most

vulnerable within a community is valuable, regardless of the exact manifestations of climate change predictions. Anticipated impacts like those described in the MFE guide (MFE, 2008b) tend to focus on physical effects as highlighted in Chapter Two. The anticipated impacts on human well-being are inherently difficult to quantify given the myriad of variables involved. What remains unknown, even more than the exact nature of climate change impacts, is how small local communities like Te Puru are likely to respond.

We are likely to see high magnitude events a lot more common – possibly even annually, rather than, as it is now, something that will occur every three to five years. Waves in this context are very significant. The worst storms are like Cyclone Drena or Bola where you get extreme sea-levels combined with a northerly swell event where you get high energy swells coming right down the Firth with much higher energy. Those kind of waves paired with extreme sea-levels are devastating (Council Planner, 2010).

The elderly are particularly vulnerable, especially in communities like Te Puru where there are fairly high proportions of elderly. Not all of them have the financial means to deal with the issues…together with the physical limitations they have. They are

also very dependent on social networks within the community (Council Planner, 2010).

The most vulnerable ones are the ones who don't know what the hazard can do (Kaumatua, 2010).

Figure 4.3: Cyclone Bola (1988) causing devastation at the Te Puru Campsite (photo: Civil Defence, Thames).

The main impacts from climate change will be increased vulnerability (Council Planner, 2010).

A kaumatua interviewed argues that the most vulnerable are the ones who do not know what the hazard can do. A beachfront property owner interviewed laughed at the question and replied with implicitness "*we are the most vulnerable*". The Mayor, has no doubt that the climate change 'issue' is a serious one because "*we have some very high risk communities on the Coromandel which we will continue to see increasingly threatened*" (Mayor, 2010). On the other hand a key informant interviewed for this study experiencing natural hazards in form of floods and high tides affecting his property and house regularly, argues that climate change is "*blown out of proportion*". "*We have decided to live in this beautiful spot right by the sea which also means that we are quite exposed. It's the price we pay*". It is pointed out that "*if the predictions for climate change are accurate then the politicians and the people are not taking enough notice of it*" (Beachfront property owner, 2010).

Low-lying deltas like Te Puru are the most vulnerable to river- and coastal flooding… Te Puru is very vulnerable. We also tend to forget how vulnerable natural coastal systems are… we are far more dependent than we realise. These systems provide us with a range of services...indirectly and directly as well as the services they provide for the wildlife and biodiversity that we are trying to

protect. These systems have been encroached on already quite significantly and if we start entrenching that encroachment so the boundaries are set and the sea-level goes up then we'll see peripheral margins like salt marshes squeezed out and squashed (Coastal Scientist, 2010).

Figure 4.4: The Thames Coast Road at Te Puru during the weather bomb in 2002 (photo: Civil Defence, Thames).

Not only will the decline of the environment ultimately affect vulnerability; vulnerability has direct implications on resilience (York, Rosa, & Dietz, 2003). As the human footprint on the Earth enlarges, humanity is challenged to develop an understanding of vulnerability quickly enough to avoid the large scale tragedies that will otherwise occur (Dietz, Ostrom, & Stern, 2003).

> *It's much more than just coast-line retreat and sea-level rise. We're looking at habitat change, the effects on the ecology, and effects on health and then we've got the social and economic impacts. We're going to have inundation of coastal flats or habitat change, changes within estuaries. It's going to have wider impacts in terms of land that is currently reserve land that's going to be under water moving the coastal barrier on to private land…so where is the public space going to be around coastal margins?* (Local Planner, 2010).

Figure 4.5: The Thames Coast Road at Thornton Bay (south of Te Puru) during a storm event in 1951 (photo: Civil Defence, Thames).

Figure 4.6: The same location and event as Figure 4.5 photographed from a different angle (note the elderly person on the road) (photo: Civil Defence, Thames).

The effects on community health with a prospect of more dramatic fluctuations around say intense cold might be severe…we could get a cold period lasting not just a couple of days but actually going on for weeks. With the way houses are constructed people won't be able to afford their power bills. Similarly with drought and heat stress etc. We might be exposed to say dengue fever and the likes as well. Going from temperate to more subtropical climate and having to deal with the diseases and organisms that thrive in those sorts of environments like weeds invading pastures for example…or in terms of what is going to happen in the marine waters…the toxicity of shell fish and algae blooms...(Council Planner, 2010).

If the predictions are true then the people living along this stream and on all that flat land are pretty vulnerable (Long time resident, 2010).

The most vulnerable? That'd be us (Beachfront property owner, 2010).

This section has accentuated the importance of not only an awareness of the anticipated impacts but has highlighted who the most vulnerable within the Te Puru community are. Vulnerability, as demonstrated through the diversity of local narratives, is not only a positive function of a community's exposure and a negative function of a community's adaptive capacity (Smit & Pilifosova, 2003) but also stands in direct relation to perception which in turn is shaped by social processes. Perception requires awareness which in turn assists a community to make wise and informed decisions in the face of projected climate change. The views presented demonstrate the fundamental challenge of developing a single coherent guidance for climate change adaptation. Apart from dealing with the aforementioned certainties and uncertainties around climate change and the inherent difficulty of quantifying the anticipated impact on human well-being, climate change adaptation policies also need to consider differences in perception. While, ostensibly, there is a superficial consistency in the local narratives presented in this research, the assumption is that more informants would have represented more diverse perceptions. Nonetheless, without taking into account local insights and experience, conflicts in values and perspectives, adaptation guidance narratives are arguably 'empty' and ill-suited to guide communities meaningfully and successfully.

3. Adaptation already underway

The biggest steps already taken to deal with climate change impacts, according to key informants interviewed, is in form of regulations around development set-backs, building regulations, education, awareness, and flood management.

Set-back regulations are steps that are being taken now to accommodate for future conditions. There is a primary set-back which is the worst erosion that could occur under the existing coastal processes without taking account of climate change. That line has at least five, usually ten metres of 'fat' in it. Council requires houses to be behind that line. With good science these lines have now been tightened down. Council uses these lines to determine house set-backs. This regulation becomes effective if you own a house with a section forward of that line and you are replacing it or doing major renovation. Council does not bend from that and tries to discourage consenting major renovations etc. Then there is a second line called the secondary set-back line which highlights what might occur in the longer term under climate change. What is done at the moment at this stage is estimate potential erosion based on sea-level rise. The sea-level rise is taken from the latest MFE guide "Preparing for climate change" (cf. Chapter Five) *which is IPCC based. With the current guidelines we use a base-level of 0.5 metres by 2090 which means that the mean sea-level will be 0.5 metres higher in 2090 compared with 1990. There is now a new requirement to consider the implications of sea-*

level rise of up to 0.8 metres. The current 0.5 metres was done before the MFE guidance came into place. Before the set-back lines will be re-adjusted we will wait for the next IPCC report or a national sea-level rise standard propagated by government. Then we'll update it on the basis of that. At this stage the secondary set-back line is primarily an advisory line we use to inform and educate the community. This gives people an understanding of what might happen under extreme events and what might happen with long-term climate change. This is how community awareness is created, so hopefully over time the capacity to adapt is increased (Coastal Scientist, 2010).

The steps we take [to adapt] are in the design of what we do: minimum floor levels, the design of our revetment walls, the covenants that we apply to our titles with respect to the foreshore yards so we've got a well-planted eight metre building line set-back from the edge. With the minimum floor level and the set-back there is an area of garden in front of the house which can be subjected to quite a bit of hydrological impact without doing property damage. The design we use means that houses are about two metres above

mean high water. Those two metres allow for approximately 500mm safety over the worst storm event plus a rise in sea-level (Property Developer, 2010).

The steps identified in this section are not so much about physical protection measures such as sea walls etc but about protecting and 'climate proofing' assets. Regulations, education and awareness indicate a move towards an acceptance of natural forces as opposed to 'hard' physical protections from the environment.

While we do still manage nature with stop-banks, dredging, and so on, we're realising that we can't place total reliance on engineering works. They are also very expensive to maintain. As a result, in delta-communities like Te Puru and others on the Thames Coast the management of the human hazard is becoming very significant already with regard to river and coastal flooding. The big emphasis is on minimum floor levels: lifting floor levels to a point where they can accommodate existing climate variability incorporated with potential sea-level rise (Coastal Scientist, 2010).

The New Zealand Government on national, regional and local level, alongside international efforts, is promoting an increased awareness of climate change and its impacts. This is indicated by a range of climate change related publications including the MFE guidance narrative introduced in the following chapter and also climate change 'open-days' hosted by New Zealand's National Institute of Water and Atmospheric Research. One such 'open day' was held on the Coromandel Peninsula in 2010. The media plays a further key role in creating awareness.

One form of adaptation already taking place is through education. Community awareness and the need to be prepared as well as understanding what it means is a constant battle. Memories are short – you could certainly see that before the weather bomb in 2002 with spiraling property prices. You had to move very quickly to get property. Whether it was subject to hazards got totally forgotten (Council planner, 2010).

One way [of adaptation] is addressing future climate change impacts by going out to the public and asking how people feel about ratepayer's money being spent on beachfront properties. Most ratepayers say 'no way' (Mayor, 2010).

Successful adaptation measures enable communities to plan for and respond to challenges of climate related events effectively. Adaptation to climate change is essential to protect the well-being of citizens and to manage public resources effectively (Mehdi, Mrena, & Douglas, 2006). “To be most effective, adaptation must proceed at several levels simultaneously” (Burton, Diringer, & Smith, 2006, p. 9).

> *We have moved from being an area where eight years ago insurance companies were threatening to pull out because the management of floods was that poor to one where [flood management] is very strictly applied* (Council planner, 2010).

> *I would say that the replacement of the Te Puru Bridge has been done with other conditions than what we’ve got now in mind. Why else would you replace a bridge that has been there for so long? If what they say that storms and flooding are going to increase then it makes sense that we are getting a new bridge* (Beachfront property owner, 2010).

This section has highlighted that steps are already taken to adjust to a changing environment. Adaptation comprises "actual adjustments, or changes in decision environments, which might ultimately enhance resilience or reduce vulnerability to observed or expected change in climate" (IPCC, 2007a, Working Group II). Climate change adaptation guidance is challenged with covering all relevant levels, including those addressed by local narratives in this section to facilitate adequate adaptation.

4. Governance roles and responsibilities and future adaptation prospects

The more people participate in local government, the more likely decision making for sustainable community outcomes will be achieved (DIA, 2009). Responsibilities, as the following narratives underscore and the comparison of guidance narrative in Chapter Five (section 6.2) shows are manifold. They include moral, causal, individual, collective and social responsibilities, "all compounded by politically sensitive questions of responsibility and equity" (Burton, et al., 2006, p. 9).

> *The set-back lines and the floor level are good and important but the most significant thing that can be done is the interaction with our communities. If you want community acceptance of adaptation you need to raise awareness of the sort of environment people live in and how these environments may change* (Council planner, 2010).

When educating the public about the anticipated climate change impacts, I don't try to sell climate change to people. I'm trying to sell what is important to people and how this might be at risk. I tap into the emotive side of people and ask questions like 'Which is your favourite beach? How would it affect you if we were to build a rock wall around it' (Mayor, 2010)?

While participation is of utmost importance it is essential to acknowledge existing barriers. Only an informed and educated public has the potential and opportunity to realise the significance of public policy issues such as climate change. While participation can at times be viewed as 'means to an end' in securing community and political support for predetermined plans and strategies (Rockloff & Lockie, 2006), the following narratives highlight the significance of information and awareness and how an absence of understanding can act as a major barrier to successful adaptation.

There are psychological barriers that need to be broken down to get people to acknowledge that there is something going on. Hopefully the events reinforce those sorts of issues (Council planner, 2010).

A major barrier is to get a community to accept the hazards. It is important to encourage people to make informed decisions (Long time resident, 2010).

We spend far too much time on plans and strategies and so on while we should be out there building capacity for adaptation, building capacity for understanding, and connecting people with their environment (Coastal scientist, 2010).

We have to think in the longer term as well as plan for the now. At the moment our communities are very deeply divorced from the environment around them. People have settled in all kinds of hazardous locations (Coastal scientist, 2010).

It is important for people to understand what is going on so that they can make adjustments accordingly. Council ideas seem to change faster than the climate (Beachfront property owner, 2010).

In a democratic environment to truly empower a community you have to make sure that people understand the reality of the environment they are in and the options. The options are mostly not just limited to the ones that they have experienced. The community as a whole has to be informed – that is the most important priority (Coastal scientist, 2010).

A priority has to be to get our cultural understandings, perceptions and expectations in line with sustainable livelihoods (Beachfront property owner, 2010).

There simply has to be a change in cultural perception. Our culture is used to engineering nature in order to achieve human aspirations. The idea that we might have to engineer ourselves... is very alien for our generation but in terms of opportunities it is the most significant opportunity we can take (Coastal scientist, 2010).

Figure 4.7: The Avalon Motel on the Thames Coast shortly after the weather bomb in 2002 (photo: Civil Defence, Thames).

A locally debated climate change adaptation example is the set-back regulations imposed by local government. While setback lines are a logical step in a slow retreat from the immediate foreshore, it does not imply that beachfront property owners necessarily agree with the approach. Naturally any property owner with assets at risk from hazards will insist on protection measures thus creating a further barrier in successful adaptation and a further challenge for a guidance narrative framed by adapting to change as opposed to resisting change. Interestingly most research undertaken on barriers, opportunities and priorities for future action focus on technological, financial and institutional aspects (Grothmann & Patt, 2005; Yohe & Tol, 2002). It is assumed that once barriers are removed or overcome, society can successfully adapt to what is to come (O'Brien, 2009). There are however limits to

this assumption which come in the form of the irreversible loss of places and identities that people value (Adger, Barnett, & Ellemor, 2009) with social and individual characteristics acting as deep seated barriers (Adger, Dessai, et al., 2009). Set-back regulations imposed by local government unequivocally impact on local stakeholder's identity and history and directly affect what community members (individually or collectively) value resulting in a conundrum for climate change adaptation. Adger, Barnett, et al. (2009, p.15) point out that the "loss of place and its psychosocial and cultural elements (the loss of a 'world') can arguably never be compensated for...". A following key informant's view owning an over 90 year[18] old house on the edge of the beach makes this clear. This particular example raises questions not only about adaptation barriers and meaningful stakeholder involvement, as discussed in Chapter Two and reviewed in the following chapter, but also the significance of local and TEK – subject of the next section.

Being here and having been through quite a few of the floods…it just doesn't make sense… Even if events are going to be more frequent, it still doesn't make sense. The people in the area are the ones that should be talked to but then again that's jeopardising some of their [council] decisions. You try to say hey, hang on, wait a minute, don't do that, they don't listen, they don't look at it. A few years ago they dumped slabs of concrete with reinforcing steel

[18] The exact year when the house was built remains unclear. The initial dwelling was a boat pulled up from the beach which was slowly turned into a house (Beachfront Property Owner, 2010). This was not an uncommon practice along the Thames Coast. Many original dwellings which have survived development pressure started off as trams, buses or, as in this case, boats (Russek, 2010), a feature which is no longer discernible in most cases.

sticking out of them on the beach. They get washed up and down the beach. The sea walls that were done correctly [by the local people] are fought by them. Once we had a battle when they were carting away sand [from the beach]. They were simply taking it away. They disturbed the [natural movement] of the sand. We now have less sand [on the beach] than we had before. The people around here have been living in their baches for a long time. They have been in the family for a hundred years. If anybody knows what's happening, they do (Beachfront property owner, 2010).

A local priority in coastal management policy on the Coromandel Peninsula, as defined by the Mayor and Council Planners interviewed, comes in form of a shifting policy narrative. There has been a deliberate move from engineered 'hard' defences such as sea walls, with a preference for soft options aiming for a natural coastline. The sustainability and the associated costs of having to rely on 'hard' options have been questioned by local and regional council (Mayor, 2010; Council Planner, 2010) making engineered options no longer the preferred policy narrative. The question however remains how this preference will be dealt with if an increasing number of properties are threatened by coastal hazards. The transition towards 'soft options' will have to stand the test of time when, as predicted (cf. IPCC, 2007a), an increasing number of beach front owners are threatened by coastal hazards and sea-level rise. Questions around the exact measures required protecting individual properties from natural hazards and sea-level rise emerge and will have to stand the test of time:

Should all properties be dealt with equally or is a holiday house different to a property that has been a cherished family home over many generations? Arguably a holiday house can more readily be replaced than the latter. If the loss of a 'world' can never be compensated for (Adger, Barnett, et al., 2009) questions of equity, affordability and responsibility will have to be dealt with and the preference of 'soft' approaches reconsidered. Disparities such as these highlight further challenges for policy narratives having to address different interests, costs, and benefits of options equitably and expediently.

If you are going to diminish the assets that bring people to live in a place you've got to expect your economy and community to suffer. If you have a community armoured with sea walls people aren't going to go to the beach, they are simply going to go somewhere else. People aren't going to invest; they are not going to buy property which means that people aren't going to go to the shops which means you are going to see a diminution of the economy. People are going to leave therefore there is going to be a diminution of social services. If you've only got say 500 people in a community you can't even keep a doctor there then you have to take an extra teacher away from the school and you end up with a downward spiral. You spend public money and you'll end up having to make the sea walls even bigger and higher. And of course who's

going to pay for that [...] this is why council has decided not to go for 'hard' options. We are looking at a triple bottom line in terms of the effects of any works that are being proposed and you've got to demonstrate that those choices are sustainable across all well-beings (Council planner, 2010).

Some decisions that needed to be made after the weather bomb in 2002 – an event that we can expect to be repeated – are still not completed. Yes, we've got a couple of bridges that are being rebuilt, but there are still properties that need to be retired […] houses should never have been built where they were and for that to happen we need to make people understand (Civil Defence, 2010).

Figure 4.8: The Te Puru School after the weather bomb in 2002 (photo: Civil Defence, Thames).

So who should be playing the key roles in the quest for meaningful and successful climate change adaptation? Who should be responsible for guiding vulnerable communities into uncertain times? While the foregoing insights have demonstrated that education and awareness are essential, local institutions as the facilitators of such steps, require greater attention. Without increased attention it is unlikely that adaptation interventions will achieve much success (Agrawal & Perrin, 2009).

Obviously local council plays a critical role. I love the way this council is changing through the Blueprint Project[19] *where it is trying*

[19] The *Coromandel Blueprint, Framework for the Future is* a living document "shaping our future landscape and prosperity". It is the region's strategic framework for managing growth and sustainable development (TCDC, 2010)

to capture community visions rather than planners writing district plans trying to capture a community vision of what they want, what they love, what they maintain and what they want to develop. The council now tries to capture the community's vision and then use that vision as a basis for developing a plan (Coastal Scientist, 2010).

I don't think our local authorities can do a lot more than they already are. They're endeavouring to overcome current natural hazards like floods and high tides; they're preparing and building bridges that are less likely to become a flood hazard. I think they're doing a pretty good job except to say that we've got to do a lot more in living sustainably. I don't think our local authorities have that in mind yet (Beachfront property owner, 2010).

We think more strategically about how our communities grow now – what type of activities will occur in certain areas and how we can manage the risk. When we build new storm water systems now for

example we take sea-level rise and more intense storm events into account. We do this with all our assets now (Mayor, 2010).

Priorities emphasised by key informants interviewed, are the importance of community interaction, education, information, meaningful dialogue and understanding. These, together with common visions, coordination of responsibility and financing, form the 'building blocks' or foundation of good adaptive governance (Nicholson-Cole & O'Riordan, 2009). Local council plays a crucial role in addressing the uncertainties of the future and adaptation to climate change. Their key role is to lead community responses to understand the risks and to facilitate adaptation to climate change (Local Government Leaders Position Statement, 2009).

5. Local and traditional environmental knowledge

Behind every person is a story and if that person has spent a long time in a certain place then the stories behind the person are guaranteed to include experiences with the environment. These stories, in many cases, can provide significant and valuable insights. They are stories about the individual human-in-nature, culture, community and adaptation. Locals not only have experience in terms of natural hazards, their consequences and how the land has changed over time, they have often also learned to use physical environmental indicators – onset of seasonal rains, frosts etc – as well as biological indicators – flowering or spring leafing, or appearance of certain migrating animals or birds such as the Pipiwharauroa[20]- the bird of Hawaiki[21]

[20] It has been thought possible that the migratory flight of the shining cuckoo encouraged Māori to come to New Zealand (Olliver, 2005).

(Chrysococcyx lucidas / shining cuckoo) – to predict certain times in the year. The Pipiwharauroa, as an example, has traditionally been welcomed as a harbinger of a change of seasons. *Ka tangi te wharauroa, ko nga karere a Mahuru,* says the proverb; "If the shining cuckoo cries it is the messenger of Spring" (Olliver, 2005).

Science can't answer everything – local knowledge is invaluable (Mayor, 2010).

We've got records of people living in communities for generations. There are diary notes, photographs and much more. The familiarity of a place…you can draw on stories from that place… Anybody who has been living in a particular locality for decades has stories to tell and there's good sound common sense… and of course there's always the photographs and stuff that get brought out from under the bed in a shoebox (Council planner, 2010).

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[21] The Pipiwharauroa is also known as the bird of Hawaiki. According to Māori legend Polynesians originated from a mythical land called 'Hawaiki' (Orbell, 1991).

People with modern lifestyles removed from 'the land' are divorced from their environment. They have a poor understanding of variability, change, and dynamics (Kaumatua, 2010).

Insights and experiences with natural cycles can be a significant component of comprehending unprecedented change. Local observations of long-time residents have the potential to detect change. An example by a long time local resident includes fruit trees flowering at times when they did not use to. Observations like these can only be made as a result of a very close association over an extended period of time with the environment. López Cerezo & González García (1997) point out that local and TEK may influence expert knowledge by emphasising factors like uncertainties and indeterminacies. Local and TEK provide insight into the social system and the culture as well as the physical environment in which guidance is required (cf. Chapter Five). Local and TEK have the potential to offer new perspectives on unexpected social and environmental impacts of policy (Hampton, 2009).

A lot of people are unaware of what has happened in the last 20 years [with regard to hazardous events]. We should at least be able to cover one century. I can scratch up bits and pieces that maybe go back to 1954 but it's very poorly documented. The only accurate record kept of natural hazards in this area is from when I started

here in 1976. Prior to that we've got to pick up by local knowledge (Civil Defence, 2010).

Listening to the experiences of older community members brings back memories of events in the past. These people know the area and what it is capable of doing (Kaumatua, 2010).

In the communities you have got the ones that have been there for a long time and have seen a few floods but then there are also the newbies in the community who before they came here would never have dreamt that something like that could ever happen to them… they are just totally blown away (Council planner, 2010).

Our old practices have relevance to the current practices. The family that lives on the flats at Te Puru next to the river behind the camping ground close to the shore… They have other lands to go to in extreme events. In the context of an ordinary settler there is a quarter acre section with nowhere else to go. You have to live

within the realms of what is available to you (Iwi representative, 2010).

The way the water was made to flow and run off here for example has not been planned with local knowledge. You don't know if council decisions help or make even more of a problem. There is a lack of putting it all together. They have a lot of changes with people in the councils and they just don't seem to keep the information together. They just seem to lose the information or disregard a lot of it (Beachfront property owner, 2010).

Our history, hence our experience with climate events is not well documented and it is "*important to catch up on that if we want to have better insights into local hazard potential*" (Civil Defence, 2010). Analysing past impacts and responses is undoubtedly important in understanding the feasibility of adaptation, even if future climate related threats might be considered to be historically unprecedented, (Agrawal & Perrin, 2009). The most promising method of doing so is by making use of the benefits of local knowledge to understand the local effects of climate change (cf. Bielawski, 1997; Fast & Berkes, 1998; Kassi, 1993; D. King, et al., 2010). Local experience, has the potential to provide insight into environmental processes at a more detailed scale than conventional scientific knowledge because it deals with

outcomes as well as predictions (Usher, 2000). The challenge however remains in the integration of local and traditional knowledge into a process of social learning and civic science as well as distinguishing between facts and perceptions.

The five 'key themes' providing insights on local narratives have shown a range of views on climate change adaptation. This chapter concludes that key informants experience unprecedented changes in local climate in form of storms, a shift in seasons, the absence of frosts in winter and a generally more erratic weather. Gradual changes like sea-level rise and warming temperatures remain scientific predictions to this point. According to the steps already undertaken to deal with these impacts including education, building regulations, development set-backs, flood management and a general awareness of change taking place, discernment of the exact effects do not appear to be the driving force behind adaptation. Given the uncertainty with regard to predicted changes and an elevated awareness coupled with divergent views and perceptions, it makes sense for planners and policy makers to regularly review strategies in place and regard these with respect to the potential of local and traditional environmental knowledge. However, in order for meaningful adaptation to evolve it is not only imperative to pay greater attention to local perspectives and insights, extend science by using local and traditional environmental knowledge, but to have a close look at the guidance available and presented in the following chapter. Climate change guidance directly relevant for vulnerable communities such as Te Puru comes in form of the MFE guide 'Preparing for Climate Change' (2008b). This guide is examined, juxtaposed and compared with seven national and international guides from western developed countries in the following chapter.

Local narratives in form of insights from key informants on climate change provide a point of reference for gauging the relevance and applicability of particular policy provisions and related guidance. Figuratively, if climate change is the 'disease',

vulnerable communities are the 'patients'. The 'drug' comes in form of adaptation guidance narratives which, in order to be as effective as possible, must be compared with other 'drugs' designed to 'cure' other 'patients' thus the seven international guidance narratives selected for this research. By asking the question fundamental to climate change adaptation guidance narratives 'what needs to be done to enable a vulnerable community to adapt successfully?' and juxtaposing local narratives with national and international guidance narratives it is possible to compare strengths and weaknesses and to define 'best practice' guidance principles despite the inherent uncertainties coupled with climate change. Guidance narratives coupled with key informant insights and existing adaptation strategies can be refined even without precise and accurate insights into locality-specific human and physical ramifications of climate change. Given the absence of potentially conflicting local narratives it has become clear that there is an awareness of climate change within the community and 'something' has to be done.

Chapter Five discusses how the pieces of the 'climate change adaptation puzzle' fit together thus facilitating a robust assessment of the MFE guidance based on its consistency with international 'best practice' and relevance and applicability at the local level in Te Puru. Policy narratives must reflect and directly relate to local narratives to convey the significance of the conundrum. The same is true for the relationship between national and international guidance. Both have been brought into being by the one overarching predicament described in the first section of Chapter Two: global climate change. Framing guidance narratives and juxtaposing these with local narratives sheds light on the relevance and implementability of what is required for successful adaptation. Chapter Five concludes with a review of the lessons learned and insights gained together with a set of 'best practice' guidance principles.

CHAPTER FIVE

CLIMATE CHANGE ADAPTATION AND LOCAL GOVERNMENT

The paramount question of this thesis is 'what needs to be done to enable a vulnerable community like Te Puru to adapt to climate change'? The foregoing chapter has disclosed local stories of the relationship between how community members perceive climate change, vulnerability, the potential and significance of local and traditional environmental knowledge and how these influence who should be doing what and why in order to achieve successful adaptation outcomes. The emerging 'essential message' or 'metanarrative' which can be described as the story of stories encompassing and explaining all the 'little stories' (Roe, 1994; Stephens & McCallum, 1998) presented in Chapter Four is about the reality of climate change and the imperative to proactively adapt to anticipated impacts. Beyond that there is a general awareness of vulnerability and an accepted commitment to adapt to anticipated and unprecedented changes. Resulting questions arising from this cognition include asking what the 'metanarrative' of New Zealand's climate change guidance is and whether the local 'metanarrative' is aligned with this guidance 'metanarrative'. Furthermore, are all international climate change guides 'cut from the same cloth'? Is there an overarching 'metanarrative' and, again, is this shaped by and aligned with the IPCC's 'metanarrative'?

This Chapter Five discusses New Zealand's 'Preparing for Climate Change' (MFE, 2008b) guide based on the essence of the key informant interviews and juxtaposed with seven international climate change guides from the United Kingdom, Australia, Canada, the United States, the Netherlands and New Zealand. This approach highlights the meaningfulness and potential of contemporary adaptation narratives

thus disclosing the relationship between local and guidance narratives as previously described and allegorised in Figure 1.1 and 1.2. This approach allows gauging the extent to which the MFE guide is consistent with or diverges from international guides and furthermore provides insight into the guides' 'metanarrative' and discloses to what extent MFE's guide resembles 'best practice'.

The guide 'Preparing for Climate Change' (MFE, 2008b) is a non-prescriptive guide aimed at providing direction for councils to make decisions about how to adapt to climate change. This was first introduced in Chapter Two and is a summary of 'Climate Change Effects and Impacts Assessment' (MFE, 2008a). The main reason for including both MFE guides in this comparison is to disclose which parts of the 150-page source-report were deemed to be of importance for the 38-page summary-report published by MFE two months later and selected for the purpose of this study. Communities and local government alike, not only on the Coromandel, but nationally and internationally, require guidance on how to adapt and deal with uncertain and unprecedented changes which is why most western countries have produced such a guide. This chapter's Section Six introduces the individual guides and explains the logic behind the selection.

1. MFE's 'Preparing for Climate Change' guide

The MFE guide's (2008b) intended purpose is to give effects to the RMA (1991) by providing direction and leadership in preparing for climate change. The guide is divided into three distinct parts: part one provides an understanding of current and future climate, part two looks at local government and climate change and part three is dedicated to ways of responding to the effects of climate change. Part two, in particular the 'key principles for responding to climate change', is of relevance to this chapter. It explains the social and legal obligations of local council to take

climate change effects into account in planning and decision-making, defines a total of eight key principles for responding to climate change, provides a checklist for considering climate change in plans and concludes with guidance on how to assess the impacts of climate change on council functions. The eight key principles which have been set out by law or have evolved through good practice are:

i. Sustainability;
ii. Consideration of the foreseeable needs of future generations;
iii. Avoidance, remedy or mitigation of adverse effects;
iv. Adoption of a precautionary / cautious approach;
v. The ethic of stewardship / kaitiakitanga;
vi. Consultation and participation;
vii. Financial responsibility; and
viii. Liability.

Given the focus of this research, these principles can be grouped into four distinct 'groups of principles'. Principles One, Two and Five focus on the capacity to endure and were amalgamated based on the following consideration: Through the principles of kaitiakitanga, tangata whenua must preserve the mauri[22] of the land by being the kaitiaki, or guardians. This approach implies taking into account the foreseeable needs of future generations. Similarly, sustainability implies the maintenance of inter-generational human well-being which again is closely linked to environmental well-being and the responsible use of resources.

The underlying criterion of Principles Three and Four is a mindful and careful approach when taking future climate change into account. Both principles are included in the RMA (1994) and relate to certain levels of uncertainty requiring

[22] Mauri is an energy which binds and animates all things in the physical world (TeAra.govt.nz, 2009) and can be understood as the force of life.

prudence. The guide's Sixth Principle is retained unchanged given its particular focus on consultation and participation. Principles Seven and Eight combine financial responsibility and liability. The underlying approach here is the amalgamation of moral imperatives and law. While responsibility implies a form of accountability and obligation, liability is a legal responsibility for one's acts and omissions (Hamilton, 1978).

The four distinct 'groups of principles' leading to the formation of seven 'guidance measures' developed for an international comparison (cf. Figure 1.2) are discussed in this chapter's Section Six. The four 'groups of principles' are:

i. Sustainability, Kaitiakitanga, local and TEK and the foreseeable needs of future generations;
ii. Precautionary / cautious approach and avoidance, remedy and mitigation of adverse effects;
iii. Consultation and participation; and
iv. Financial responsibility and liability.

The following sections gauge the extent to which the four groups of principles are consistent with, relevant to and applicable to the Te Puru context given the local narrative. The principles are then defined by means of a brief discussion.

2. Sustainability, kaitiakitanga, local and TEK and the needs of future generations

Both the RMA (RMA, 1991) as well as the Local Government Act (LGA, 2002) emphasise the importance of the ongoing ability of communities and people to respond and adapt to change in a way that avoids or limits adverse consequences

and enables future generations to provide for their needs, safety and well-being. The principle of kaitiakitanga in both acts underpins sound planning decision-making in the interest of the community to avoid or minimise loss of value or quality over time. Sustainability describes the use of our environment as a regenerative system without its depletion. Human well-being depends on the well-being of the environment, a notion consistent with and underscoring the Te Puru narrative presented in Chapter Four.

It is not only about us, but also about our children and grand-children and generations to come (Kaumatua, 2010).

It is important to get people to acknowledge that their little piece will contribute to the bigger, long-term picture (Mayor, 2010).

The values of kaitiakitanga are within us as a culture (Kaumatua, 2010).

The understanding of kaitiakitanga should teach us that nature sets constraints which we have to live within (Iwi representative, 2010).

There is a lot of knowledge out there about this area and what it can do (Long time resident, 2010).

Council should make more use of people with the knowledge in the area (Beach front property owner, 2010).

You cannot underestimate the value of the people who lived in an area for a long time in terms of understanding how individuals and communities react to changes in climate and stresses that will be going on (Council planner, 2010).

Currently humanity is living unsustainably evidenced by key findings from the Agenda 21 (UNCED, 1992), the Millennium Ecosystem Assessment (2005) and the

International Union for Conservation and Nature (2008) providing daunting facts, which taken together present an alarming picture of the future. These include a degradation of nearly two-thirds of the world's ecosystems, unequivocal climate change as a result of anthropogenic climate gas emissions (IPCC, 2007a) and the nearing of a peak oil period (IUCN, 2008). Modern western ways of living focus on short-term gain and profit which is at odds with long-term interests and sustainability. A recently completed survey of 500 senior executives suggests that sustainability is losing out to the demand of short term profits (Tabacek, 2010). This disjuncture between current practice and the guidance provided presents a major challenge in times where the need and urgency for sustainability is clearer than ever before (UNCED, 1992). Increasing sustainability will require a major collective effort.

There is a need for all professional ethics to encapsulate sustainability (Coastal Scientist, 2010).

Our cultural understandings, perceptions and expectations are significantly at odds with sustainability (Coastal Scientist, 2010).

As a culture we know that we are not sustainable (Beachfront property owner, 2010).

We need to be more honest about the cost of our lifestyle (Council Planner, 2010).

By defining sustainability as a key principle and adopting the values of kaitiakitanga (D. King, et al., 2010), the guide makes the foreseeable needs of future generations an imperative. Methods of achieving the ambitious goal are participation of local stakeholders (Hampton, 2009), adaptation (Adger & Jordan, 2009), education and information (Dietz, et al., 2003), improved infrastructure (J C Ribot, Najam, & Watson, 1996), honouring of local knowledge and experience (Berkes, 2008), assurance of holistic responses (J C Ribot, et al., 1996), and improved institutional capacity and efficiency (J. W. Handmer, et al., 1999).

Our old practices have relevance to our current practices (Iwi representative, 2010).

3. The precautionary principle / cautious approach and avoidance, remedy and mitigation

'Preparing for climate change' (MFE, 2008b) uses the terms precautionary / cautious synonymously in the definition of its key principle. In the RMA (1991), the NZ Coastal Policy Statement (NZCPS, 1994), and the Civil Defence Emergency Management Act (CDEM, 2002) the terms are divided into the precautionary principle and a cautious approach. The principle requires an informed but risk averse approach to decisions where full information on effects is not available at the time of decision-making.

> *Our approach has become more strategic in terms of how communities grow* (Mayor, 2010).

Under the RMA (1991), the duty to avoid, remedy or mitigate adverse effects applies to the preparation of plans by local authorities under that Act, every decision made under that Act, and to everyone who carries out an activity or development under that Act. The RMA (1991, Section 32) requires the evaluation of a plan provision to consider the risks of acting or not acting if there is uncertain or inadequate information. This is directly relevant to addressing climate change given the aforementioned uncertainties involved.

We need to accept that values are located not only behind sea walls but also in front of sea walls (Council planner, 2010).

Enough mistakes have been made in the past, we need to ensure that we avoid making decisions today that we will regret further down the track (Council planner, 2010).

Through analysis of future scenarios, climate change should be taken into account when contemplating new activities and developments (MFE, 2008b). Where climate change effects are expected to be significant such as in vulnerable coastal communities like Te Puru, a precautionary approach reflects the direction set by the New Zealand Coastal Policy Statement (1994).

People don't like set-back lines but rate payers also don't want to see their money spent on the protection of beach front properties (Council planner, 2010).

We now give 'soft' defences a preference over 'hard' defences (Mayor, 2010).

Far too much time has been spent on plans and strategies than building capacity for change and understanding and connecting people with their environment (Coastal scientist, 2010).

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4. Consultation and Participation

Principles of consultation with communities and affected people are fundamental to local government decision-making. Consultation and participation imply informed input into decision-making processes and can also be used to raise awareness of risk and appropriate responses. Consultation and participation in the preparation for climate change is indispensable.

[Council] interaction with the communities is the most meaningful work that can be done (Council planner, 2010).

However, as chapter Four, Section Four has shown, there is a certain risk that consultation and participation is used as a means to an end as part of a 'political choreography' (Cheeseman & Smith, 2001) in securing community support for plans and strategies predetermined by government and other stakeholders. "The credibility of any exercise in public consultation rests, in the first instance, on the fact that those conducting the inquiry are not seen as partisan players and that they approach their task objectively and in an unbiased manner" (Cheeseman & Smith, 2001, p. 89). While consultation and participation have become the preferred modus operandi the question emerges whether existing political structures are supportive of greater substantive democracy and flexibility (Nelson, Babon, Berry, & Keath, 2008).

> *The community needs to be more actively involved in decisions made. We should be the ones deciding what is best for us* (Beachfront property owner, 2010).

The above quote demonstrates the potential for fundamentally different local narratives. Beachfront property owners may 'demand' physical protection measures in form of seawalls, revetments, groynes, etc. essentially subsidised by ratepayers who do not live on the coast and who are likely to have a very different outlook. Unfortunately, given the small number of key informants as previously discussed, this potential contrast does not emerge clearly.

Is the RMA (1991) the same in theory as in practice? Why is it that it proposes the mode of consultation as opposed to deeper participation? Coupled with the aforementioned uncertainties and the underlying conflicts there is an actual risk that consultation becomes a form of manipulation aimed at achieving predetermined goals. Nelson, et al., (2008) argue that deep reforms in the traditional patterns of engagement between local government and communities are essential in order to enhance the power of community members and support greater, substantive, democracy and flexibility. There is a risk that planning outcomes are shaped by economic parameters, historical relations between Māori and Pākehā setting precedence for future participation, and that tangata whenua concerns are 'filtered out' during cross-cultural consultation under the RMA (1991). The setback regulations imposed on beachfront property owners are a further example where underlying conflicts of interest characterising the use of natural resources and the difficulties these create for the development of adaptive approaches planning and management (Rockloff & Lockie, 2006) create a challenge for the consultation and participation process: given the projected ramifications of climate change an eventual retreat from the coastline is the most logical step and one that will have to be executed to avoid substantial future losses. This realisation however is not necessarily in accordance with potentially affected landowners.

> *Anyone looking to put a policy in place that affects the community would be foolish to ignore the community's views* (Council planner, 2010).

Local authorities play a lead role in educating and leading the community (Council planner, 2010).

Council has engaged in meaningful discussion with the community (Mayor, 2010).

Stakeholder participation through involvement however is the most effective 'tool' through which stakeholders are empowered. Naturally, as in this case there is always a chance that some will win while others will lose (Jentoft & McCay, 1995) which is why it is imperative for policies in the current environment to incorporate a diverse range of social norms and values in order to produce fair outcomes (Dryzek, 1990). Kooiman & Chuenpagdee (2005) make clear that for a system to be effectively governed, the governing system must both correspond to its features (i.e. complexity, diversity and dynamics) and be responsive to the needs of those being governed.

The community as a whole must be informed and it has to be ensured that people understand their environment (Coastal scientist, 2010).

Community awareness and the need to be prepared is a constant battle (Civil Defence, 2010).

Information is crucial to achieve meaningful stakeholder participation. It enables community members to participate more effectively in the political process. Not only factual information about the state of the environment and human actions is what environmental governance requires, but also information about uncertainty and values (Dietz, et al., 2003).

Adaptation requires an informed and raised awareness of the environment people live in and how this will change over time (Coastal scientist, 2010).

As much as the inherent conundrum in the climate change 'issue' lies in the reconciliation of different levels, from global to local (and ostensibly separated), further challenges lie in the disparities between private interest and the collective good. In order to achieve safety and sustainability for the entire community, people need to reconcile their 'private interests' with the collective good. Hardin's *Tragedy*

of the Commons (1968) – the metaphor of common property resource management and eventual degradation and overexploitation of commonly held resources comes to mind. While the community's safety and sustainability need to be achieved, the costs and benefits of doing so will be experienced differentially. Challenges like these are entirely new to communities affected by climate change calling for the deep reforms in the patterns of engagement between local government and communities mentioned above. These reforms must take place in an environment increasingly challenged with unprecedented changes and very challenging conditions for governance (Dietz, et al., 2003) due to an increase of difficulties to resolve contending interests around responsibility and liability. Who, for example, is responsible when risk, created by property developers, is carried by those buying property? Should local Government be held responsible, the ratepayers, the property owner or should, ultimately, the property developer be held liable? As much as questions like these evolve around legal issues they are fundamentally moral questions tightly knit with wider community interests as the following section demonstrates.

5. Financial responsibility and liability

In terms of financial responsibility and liability the MFE guide (2008b) points out the importance of transparency in expression of costs for infrastructure enhancements or retrofitting anticipating future effects of climate change. These costs can become 'considerable' resulting in previously discussed questions of equity in wider community interests. Local government is required to act within normal codes of financial responsibility on behalf of the community. The Local Government Act (LGA, 2002) sets out requirements to identify in detail the reasons for any current provision, and the associated cost.

One of the very few budget increases has been around climate change (Council planner, 2010).

The quotes from key informants make clear the economic considerations given to climate change und underline the imperative of transparency of spending for meaningful adaptation outcomes. Defining monetary values as part of adaptation is inherently difficult given the wide range of interests and potential conflicts coupled with the inherent uncertainty involved in the precise locality specific nature and impacts of future climate change.

There is always a trade-off between physical protection works that give a little more comfort but there are also limits to the cost of those and what is affordable (Council planner, 2010).

The situation on the Coromandel Peninsula in communities like Te Puru seems particularly difficult when addressing questions of equity in wider community interests due to a range of different reasons for exposure and vulnerability: while some community members have deliberately built and settled in hazard prone areas

(i.e. beachfront) for 'lifestyle' reasons, others have lived on the beachfront for generations. Some community members have "*sunk their life savings into a high-risk property without knowing – or wanting to know – what they have done*" (Council Planner, 2010).

Ratepayers are not interested in council spending money on beachfront properties (Mayor, 2010).

There are also hazard-exposed investments for example by local Māori, who have "*other lands to go to in extreme events*" (Iwi representative, 2010). Regardless of the 'who' and 'why' – the underlying vulnerabilities will, in one way or the other, emerge when predictions become reality resulting in the abovementioned 'considerable' costs. Eakin, Tomkins, Nelson & Anderies (2009) point out that policy-makers are morally obligated to protect their most sensitive constituencies thus adding to the challenge of financial responsibility and liability.

'Hard' [coastal defence] engineering options are far more costly than 'soft' options (Mayor, 2010).

I just don't understand why they have to build this new huge bridge for seven million [New Zealand] dollars [in Te Puru]. The old one served its purpose; they are wasting ratepayers' money (Beachfront property owner, 2010).

Given the above mentioned policy-maker's moral obligation to protect their most sensitive constituencies it pays to ask what shapes risk and why is it so hard to secure community safety and sustainability? In this context Pearce (2003) points out the importance of risk awareness in local decision making processes. The integration of hazard, risk and vulnerability assessment into community planning and decision-making must be used to formulate policy and planning actions to meet community needs and expectations (Godschalk, Kaiser, & Berke, 1998). Due to a fear of panic and people leaving the area, risks have, in the past, possibly been swept under the carpet (Godschalk, et al., 1998). Knowingly or unknowingly this has created a high level of vulnerability, particularly in the face of climate change predictions. Policy narratives however are now forced to address and reflect community risk and vulnerability. This in turn will reflect on consultation and participation which can be decisive in an assessment and most importantly an allocation of responsibility and liability.

6. Selection of a prudent strategy

Under the New Zealand Resource Management Act (RMA, 1991), local authorities are obligated to ensure the avoidance or mitigation of natural hazards. The New Zealand Coastal Policy Statement (NZCPS, 1994), which contains policies aimed at

accomplishing the purpose of the RMA, namely the sustainable management of natural and physical resources, includes specific reference to a rise in sea-level and its impacts on the subdivision, use, and development of the coast. Numerous coastal hazard studies commissioned by local authorities and developers suggest that a considerable portion of coastal settlements will be endangered by and exposed to a wide range of coastal hazards in the face of climate change. Where development pressure is high the potential increase in vulnerability is large unless adaptive measures are taken (IPCC, 2000). While the challenge is not so much about finding the best policy today for the next 100 years, it lies in selecting a prudent strategy and adjusting it over time in the light of new information (IPCC, 1996). The present prudent strategy selected by the New Zealand Government comes in form of the 'Preparing for Climate Change' (MFE, 2008b), a pragmatic, non-prescriptive summary of 'Climate Change Effects and Impacts Assessment' (MFE, 2008a). A revision of the New Zealand Coastal Policy Statement (NZCPS, 1994) and a policy statement are expected to complement the guide in due course.

Other countries have defined prudent strategies providing guidance on how to adapt meaningfully to climate change too. Eakin & Luers (2006) and Füssel & Klein (2006) point out that the growing literature on climate change adaptation no longer seeks to create standardised and universally accepted concepts but now acknowledges the co-existence of different climate change approaches which is why a comparison makes sense. The eight guides were selected based on criteria defined during the selection process. The criteria were defined according to what the literature review for the purpose of this research has defined to be most appropriate for policy makers dealing with climate change adaptation on a community level. This section focuses on a comparison of seven different 'guidance measures' and assists in answering the first two questions of what the roles and responsibilities of climate change adaptation guidance are and highlight the

commonalities and insights of different adaptation guides in order to highlight the guides' 'metanarrative'. The seven 'guidance measures' taken into consideration for the purpose of this comparison, further developed from the 'key themes' used in exploring local narratives and the 'groups of principles' defined to analyse the MFE (2008b) guide include:

i. Key Principles;
ii. Key questions;
iii. Guidance with respect to the 'uncertain' future;
iv. Key responsibilities;
v. Governance / Participation;
vi. Education / Information dissemination; and
vii. Local and TEK.

The following section answers the remaining two questions about how adequate New Zealand's guide (MFE, 2008b) is relative to international guides and how relevant and applicable the guide is for the Te Puru community as it prepares for and adapts to climate change. Against the background of Chapter Four's local narrative it furthermore brings attention the contrast between rhetoric and reality: the 'real-world' narrative is not necessarily equal to the guidance narrative. The 'real-world' narrative, as highlighted in this chapter's Section Two as well as the introduction to Chapter Two, is that human's are living unsustainably in a world dominated by short-term gain and profit resulting, inter alia, in the dilemma of climate change. The purpose of climate change guidance is therefore to identify this dilemma and lead the reader to understanding, preparedness and adaptation. Naturally in different guides and countries this is achieved in different ways. However, as the following juxtaposition will highlight, the guides selected for this

study share the same 'metanarrative' which, as might be expected, is akin to the IPCC's 'metanarrative'.

For the purpose of this comparison only guides written in English were considered. The guides consulted for this thesis were published in New Zealand (NZ), Australia (AUS), Canada (CDN) both in form of a guide for Canadian municipalities as well as for international policy options (INTL), the United Kingdom (UK), the Netherlands for the United Nations (UN) Environment Programme (UNEP), and the United States of America (USA). Research for the selection of the eight guides compared for this thesis has shown that most western developed countries worldwide have published climate change adaptation guidance now. Many least developed countries identify priority activities that respond to their urgent and immediate needs to adapt to climate change through national adaptation programmes for action or NAPA's (UNFCCC, 2008). The guidebooks chosen form a 'road map' of the information currently available to planners and provide insight into the climate change adaptation guidance in western developed countries (Perkins, Ojima, & Corell, 2007). The key roles and responsibilities of such guides is to bring attention to the inherently complicated subject of climate change, emphasise the imperative of adaptation and assist local governments to identify and respond to climate change related impacts. These roles and responsibilities are fundamentally new to local government emphasising the importance for sound, meaningful and effective guidance.

The aim is to compare the relative strengths of different guides in different parts of the developed world and gauge the adequacy of New Zealand's guide (MFE, 2008b) relative to what adequately constitutes internationally most effective practices. The eight guides selected are:

i. NZ: Preparing for Climate Change: A Guide for Local Government in New Zealand. Ministry for the Environment – Fig. 5.1 (MFE, 2008b);

ii. NZ: Climate Change Effects and Impact Assessment: A Guidance Manual for Local Government in New Zealand. Ministry for the Environment – Fig. 5.2 (MFE, 2008a);

iii. AUS: Adapting to Climate Change in Australia. Department of Climate Change – Fig. 5.3 (Dept. of Climate Change, 2010);

iv. CDN: Adapting to Climate Change: An Introduction for Canadian Municipalities. Canadian Climate Impacts and Adaptation Research – Fig. 5.4 (Mehdi, et al., 2006);

v. UK: Climate Adaptation: Risk, Uncertainty and Decision-making. UK Climate Impacts Programme – Fig. 5.5 (Willows & Connell, 2003);

vi. INTL: Adaptation to Climate Change: International Policy Options. PEW Center on Global Climate Change – Fig 5.6 (Burton, et al., 2006);

vii. UN: Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies. United Nations Environment Programme; Institute for Environmental Studies, Vrije Universiteit, Amsterdam – Fig 5.7 (UNEP, 1998);

viii. USA: Preparing for Climate Change: A Guidebook for Local, Regional and State Governments. ICLEI, Washington Climate Impacts Group – Fig. 5.8 (Snover, et al., 2007).

Figure 5.1: Preparing for climate change (NZ)

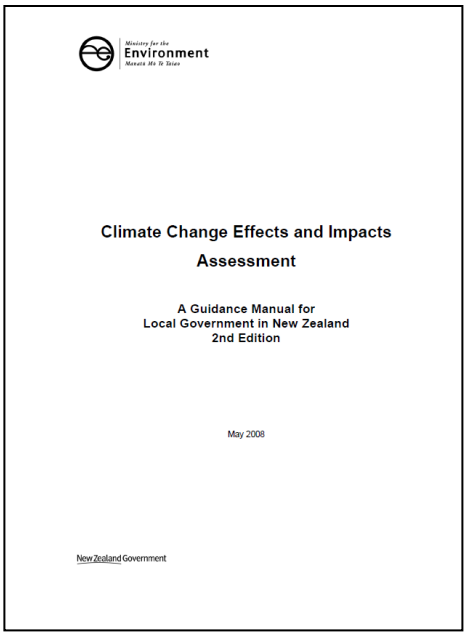

Figure 5.2: Climate Change Effects and Impacts Assessment (NZ)

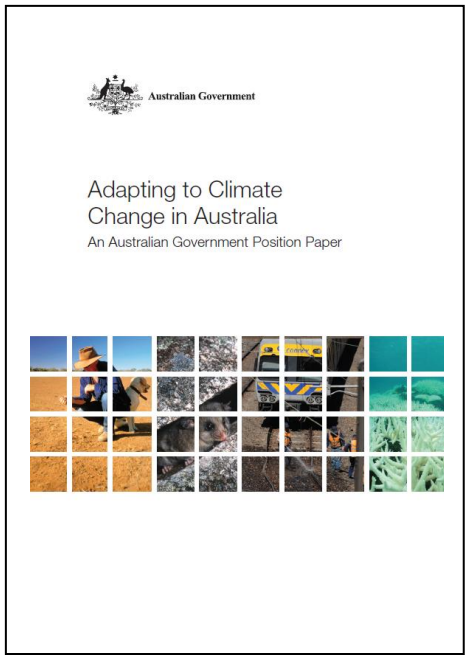

Figure 5.3: Adapting to Climate Change in Australia (AUS)

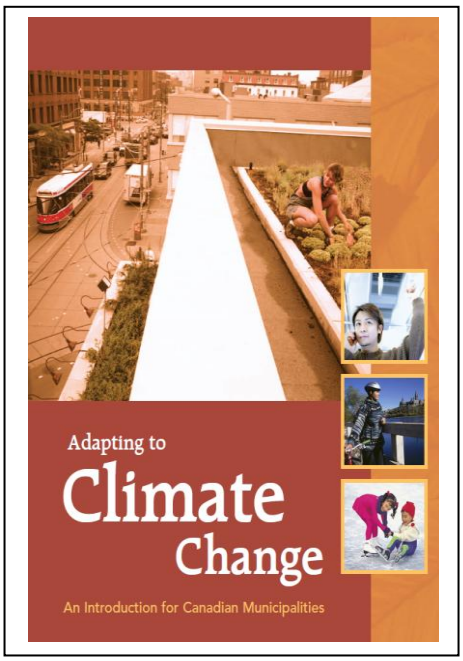

Figure 5.4: Adapting to climate change (CDN)

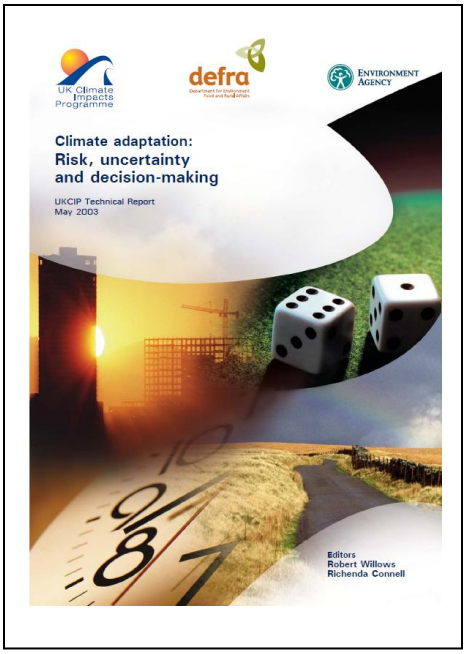

Figure 5.5: Climate adaptation: Risk, uncertainty and decision-making (UK)

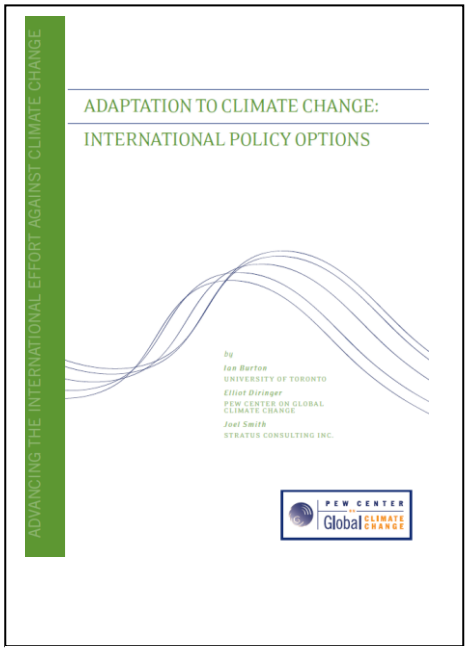

Figure 5.6: Adaptation to Climate Change (INTL)

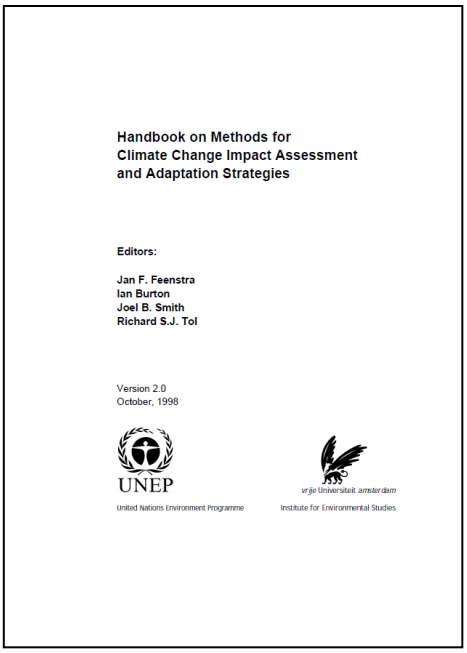

Figure 5.7: Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies (UN)

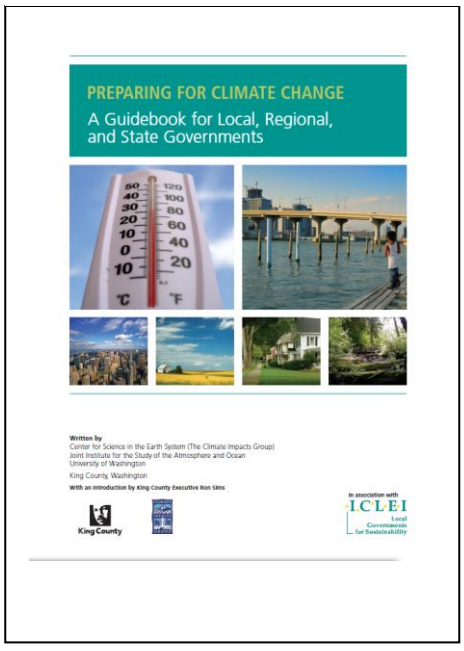

Figure 5.8: Preparing for Climate Change (USA)

Only a juxtaposition of New Zealand's prudent strategy with the strategy of other western developed countries facing very similar challenges as a result of climate change by deploying integrative 'guidance measures' assists in answering the questions including:

- What are the roles and responsibilities of adaptation guides?
- What are the commonalities and insights of different adaptation guides?
- Is New Zealand's guidance narrative adequate in preparing for and adapting to climate change?
- What guidance elements are indispensable in preparing for climate change?
- How does the metanarrative compare, is there an overarching story of stories encompassing and explaining all the 'little stories'
- Are there similarities in methodology?

The subsequent tables are structured as follows: The first table of each section juxtaposes 'guidance measures' in form of excerpts from each of the eight guides. The purpose is to retain the integrity of the guides. For clarity the excerpts are summarised in the second table of the section thus indicating whether the according 'guidance measure' is covered by the guide or not. Allowing for easy identification insights from 'Preparing for Climate Change' (MFE, 2008b) are highlighted in bold. Tables 5.1 and 5.2 compare the guides' key principles with each other. Tables 5.3 and 5.4 compare the guides' key questions with each other and Tables 5.5 and 5.6 offer insights into the respective responsibilities. Tables 5.7 and 5.8 give an understanding of the guides' interpretation of uncertainties and the future. Tables 5.9, 5.10 and 5.11 compare the respective guidance principles with regard to governance / participation, education and information dissemination. Tables 5.12 and 5.13 present a comparison of the eight guides' TEK insights. In the following tables the MFE (2008b) insights are highlighted in bold.

6.1. Key principles and key questions

Key principles and key questions arguably represent the foundations of climate change adaptation guidance literature. By defining such key insights a guide provides the opportunity for the reader to understand the key message without deviations, they bring the reader 'straight to the point'. Four of the eight guides have stated their key principles saving the reader from having to 'read between the lines'. Six out of the eight guidebooks have defined key questions challenging the reader to address climate change and give consideration to the potential consequences for the according region.

Key Principles: Clearly defined key principles such as moral rules or guidance are provided by four of the eight guides analysed for the purpose of this research. Out of these four, two are MFE's publications (MFE, 2008a, 2008b), the others are Snover, et al. (2007) and Dept. of Climate Change (2010). The remaining four guides do not clearly define key principles explicitly.

Key Questions: By raising key questions the reader is challenged to think about answers. In some cases this might be a question the reader has never thought about or, in the context of climate change adaptation, effects the reader has not given any consideration such as "How could climate change affect my region?" (Snover, et al., 2007).

Table 5.1: Insights into key principles of eight guidance narratives

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Key principles	**Sustainability; Consideration of the needs of future generations; Avoidance; remedy or mitigation of adverse effects; Adaptation of a precautionary / cautious approach; The ethic of stewardship / kaitiakitanga; Consultation & participation; Financial responsibility; Liability (p. 16).**	Sustainability; Provisions of the need of future generations; Avoidance and mitigation of adverse affects; Adoption of a cautious or precautionary approach; Prudent stewardship and kaitiakitanga; Consultation; Financial responsibility and liability (p. 13).	...adaptation considerations will be embedded within existing policy and institutional frameworks (p. 12).	No key principles specified.	No key principles specified.	No key principles specified.	No key principles specified.	Increase public awareness of climate change and its projected impacts on your community (p. 93); Increase your technical capacity to prepare for climate change impacts; "mainstream" information about climate change vulnerabilities, risks, and preparedness into planning, policy, and investment decisions; Strengthen community partnerships that reduce vulnerability and risk to climate change impacts (p. 94).

Table 5.2: Overview of key principles

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Sustainability; Consideration of the needs of future generations; Avoidance; remedy or mitigation of adverse effects; Adaptation of a precautionary / cautious approach; The ethic of stewardship / kaitiakitanga; Consultation & participation; Financial responsibility; Liability.	✓	✓						
Adaptation considerations are embedded within existing frameworks.			✓					
Increase public awareness and technical capacity; "Mainstream" climate change information and strengthen community partnerships.								✓
No key principles specified.				✓	✓	✓	✓	

Table 5.3: Insights into key questions of eight guidance narratives

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Key questions	**Could an existing problem be exacerbated by climate change? What foreseeable problem may be caused or exacerbated by climate change? Is the issue complex? Is the location sensitive to climate change? Does the decision imply a permanent long-term change (p. 32)?**	What are the key points I need to know about planning for climate change in NZ? Why should my council take any notice of and plan for climate change? Isn't this problem too big or long-term for a council to tackle, given all the uncertainties? How is the climate in our region or district likely to change due to global greenhouse gas emissions? What are the uncertainties? What functions and services undertaken by my council might be affected by climate change? What methods and data sources are available for assessing likely effects? What climate change assumptions should be used in scenario assessments? What about the uncertainties? How are climate change risks estimated, and prioritised relative to other hazards? How can climate change risk assessment be integrated into council decisions and plans (p. 16)?	No key questions specified.	No key questions specified.	What are the climate and climate change risks that could affect my decision? What adaptation measures are required and when? What adaptation measures would be most appropriate (p. 4)?	Difficult questions of fairness suffuse the climate change debate but are particularly stark in the case of adaptation: those most vulnerable to climate change are the ones least responsible for it (p. 1).	What does climate change mean to us? What might be done about it (p. 19)?	How could climate change affect my region, and do those impacts pose a risk for my community (p. 33)? Do these impacts appear significant enough to begin preparing for climate change (p. 44)?

Table 5.4: Overview of key questions

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
How does climate change exacerbate problems now and in the future?	✓	✓						
What does climate change mean to us, how does it affect this region and the decisions to be made in the face of climate change?					✓		✓	✓
How is fairness related to adaptation and climate change?						✓		
No key questions specified.			✓	✓				

Of the eight guides selected for this comparison two (Dept. Of Climate Change (2010) and Mehdi, et al. (2006)) fail to define key questions. Except for Burton, et al. (2006) all remaining guides ask practical, region-specific questions such as "What functions and services undertaken by my council might be affected by climate change?" (MFE, 2008a) or "What foreseeable problem may be caused or exacerbated by climate change?" (MFE, 2008b). Burton, et al. (2006) do not explicitly formulate key questions as such but guide the reader's attention to the fact that moral and ethical questions suffuse the climate change debate and are particularly stark in the case of adaptation: those most vulnerable to climate change are the ones least responsible for it.

6.2. Key responsibilities and insights into an uncertain future

Key responsibilities and insights into an uncertain future are grouped in table 5.3 and table 5.4. Reasons for the connection of these two 'guidance measures' into one table are the previously discussed uncertainties about climate change and its effects affecting the responsibilities. Responsibilities not only stand in direct relation to the causes of climate change but also its ramifications. Defining responsibilities is an inherently difficult task given the range of scales affected by and responsible for climate change from global to local.

Key responsibilities: Generally the principle predicament of climate change as described in Chapter Two is that the least responsible for accumulation of greenhouse gases are the most vulnerable to adverse climate change impacts. Responsibilities, as the comparison in this section shows, are manifold. The local narratives in Chapter Four, Section Four have underscored this. They include moral, causal, individual, collective and social responsibilities, "all compounded by politically sensitive questions of responsibility and equity" (Burton, et al., 2006, p. 9).

This is not surprising given the complexity of climate change and the divergent perceptions and interests held by key community stakeholders and the resulting need for adaptation. Assigning responsibility is arguably simple, but the most difficult practical challenge of climate change. Fundamentally there are two principles of responsibility allocation:

1. The 'polluter pays principle' (Jagers & Duus-Otterström, 2008): "The perpetrators of environmental damage ought to bear the costs of its bad effects" (Page, 2006, p. 53).
2. The 'ability to pay principle' (Jagers & Duus-Otterström, 2008): "Among a number of parties, all of whom are bound to contribute to some endeavour, the parties who have the most resources should contribute the most to the endeavour" (Shue, 1999, p. 537).

Caney (2005) points out that only a combination of the two principles is adequate and that any responsibility resulting from climate change is a burden for the simple reason that the resources used could and would be allocated otherwise.

The justice based dilemma of responsibility can be described as either backward-looking or forward-looking (Caney, 2005; Gardiner, 2004; Jagers & Duus-Otterström, 2008). Backward-looking means that the question is asked who has caused what has happened and is happening and who can be blamed for it. By asking who has caused it, a 'causal responsibility' is assigned (Jagers & Duus-Otterström, 2008) thus forming the ethical basis for a commitment to correct what has happened. Forward-looking means that once a responsibility is identified, there is an obligation to correct or counter the effects: "Who should be doing something about it?" A remedial responsibility is assigned (Miller, 2004) with no ethical basis relating to a historical or ongoing contribution to climate change. Jagers & Duus-Otterström (2008) emphasise the possibility of being causally responsible without being remedially

responsible and vice versa. But what if the original polluters or those that have created vulnerability no longer exist? Is the present generation responsible for its predecessor's actions? What if the predecessors were truly ignorant? What is a fair allocation of responsibility? These questions highlight that the matter of responsibility and climate change is an inherently complicated one and finding sufficient answers to these and a multitude of subsequent questions unfortunately exceeds the scope of this research. Nonetheless it is of significance to highlight the predicament of responsibility with regard to climate change and examine the key responsibilities defined in the eight guidance narratives carefully. Against the background of the insights about responsibilities described it is particularly relevant to examine how the guides deal with the probably most central ethical concept of responsibility. Table 5.3 and 5.4 summarise the individual guides' insights on key responsibilities and insights into the 'uncertain' future.

Six of the eight guidebooks explicitly define key responsibilities with the exception of Willows and Connell (2003) where adaptation revolves around the local impacts of climate change and Burton, et al. (2006) where the key responsibilities are formulated in more general and international terms.

Insights into the 'uncertain' future: Eakin, at al. (2009, p. 212) point out "the fact that climate change is characterised by a high probability of surprise events; significant scientific uncertainty; and a need for long-term planning horizons" makes the definition of guidance narratives more difficult. Policy makers are forced to make decisions against the background of grave uncertainties and hence need to focus on guidance for the 'uncertain future'. All eight guides focus attention on this challenging topic. These include the necessity of considering a range of possible futures (MFE, 2008b); the significance of uncertainty (Willows & Connell, 2003); uncertainty necessitating flexibility and creativity (Dept. of Climate Change, 2010); the future being different to the past (Mehdi, et al., 2006); the importance of

uncertainty analysis (UNEP, 1998); the need for preparation for uncertain impacts (Snover, et al., 2007); the assurance of 'future-proofing' council activities (MFE, 2008a) and the lack of certainty complicating the political questions surrounding costs and burden-sharing (Burton, et al., 2006).

Table 5.5: Insights into key responsibilities of eight guidance narratives

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Key responsibilities	**Local government is responsible for a wide range of functions that may be affected by climate change under the Local Government Act 2002, the Resource Management Act 1991 and other legislation (p. 16). ...(there are) both legal and social obligations to take climate change effects into account...(p. 16).**	Local government has a wide range of responsibilities that relate to adaptive responses to climate change (p. 97).	Adaptation is a shared responsibility – governments, business and the community all have a stake and a role in responding to climate change impacts (p. 7).	Even though municipalities share responsibilities associated with infrastructure with other orders of government, any effect of climate change is ultimately felt locally, even if it originates outside local jurisdictions... (p. 9).	...a responsibility to be aware of the risks associated with the future being different to that anticipated... (p11).	...the international community faces a host of difficult issues stemming from the underlying characteristics of climate risk, the institutional contexts for adaptation decision-making and action, and inherent limits on available resources – all compounded by politically sensitive questions of responsibility and equity (p. 9).	No key responsibilities specified.	Localities, regions and states are on the front lines of climate change impacts, and have a responsibility to respond (p. 27).

Table 5.6: Overview of key responsibilities

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
There is a wide range of shared legal and social obligations and responsibilities to take into account.	✓	✓	✓	✓		✓		✓
There is a responsibility to be aware of the risks associated with climate change.					✓			
No key responsibilities specified.							✓	

Table 5.7: Future / uncertainty principles of eight guidance narratives

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
the 'uncertain' future	**Considering the needs of future generations is a fundamental basis of international, national, regional and local responses to climate change (p. 17). ...(it is) necessary to consider a range of possible futures when assessing climate impacts, and whether adaptive responses are needed (p. 32).**	...it is necessary to consider a range of possible futures when assessing climate impacts and development strategies (p. 61). ...it is vital to integrate climate change into standard considerations to ensure that council activities are "future-proofed" and remain sustainable for future generations (p. 11).	Uncertainty is a reason for flexibility and creativity, not for delay (p. 6).	...historical rates of change and variability are no longer an accurate gauge for future climate conditions (p. 2).	Uncertainty increases the further you look into the future. ...for many aspects of climate change adaptation, uncertainty will be significant (p53). Decisions today will have implications tomorrow in terms of the future impact of climate on society (p. 3).	Lack of certainty especially complicates the political questions surrounding costs and burden-sharing, which invoke competing notions of equity and responsibility (p. 11). While certain impacts may in the nearer term prove beneficial to some, in the long term, the effects will be largely detrimental (McCarthy, Canziani, Leary, Dokken, & White, 2001) (p. 1).	Forecasting, or telling the future, by whatever method used, is notoriously unreliable (p. 21). Uncertainty analysis must accompany the overall integrated assessment (p. 311).	"The future ain't what it used to be" (Yogi Berra) (p. 9). Planning for the future can benefit the present (p. 27). We must prepare for the impacts underway while we work to avoid even worse future effects (p. 11). Reducing greenhouse gas emissions today will play a critical role in determining how much climate change we experience in the future (p. 25).

Table 5.8: Overview of 'uncertain' future insights

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
The needs of future generations as well as a range of possible futures need to be considered.	✓	✓		✓				
Uncertainty should be reason for flexibility and creativity.			✓					
The future is highly uncertain thus complicated and unreliable.					✓	✓	✓	
Preparing and planning for the future can benefit the present.								✓

6.3. Governance, TEK, Education and Information Dissemination

Governance, TEK, Education and Information Dissemination represent three key subjects of relevance to not only this thesis but to successful climate change adaptation in general. The promotion and employment of human and social capital necessary to effectively move technical, economic and policy levers for adaptation to climate change is key to successful outcomes (Moser, Kasperson, Yohe, & Agyeman, 2008). As discussed in Chapter Two, ecological knowledge systems, including local and TEK must be enhanced and built into local adaptive management practices and 'polycentric nodes of governance' are essential to maintain flexibility and diversity (Folke, et al., 2005).

Governance: Adaptation to climate change will require the active involvement of local community stakeholders and institutional adjustments will inevitably have to focus on community reorganisation and initiative (Adger, 2003; Folke, et al., 2005; IPCC, 2007a). Five of the eight guides have translated the importance of governance into key insights. The two guides from New Zealand focus on 'consultation' while the remaining three guides concentrate on the term 'involvement'. Although five out of eight guides provide key insights into governance / participation, in order to truly represent the views and values of local stakeholders, 'consultation' has to evolve to 'authentic participation'.

Table 5.9: Governance and education / information dissemination insights of eight guidance narratives

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Governance	**Principles of consultation with communities and affected people are fundamental...(p. 18).**	Principles of consultation with communities and affected people lie at the heart of local government decision making (p. 93).	No governance insights specified.	No governance insights specified.	There is a need for genuine stakeholder and public involvement (p60). The decision process should, in general, involve all stakeholders (p. 6).	No governance insights specified.	...consideration should also be given to methods of stakeholder involvement... (p. 30).	...if ever there was an issue in the public domain that cried out for the involvement of our younger generation in this great country it is climate change (p. 12).
Education / Information dissemination	**...relevant to climate change, those being consulted must have sufficient information to understand the likely scenarios and associated risks...(p. 18).**	For decisions relevant to climate change, those being consulted must have sufficient information to understand the likely scenarios and associated risks for their communities (p. 93).	Individuals and businesses can only take effective action to adapt to climate change if they are well informed about its potential impacts and risks (p. 8 & p. 10).	No education / information dissemination specified.	...increase public awareness (p. 68). ...reduce uneven stakeholder awareness on climate change (p. 68).	Adaptive capacity reflects fundamental conditions such as income and education levels, the strength of government institutions, and access to information and technology (p. 10).	Another type of adaptation is the dissemination of knowledge through education and public information campaigns, leading to behavioural change (p. 121).	Increase public awareness of climate change and its projected impacts on your community (p. 93).

Table 5.10: Overview of governance insights.

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Principles of consultation are fundamental.	✓	✓						
Genuine involvement must include all stakeholders.					✓			
Methods of stakeholder involvement should be considered.							✓	
The younger generation must be involved in climate change.								✓
No governance insights specified.			✓	✓		✓		

Table 5.11: Overview of education / information dissemination insights.

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Those being consulted must have sufficient information	✓	✓						
Effective adaptation / adaptive capacity require information about potential impacts and risks.			✓			✓		
Information increases public awareness					✓			✓
Dissemination of knowledge leads to behavioural change facilitating adaptation.							✓	
No education / information dissemination specified.				✓				

Table 5.12: TEK insights of eight guidance narratives

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
TEK	**The Local Government Act 2002 and the RMA both contain the concepts of stewardship / kaitiakitanga (p. 17).**	Seeking expert opinion can involve the presentation of plausible scenarios of climate change for your region to knowledgeable people in your region, or national experts, to seek their views (p. 55).	No TEK insights specified.	No TEK insights specified.	No TEK insights specified.	No TEK insights specified.	The judgement of experts, who may include people with a lifetime of experience but little formal education, may be quite accurate, but its use is hard to justify in terms of the scientific methodology since it is difficult to test (p. 362).	No TEK insights specified.

Table 5.13: Overview of TEK insights.

Insight	MFE (2008b) (NZ)	MFE (2008a) (NZ)	Dept. Of Climate Change (2010) (AUS)	Mehdi, et al (2006) (CDN)	Willows & Connell (2003) (UK)	Burton, et al(2006) (INTL)	UNEP (1998) (UN)	Snover, et al (2007) (USA)
Stewardship and kaitiakitanga are included in policy documents.	✓							
Seeking expert opinion can involve seeking the views of regional knowledgeable people or experts.		✓						
The judgement of experts with a lifetime of experience but little formal education may be accurate but hard to justify.							✓	
No TEK insights specified.			✓	✓	✓	✓		✓

Local and TEK: Given the potential of local and TEK discussed in Chapter One, Section Four it is surprising to see only three guides, two of which are the MFE guides, mention local and TEK in an adaptation context. Local and traditional knowledge has the potential to function as local-scale expertise; as a source of climate history and baseline data; in formulating research questions and hypotheses; as insight into impacts and adaptation and for long-term community-based monitoring (Riedlinger & Berkes, 2001). Out of the eight guides examined, only MFE (A) (2008a) explicitly recommends seeking the views of knowledgeable people in the region, while MFE (B) (2008b) defines the concept of kaitiakitanga as one of its key principles. Kaitiakitanga implies the collaboration of traditional and local knowledge owners. The UNEP Handbook (1998) makes mention of the possibility of the judgement of people with a lifetime of expertise to be quite accurate but hard to justify in terms of the scientific methodology since it is difficult to test.

Education / information dissemination: All guides except for Mehdi, et al. (2006) provide the reader with insights into education / information dissemination. Four guides place the insights into governance context and realise the significance and immediate need for enhancement. Of the remaining three guides two (Dept. of Climate Change, 2010; UNEP, 1998) focus on the direct relevance of this insight to adaptation. Burton, et al. (2006) points out a connection between adaptive capacity and education.

The comparison of different insights from different countries has shown that local government plays an important role in framing and facilitating adaptation to climate change. Comparisons like these have the potential to play an important role in developing guidance for local action and providing key insights into the role of local government in climate change adaptation. Even though there is a large case literature on adaptation and adaptive responses, there are few comparative studies

of adaptation approaches with key insights and understandings. With a growing body of literature and guides on climate change adaptation coupled with increasingly accurate scientific projections and more attention on how to apply the knowledge and the insights in the field, approaches as the ones presented here will evolve over time. Preparing for and adapting to climate change is a continual process, to be regularly revisited and refined as impacts, vulnerabilities and strategies become better defined (Perkins, et al., 2007). The following section discloses the insights gained from international guidance narratives and their relevance for climate change adaptation in New Zealand. With the help of the 'guidance measures' developed for juxtaposition (as explained in this chapter's Section Six) the question of what needs to be done to enable a vulnerable community is answered and the comparison between 'Preparing for Climate Change'(MFE, 2008b) and the other seven guidance narratives continued.

7. Climate change guidance in practice

This section targets the practical application of climate change guidance for local government. What are the roles and responsibilities of climate change adaptation guides? Are all guides 'cut from the same cloth' and do they all share a common 'key message' or 'metanarrative'? What is more, is the IPCC's 'metanarrative ' reflected in the guides selected? What exactly are the commonalities and insights of different adaptation guides? Is New Zealand's guide (MFE, 2008b) adequate in preparing and adapting to climate change? In what way does the guide benefit local communities like Te Puru? Only by comparing New Zealand's guidance with international guides and juxtaposing the guides with the help of a common denominator – in this case the 'guidance measures' developed – is it possible to draw conclusions about the meaningfulness and relevance of New Zealand's guidance narrative.

The comparison of the eight guides has enabled the development of 'guidance measures' considered being of greatest importance for policy makers. The question remains how adequate is New Zealand's guidance based on international climate change guides? While the guide does not explicitly mention the term 'adaptation' as such it does identify the need for adaptation: "Adapting to long-term climate change will also contribute to our resilience to extreme events as well as natural fluctuations in climate" (MFE, 2008b, p. 1). Both MFE guides together with Snover, et al. (2007) are the only guides consulted for this comparison not utilising 'adaptation' in its title, indicating the general emphasis of the guidance provided. In this context it pays to highlight and compare the different key insights of 'adaptation'. Table 5.14 compares key adaptation insights from the guides selected for this research as well as key insights from the IPCC, the World Bank and the UNFCCC.

The aim of 'Preparing for Climate Change' (MFE, 2008b) is to help local government to identify, scope, respond to and comprehend climate change in a rather general way as opposed to focusing explicitly on adaptation. The comparatively general approach is further reflected in the guide's key questions and key principles as accentuated in Tables 5.1 – 5.4: Key questions range from already existing problems and how these are likely to be exacerbated by climate change to problems anticipated to arise as a result of permanent long-term change demanding unprecedented solutions. Key principles range from sustainability to liability arguably covering all aspects that come into play in a New Zealand context, including kaitiakitanga. Local government's key responsibilities are clearly defined with reference to legislation leaving no doubt about the significance of climate change for New Zealand.

Table 5.14: A comparison of key adaptation insights

Source	Key Adaptation Insight
IPCC	High priority should be given to increasing the capacity… to adapt to Climate Change in ways that are synergistic with wider societal goals and sustainable development.
World Bank	…adaptation efforts must be intensified to cope with unavoidable changes.
UNFCCC	Adaptation to the adverse effects of climate change is vital in order to reduce the impacts of climate change that are happening now and increase resilience to future impacts.
(MFE, 2008b) NZ	**New Zealand needs to adapt... Adapting to long-term climate change will also contribute to our resilience to extreme events as well as to natural fluctuations in climate (p. 1).**
(MFE, 2008a) NZ	New Zealand has commitments to formulate and implement national and regional programmes containing measures to 'facilitate adequate adaptation to climate change'[23] (p. 6).
(Dept. of Climate Change, 2010) AUS	Adapting to the impacts of unavoidable climate change is critical to any effective climate change response (p. 1). We need to pay attention now to our climate change adaptation needs (p. 6). We need to measure how well we are adapting to climate change (p. 16).
(Mehdi, et al., 2006) CDN	Successful adaptation measures enable communities to plan for and respond effectively to the challenges of climate related events (p. 8). Adaptation to climate change is essential for municipal governments to protect the well-being of citizens and to manage public resources effectively (p. 26).
(Willows & Connell, 2003) UK	Climate change represents a complex, strategic risk, requiring decisions concerning policies, strategies, plans and projects that will provide benefits under future climate that will deliver climate adaptation (p. V).
(Burton, et al., 2006) INTL	The record of collapsed societies shows that coping with climate has not always been easy or successful, and there are limits to adaptation[24] (p. 3). To be most effective, adaptation must proceed at several levels simultaneously (p. 9).
(UNEP, 1998) UN	Adaptation refers to all those responses to climate change that may be used to reduce vulnerability. Adaptation can also refer to actions designed to take advantage of new opportunities that may arise as a result of climate change (p. 117).
(Snover, et al., 2007) USA	Adaptation is not one activity or decision but rather a continuous set of activities, actions decisions, and attitudes undertaken by individuals, groups, and governments[25] (p. 95).

[23] Article 4.1 (b) UNFCCC
[24] Lamb, 1995
[25] Adger, et al., 2005

The ‘uncertain’ future and the needs of future generations are addressed by being pointed out as the “fundamental basis of international, national, regional and local responses to climate change” (p.17) with the need of considering a “range of possible futures” (p. 32).

The guidance provided with regard to governance does not necessarily foster the active involvement of local community stakeholders but merely mentions the principle of “consultation with communities and affected people as fundamental” (p. 18).

The term ‘involvement’ does not appear in New Zealand’s (MFE, 2008b) guide. With regard to TEK the guide defines the concept of kaitiakitanga as one of its key principles. It furthermore makes reference to the Local Government Act (LGA, 2002) and the RMA (1991), both containing the concepts of kaitiakitanga. Again, with regard to education / information dissemination, the guide restricts its application of this measure to those being ‘consulted’ as opposed to ‘involved’. In other words authentic participation is not given the relevance required. The importance of education / information dissemination however is recognised by means of pointing out the “necessity of sufficient information to understand the likely scenarios and associated risks” (p.18). According to the ‘Coastal Adaptation to Climate Change’ report for the Coromandel Peninsula by NIWA (2007) there is a need to raise the public’s awareness of adaptation to climate change and better understand what is valued by coastal stakeholders. Education / information dissemination is one of the primary measures for achieving this goal.

Not surprisingly the eight guides selected share very similar ‘essential messages’:

> *There is a need to assess the potential effects of climate change and additional risks and opportunities should be part of existing*

planning, risk assessment and operational processes (MFE, 2008b, p. 38).

Adapting to climate change now will contribute to our resilience to natural fluctuations and reduce vulnerability (MFE, 2008a, p. X).

Governments have an important role to play in creating the right framework and in providing appropriate information to allow the private sector to make well-informed decisions (Dept. of Climate Change, 2010, p. 1).

Vulnerability to the effects of climate change needs to be reduced through anticipation and adaptation and there is a need to understand the process required (Mehdi, et al., 2006, p. 4).

As climate changes so too will risk thus having an effect on a range of decisions. There is a need to be aware of these risks and make climate adaptation decisions (Willows & Connell, 2003, p. V).

Human induced climate impacts and the new adaptation challenges presented by climate change must be understood within the broader context of climate risk generally, and against a backdrop of rising vulnerability (Burton, et al., 2006, p. 23).

Climate change is a present reality and we need to answer the fundamental questions what climate change means to us and what might be done about it (UNEP, 1998, p. XX).

> *There is a critical opportunity – and a need – to start preparing today for the impacts of climate change. If we wait until the impacts are clear to develop preparedness plans, we risk being poorly equipped to manage the economic and ecological consequences (Snover, et al., 2007, p. 1).*

The 'metanarrative' of the eight guides selected can be summarised as follows:

> **Climate change is impacting vulnerability and resilience now and steps must be undertaken to understand, prepare for and adapt proactively to anticipated impacts.**

The IPCC's 2007 'metanarrative' is:

> **There is observational evidence of climate change underway and it is likely that anthropogenic warming is a discernable influence. Future large-scale events may cause very large impacts. More extensive adaptation than is currently underway needs to take place to reduce vulnerability to future climate change impacts.**

Chapter Four's local 'metanarrative', as previously mentioned, is:

> **We are experiencing climate change already. Impacts are anticipated to increase resulting in an awareness of the imperative to adapt proactively.**

While there is a high level of consistency in the essential messages enabling the formulation of 'metanarratives', the juxtaposition and comparison has shown that this is not necessarily the case in the detail. Meanderings are particularly obvious in

the cases where guidance narratives fail to take a firm stand on the guidance measures developed. In the case of the key informants those potentially affected by anticipated climate change impacts like the beachfront property owners interviewed have provided dissenting narratives. Naturally the beachfront property owners interviewed are less supportive of 'soft' climate change adaptations in form of managed retreat. Unfortunately the local narratives in Chapter Four did not yield the potential for underlying conflicts due to the relative small number of key informants. The divergence nonetheless between short-term private interest such as vulnerable property owners directly affected by climate change (i.e. sea-level rise, coastal erosion, storm surges etc) versus long-term community interest in safety, equitable sharing of costs and benefits, and sustainability are obvious. Adaptation essentially involves reconciliation of contending interests. A local council planner interviewed for this research makes clear that

> *MFE's 'Preparing for Climate Change' guide is very useful in terms of providing us with direction and explaining the science to a lay-person. There is a strong need for these sorts of documents. It will be very interesting to see what the next publication will look like* (Council planner, 2010).

A major challenge for climate change guidance is therefore not only to antagonise the dominant contemporary 'metanarrative' of exploitation resulting in unsustainability, short-term gain and profit at the cost of the environment and public safety and long-term well-being, but also to consolidate the IPCC's 'metanarrative' and do justice to the 'little' stories and the 'metanarrative' of vulnerable communities such as Te Puru.

So how useful is New Zealand's climate change guide really? Based on the 'metanarrative' of the key informant interviews and the international comparison of

key insights into seven 'guidance measures' considered to be of the greatest importance for successful adaptation to climate change 'Preparing for Climate Change' (MFE, 2008b) does its title justice. Other than taking the opportunity to place increased emphasis on the meaning and power of governance in a meaningful and successful preparation and adaptation to climate change the guide expediently utilises all seven 'guidance measures' proposed for the purpose of this study. While, naturally, there is always room for improvement and stronger emphasis on key insights and measures such as the potential of local and TEK or governance, the guide provides overall guidance on all measures identified as important in this study. By doing so, there is a very clear benefit to vulnerable communities as the apparent correspondence between the underlying principles of the guide (MFE, 2008b) and the local narratives as presented in the previous chapter have shown. In the context of the Te Puru community, there is an obvious dependence on successful adaptation to climate change for a sustainable future - meaningful adaptation guidance is indispensable in preparing and adapting to climate change. Low lying coastal communities like Te Puru, divided by an unstable river and a history of high magnitude storm events projected to increase in severity and frequency clearly need meaningful guidance. Key principles including sustainability, consideration of the needs of future generations, avoidance, remedy or mitigation of adverse affects, adaptation of a precautionary / cautious approach, kaitiakitanga, consultation and participation, financial responsibility, and liability are of direct relevance and are already informing local government efforts to facilitate adaptation.

The reason why climate change adaptation guides like the 'Preparing for Climate Change' (MFE, 2008b) exist, is to answer the question of how to adapt to climate change successfully and to antagonise increased unsustainability in the face of climate change. This is achieved by defining meaningful key principles, asking key questions, looking at what is ahead of us with respect of the 'uncertain' future,

defining key responsibilities, realising the potential of governance, providing education and information and making use of local and TEK.

8. The formation of 'best practice' guidance for New Zealand

The Business Dictionary (2010) defines 'best practice' as methods that have shown results superior to those achieved by other means, and which are used as benchmarks to strive for. While no best practice remains best for long as people keep finding better ways of doing things, it nonetheless makes sense to define a best practice so that this can potentially provide a foundation for future efforts. Best practice implies that understanding should be continuously updated and adjusted, and each management action viewed as an opportunity to further learn how to adapt to changing circumstances (Carpenter & Gunderson, 2001). Learning from real-world experiences is a crucial part of building knowledge and skills into organisations and institutions (Fazey, Fazey, & Fazey, 2005).

A practical and effective climate change adaptation guide needs to define its key principles to 'set the scene' and define an origin from which the guide proceeds. Of the eight guides compared, 'Preparing for Climate Change' (MFE, 2008b) has articulated guidance for most of the 'guidance measures' developed through international best practice. The measures were defined according to what the guidance narrative comparison has shown to be of greatest relevance for policy makers dealing with climate change adaptation at the community level. The initial formation of the four 'groups of principles' (cf. Figure 1.2) has provided a clear indication of the measures of relevance based on selected international guidance. The analysis undertaken in this chapter together with the perceptions and experience from the key informants in Chapter Four have highlighted what is considered to be best practice key principles. First and foremost a clearly

understandable definition of adaptation is considered paramount for a best practice guidance narrative, followed by a meaningful interpretation of sustainability. Guidance policy narratives must make these two elementary principles distinct and intelligible. The subsequent three principles were adapted from the initial 'groups of principles' formed for an analysis of the MFE (2008b) guide. These include avoidance, remedy, or mitigation of adverse effects, adoption of the Precautionary Principle, kaitiakitanga and local and TEK. The consequential three principles education and public awareness, governance, responsibility and liability have, based on the comparison of international guidance and the local narratives, emerged to be of utmost importance. The ninth and final best practice key principle was drawn from the insights provided by a Council Planner interviewed for this research together with insights gained in the study of international guidance. It concerns the significance of 'mainstreaming' the climate change imperative to build a foundation for good adaptive governance: common visions, coordination of responsibility, financing, community interaction, education, meaningful dialogue, involvement, participation and understanding (Nicholson-Cole & O'Riordan, 2009). All principles from the groups formed for the analysis of New Zealand's guidance narrative were given justice in a way that they were either adopted (i.e. sustainability, kaitiakitanga, local and TEK) or slightly amended to fulfil the demands of 'best practice' principles (i.e. consultation and participation becoming governance). In summary the nine 'best practice' key principles for adapting to climate change in New Zealand based on this research are:

i. Adaptation;
ii. Sustainability;
iii. Avoidance, remedy or mitigation of adverse effects;
iv. Adoption of the Precautionary Principle;
v. Kaitiakitanga, local and traditional environmental knowledge;

vi. Education and public awareness;
vii. Climate governance;
viii. Responsibility and liability; and
ix. 'Mainstreaming' of climate change information, vulnerability, risk, and preparedness into planning, policy, and investment decisions.

The following sections provide an overview of the best practice key principles, briefly explaining why they were selected and why they are considered to be best practice.

8.1. Adaptation

Chapter Four has highlighted a general awareness of climate change among the key informants interviewed. It has also shown that some climate change effects are beginning to emerge but predictions like sea-level rise or an average temperature increase are not perceived or experienced by the local community yet. It was pointed out that some key informants expect more changes than others based on individual differences in the perception of the environment as such. Nonetheless, the interviews with local key informants have unequivocally demonstrated that changes are observed, that they are unprecedented, beyond the region's general variability and require adaptation. A best practice guide should incorporate insights and perceptions about how climate change is experienced locally from key informants. Making use of climate change perceptions from different parts of the country will provide the reader with a sense of recognition and identification and reinforce the importance of taking adaptive action. Solidarity and feelings of relatedness are very powerful hence giving policy makers the opportunity to experience that others are dealing with the same or at least very similar issues.

A best practice guide should furthermore provide a clear understanding of the key meaning and importance of adaptation. The comparison between the eight different adaptation guides, the IPCC, the World Bank, and the UNFCCC presented in Table 5.14 has found the combination of the following two insights from UNEP (1998) and the UNFCC (2010) to be the most relevant:

> Adaptation refers to all those responses to climate change that may be used to reduce vulnerability (UNEP, 1998) Adaptation to the adverse effects of climate change is vital in order to reduce the impacts of climate change that are happening now and increase resilience to future impacts (UNFCCC, 2010).

The reason for the combination of the two insights into a 'best practice' adaptation definition is threefold: The need to reduce vulnerability is paramount. The UNFCCC quote explains the impacts of climate change happening now as the reason behind vulnerability. The third key point is resilience: In simple terms resilience is defined as the result of a reduction in vulnerability. In other words reducing vulnerability to the impacts of climate change leads to a resilience against future impacts.

8.2. Sustainability

Insights from key informants and the discussion of sustainability in the context of existing literature and as one of the key principles of New Zealand's 'Preparing for Climate Change' guide in Chapter Four have shown that human well-being depends on the well-being of the environment. For this reason and the fact that humanity is living unsustainably evidenced by key findings from the Millennium Ecosystem Assessment (2005) and the International Union for Conservation and Nature (2008) providing daunting facts, which taken together present an alarming picture of the

future, it is imperative for a best practice guide to define sustainability as one of its key principles. The concepts of sustainable development are furthermore addressed in the Local Government Act (2002) and sustainable management of an area's natural and physical resources in the RMA (1991). As previously mentioned, since 2004 the RMA has included that people making decisions in terms of the Act must have particular regard to the effects of climate change (MFE, 2008b).

8.3. Avoidance, Remedy or Mitigation of Adverse Effects

The duty to avoid, remedy and mitigate adverse effects applies to the preparation of plans by local authorities under the RMA (1991), every decision made under the RMA, and to everyone who carries out an activity or development under the RMA. In other words anticipated climate change impacts have to be taken into account when contemplating new activities or developments through reasonable understanding and analysis (MFE, 2008b). While the eight climate change guides compared for the purpose of this study focus on physical impacts, the key informant interviews have shown that it is equally important to assess and bring to attention the impacts on human well-being. There is a decisive need to improve our understanding of the anticipated social-ecological impacts and couple these with the anticipated physical impacts. Of further significance for this key principle is an identification of who the most vulnerable are, why and in which way; and to take practical steps to reduce their vulnerability.

8.4. Adoption of the Precautionary Principle

The Precautionary Principle presents a shift from post-damage control (civil liability as a curative 'tool') to pre-damage control (anticipatory measures) of impacts

(UNESCO, 2005). The principles can be described as a strategy to cope with the uncertainties associated with climate change. The New Zealand Coastal Policy Statement prepared under the RMA (NZCPS, 1994), the RMA (1991) itself and the Civil Defence Emergency Management Act 2002 (CDEM, 2002) explicitly include the concept of the precautionary principle which is why it is of direct relevance to a best practice climate change adaptation guide. The principle requires an informed but risk averse approach to decisions where full information on effects is not available at the time of decision-making. The precautionary principle is of particular importance as a separate climate change adaptation key principle not only as a result of the uncertainties involved but also in terms of what adaptation steps have already been undertaken. An awareness of steps already taken to deal with climate change impacts has the potential to focus on achievements and what remains to be done 'precautiously'. 'Re-inventing the wheel' is a waste of precious time, money, energy and ultimately the trust stakeholders should place in local government. With particular regard to the aforementioned uncertainties involved with climate change projections, localities and regions have the possibility to learn from each other. This can be accomplished by comparing and highlighting the achievements to date. While different environments (i.e. coastal, mountain, inland etc) and community settings in different parts of New Zealand are and will be affected by climate change in different ways, learning about the experiences and insights acquired by others can be a critical step towards reducing vulnerability, enhancing resilience and successful adaptation.

A shift in the general approach like the move towards an acceptance of natural forces as opposed to 'hard' physical protection from the environment as highlighted in the interviews by the council planners, the coastal scientist and the mayor is of further relevance to the precautionary principle. If people's perception of their environment is changed, the adaptation 'horizon' is widened.

Through analysis of future scenarios, climate change should be taken into account when contemplating new activities and developments (MFE, 2008b). Where climate change effects are expected to be significant, a precautionary approach is even more important and is consistent with the direction set by the New Zealand Coastal Policy Statement (NZCPS, 1994).

8.5. Kaitiakitanga, Local and Traditional Environmental Knowledge

Both the RMA (1991) as well as the Local Government Act (2002) contain the concepts of kaitiakitanga stating that a local authority should ensure prudent stewardship and the effective use of its resources in the interest of the region.

The insights from key informants accompanied by the literature review have furthermore demonstrated the potential of local and TEK. As explained in Chapter One, Section Four, TEK is used against the background of Māori culture and traditions while local knowledge does not necessarily imply an indigenous component. Without analysing how impacts were addressed in the past, the significance of adaptation cannot be fully understood. Local observations of unprecedented changes like those presented in Chapter Four together with insights and experiences have the potential to detect changes that may affirm or challenge scientific findings. Furthermore they can provide insights into factors like uncertainties and indeterminacies. Most importantly local narratives reveal the richness and diversity of community values, interest and experiences that need to be taken into account and frame climate change adaptation planning at the local level. New Zealand's Climate Change Effects and Impacts Assessment' (MFE, 2008a) guide consulted for the international comparison provides an appropriate justification for making use of local and TEK:

> Seeking expert opinion can involve the presentation of plausible scenarios of climate change for your region to knowledgeable people in your region...to seek their views (MFE, 2008a).

A best practice guide will also have to bring attention to the challenges associated with social learning and civic science (linking science, social values, and local knowledge) (c.f. K. N. Lee, 1993) and distinguish between facts and perceptions.

8.6. Education and Public Awareness

Education and public awareness is the key to an informed public and only an informed society can make informed and reasoned decisions and achieve meaningful stakeholder participation. While the New Zealand government is already working actively to educate the public and raise awareness on climate change, a best practice guide should include education and public awareness as a key principle. The principle should include public awareness of the anticipated impacts on both a physical as well as social-ecological level and accommodate for uncertainties inherent in climate change. A growing awareness that social-ecological systems are more complicated than scientists had previously believed (UNESCO, 2005) should be fostered. Education therefore requires a holistic approach as opposed to reducing climate change to one aspect of relevance. Education and awareness lead to behavioural change which in itself is a form of adaptation.

8.7. Climate governance

Common visions, coordination of responsibility, financing, community interaction, education, information, meaningful dialogue, involvement, participation, and

understanding form what Nicholson-Cole & O'Riordan (2009) describe as the 'building blocks' or the foundation of good adaptive governance. The "mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights and obligations, and mediate their differences" (UNDP, 1997, p. 1) need to be brought to the reader's attention making clear the importance of governance as indispensible to successful adaptation. Underdal (2010) points out that both climate change and biodiversity loss are some of the most important processes of social-ecological change sharing three interacting characteristics making them highly demanding challenges of governance:

i. The fact that they are long-term policy problems with time lags often extending beyond one human generation;
ii. They are embedded in profound 'uncertainties' (cf. Section 6.2) coupled with an incomplete understanding of the acting systems; and
iii. They involve global collective goods of a nature linking them to a wide range of human activities, leaving them beyond the scope of 'single best effort[26]' solutions.

The insights gained from this researched have clearly shown that because the challenges of governance are so demanding, it is indispensable for 'best practice' guidance to include this principle. "To be effective a response strategy must match the challenge" (Underdal, 2010, p. 392). A best practice guide needs to clearly state who should be doing what and why and outline practical steps for resolving conflict and achieving more effective collaboration between key governance role players.

Future adaptation prospects need to be highlighted to disclose the range of options available to communities. Identifying the consequences of different actions is of

[26] The term 'single best effort' was shaped by Barrett (2007) referring to collective action problems where a single actor is capable of providing the collective good in question through unilateral efforts, and has a strong interest in having the goods provided (cf. Sandler, 1998).

equal importance if decisions are to be well-thought-out and sustainable. A combination of key insights from the USA's and the UK's guidance narrative (Snover, et al., 2007; Willows & Connell, 2003) form an adequate introduction to governance in the context of climate change:

> There is a need for genuine stakeholder and public involvement (Willows & Connell, 2003). If there ever was an issue in the public domain that cried out for involvement [...] it is climate change (Snover, et al., 2007).

8.8. Responsibility and Liability

Responsibility and Liability are two inherently crucial and complicated aspects in dire need of being addressed as part of climate change adaptation. As discussed at the beginning of this chapter, the principle represents an amalgamation of moral and law. While responsibility implies a form of accountability and obligation, liability is a legal responsibility for one's acts and omissions (Law.com, 2010). Localities, regions and states are at the front lines of climate change impacts, and have a responsibility to respond (Snover, et al., 2007). A failure in doing so can result in liability. Local government can be liable for decisions that are shown to have been made in the face of information that should have led to a different decision (MFE, 2008b). Liability can prove to be valuable if traditional public policies are unfeasible or if liability can make these public policies more feasible and efficient (Sigman, 2007).

The importance of 'Responsibility and Liability' as a best practice key principle lies in the fact that the effects of climate change will be experienced locally despite the causes most likely originating outside of local jurisdictions. Ultimately successful adaptation results from a shared responsibility in the form of the government,

businesses and the community each having a stake and a role in responding to the impacts (Dept. of Climate Change, 2010).

8.9. Mainstreaming of Climate Change Information, Vulnerability, Risk and Preparedness into Planning, Policy and Investment Decisions

Mainstreaming involves the integration of policies and measures that address climate change into planning and ongoing sectoral decision-making, in order to ensure the sustainability of investments as well as to reduce the sensitivity of development activities to today's as well as tomorrow's climate (Huq, Rahman, Konate, Sokona, & Reid, 2003; R. J. T. Klein, 2002). Snover, et al. (2007) point out that in order to remain resilient to the impacts of climate change, assumptions and preparedness actions need to be mainstreamed into planning, policy-making, and investment decisions. More systematic ways of addressing climate change in government activities and increasing the robustness to a range of climate change scenarios need to be found. This key principle also includes increasing the flexibility of how government services and programs are managed.

9. Conclusion

This work assesses the relationship between climate change guidance, insights from local key informants and adaptation. By distilling insights from key informants, juxtaposing these with New Zealand's 'Preparing for Climate Change' (MFE, 2008b) guide and comparing the guide with seven international adaptation guides, a set of best practice key principles is derived to guide meaningful adaptation in New Zealand. The moral and ethical predicament of climate change, coupled with unsustainable practices driven primarily by short-term gain and profit, have

triggered not only unprecedented environmental changes as described by local narratives but are the raison d'être for adaptation guidance narratives. The common denominator of climate change allows for a definition of 'key themes' along which local insights and perceptions are arranged. The 'key themes' are aligned alongside New Zealand's guide's 'groups of principles'. Assessing the MFE guide (MFE, 2008b) based on its consistency with international guides not only provides insights into the guides' 'metanarrative' but also the relevance and applicability at the local level. Conclusions are drawn about the adequacy and meaningfulness of New Zealand's guidance thus clearing the way for the definition of 'best practice' guidance measures for New Zealand.

A question central to this research is how key climate change guidance can lead a vulnerable coastal community to meaningful climate change adaptation. The present essential adaptation message is that while changes in climate are already experienced, anticipated changes are the real cause for concern: the steps taken now are crucial to the effects changes will have in the future. The fact that climate change is characterised by uncertainties in terms of when, where and how impacts will take place coupled with scientific uncertainty and a need for long-term planning horizons, makes meaningful guidance towards a sustainable and resilient future not only more difficult but exceedingly critical.

Local narratives need to be taken into account in developing guidance that is locally relevant and implementable. Without increased attention to local institutions and stakeholders and their role in adaptation efforts of different kinds, coupled with the ways in which local and external institutions can be articulated in the context of adaptation, it is unlikely that adaptation efforts will achieve much success (Agrawal & Perrin, 2009). Currently there is little to no information as to what forms of adaptation exist, which adaptation options have proven to be successful or what ultimately triggers adaptation. Understanding societal processes and incorporating

these into local governance efforts and institutions are bound to benefit policymakers and communities alike.

In summary, the six key findings of this research are:

i. Adaptation needs to occupy a larger role in the face of the future climate as projected by the IPCC and already experienced climate impacts. This need is emphasised by increased unpredictability, uncertainty and unquantifiability of risks as well as increased community vulnerability as a result of a historic settlement burden coupled with population growth and development intensification;
ii. Adaptation has to take place where impacts and changes are experienced;
iii. Compared with seven international climate change adaptation guides, New Zealand's guide (MFE, 2008b) expediently utilises all 'guidance measures' identified in this study;
iv. 'Best practice' key guidance principles should include sustainability, avoidance, remedy or mitigation of adverse affects, adoption of the precautionary principle, kaitiakitanga and local and traditional knowledge, education and public awareness, governance, responsibility and liability, and the mainstreaming of climate change information, vulnerability, risk and preparedness into planning, policy and investment decisions;
v. Local and TEK have the potential to offer a decisive contribution to climate change adaptation efforts by complementing scientific studies with local narratives that provide observations at a finer and more detailed scale;
vi. Not only are the eight climate change guides from western developed countries selected for this research 'cut from the same cloth' but the

IPCC's 'metanarrative' is furthermore reflected in the guides' 'metanarrative' and the local 'metanarrative' is aligned with New Zealand's MFE guide.

A transition has begun and the need for and value of adaptation to climate change, as the adoption of Narrative Policy Analysis in this research has demonstrated, is clearly recognised. Nonetheless a lot remains to be done before key informants such as those interviewed for this research, local and national government in New Zealand and internationally can establish locally implementable adaptation goals and visions for a sustainable future. In order for meaningful adaptation to successfully gain ground, community participation is central. This will require adjustments in government including a review of policy documents, greater certainty in scientific projections to reduce the high degrees of uncertainty and complexity that comes with climate change, as well as well-informed communities willing and able to reduce their vulnerability. The future challenge lies in giving effect to the 'best practice' key principles for adapting to climate change based on this research in 'real' local communities. The focus of subsequent research will have to lie in devising ways of reconciling contending interests and enabling local voices to be heard, including an examination of the public decision making processes that integrate climate concerns into day-to-day planning and decision-making. Mainstreaming the climate change dilemma and committing adaptation into both formal and informal societal institutions poses further challenges for future research.

APPPENDICES

Information Sheet

Adaptation to climate change: A case study of Coastal Communities on the Coromandel Peninsula

By Paul Schneider

INFORMATION SHEET

This information sheet provides background information about a research project on the adaptation of coastal communities to climate change on the Coromandel Peninsula. It also gives a brief explanation of what is involved in participating in this project.

WHO IS THE RESEARCH LEADER AND

WHAT IS THE PROJECT ABOUT?

RESEARCH LEADER: Paul Schneider is the Research Leader. I live half way between Thames and Coromandel Town and I am writing my thesis extramurally at the College of Humanities and Social Sciences at Massey University.

RESEARCH AIM: The aim of this research is to understand how communities on the Coromandel Peninsula are affected by projected climate change. My research endeavours not only to comprehend the local relevance of climate change but also identify key factors for adaptive capacity and vulnerability.

RESEARCH APPROACH: Face to face interviews with a range of people living and working on the Coromandel Peninsula will be conducted. These include community members potentially affected by projected changes in climate, professionals from the public and private sector as well as people with an in-depth local environmental knowledge.

PROPOSED FIELDWORK: I am particularly interested in individuals' stories, gut feelings, perceptions as well as views about anticipated climate change impacts, how these influence our communities and what practical steps we can take. I am not seeking official organisational viewpoints. The questions I would like to explore include:

i. **Are we experiencing a change in climate already and how serious is the 'issue' for the Coromandel Peninsula?**
ii. **What are the anticipated impacts and who is most vulnerable?**
iii. **What steps are already being taken to deal with climate change impacts?**
iv. **Who should be doing what and why? What do you see as barriers, opportunities and priorities for future action?**
v. **What insights do local and traditional knowledge provide when it comes to climate change and what can we learn from the past?**

BENEFITS OF THIS RESEARCH: This research will help better understand the vulnerability of Coromandel coastal communities to anticipated climate change impacts. It will provide valuable insights about the practical steps that can and should be taken to strengthen community resilience and adaptive capacity. Academic journal articles will be published and be made available to interviewees.

WHAT DOES PARTICIPATION IN THIS PROJECT INVOLVE?

This research is based on informal interviews and direct observations. Participation is completely voluntary and no compensation is provided for your participation. Interviews will take about one hour. The times will be at your convenience. With your permission, interviews will be sound-recorded. Information obtained from the interviews will be held by the researcher for a minimum of five years, and may be destroyed thereafter.

A summary of the research findings will be sent to all participants. The findings will also be published in academic literature. The findings will be reported so that the

individual identity of participants is strictly confidential, unless participants indicate otherwise.

If you decide to participate, you have the right to:

- Skip any particular question and select only those to which you choose to respond;
- Withdraw from the study;
- Ask questions about the study at any time during participation;
- Provide information on the understanding that your name will not be used unless you give permission to the researcher;
- Be given access to a summary of the project findings when it is concluded; and
- Ask for the sound recording to be turned off at any time during the interview or discussions.

This research has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher is responsible for the ethical conduct of this research. If you have any questions about the conduct of this research that you wish to raise with someone other than the researcher, please contact Professor John O'Neill, Director (Research Ethics), telephone 06 3505249, e-mail humanethics@massey.ac.nz.

I will be conducting interviews in April 2010. Please let me know by telephone or e-mail if you are able to participate in this project; including your preferred meeting date, time, and venue.

Please do not hesitate to contact me if you have any questions.

Paul Schneider

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Consent Form

Adaptation to climate change: A case study of Coastal Communities on the Coromandel Peninsula

By Paul Schneider

PARTICIPANT CONSENT FORM

I understand the aims of this study and have had the details explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to participate in this study under the conditions set out in the Information Sheet.

I agree / do not agree to the interview being sound recorded.

I wish / do not wish to have my recordings returned to me.

Signature ..... **Date** .....

Full Name - printed .....

Location of Interview

.....

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