

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

The role of Land-Use Planning in reducing the Vulnerability of the Bay of Plenty region to Natural Hazards

A thesis presented in partial fulfilment of the requirements for the degree of

Master of Resource and Environmental Planning

at Massey University, Palmerston North, New Zealand.

Stephen Kaye Morris

2013

“A prudent person foresees danger and takes precautions. The simpleton goes blindly on and suffers the consequences.”

- Proverbs 22:3 (New Living Translation)

Abstract

This thesis analyses policies and plans used by local authorities in New Zealand's Bay of Plenty region to determine how well they address vulnerability

to natural hazards. Interviews were conducted with planners, decision-makers and community leaders to find improvements necessary to reduce vulnerability. The Bay of Plenty was chosen as a case study due to the wide range and close proximity of natural hazards the region is exposed to. Following a literature review, policies, plans and interview data was coded, arranged into themes and findings written up. This research found that New Zealand has robust legislation that provide planners, decision-makers and individuals with the foundation and tools to avoid or mitigate hazard risk. However, the lack of use of the term vulnerability needs to be addressed. The 'existing use' rights conundrum presented by the Resource Management Act (1991) presents a challenge to meaningful locational decisions to reduce exposure. The absence of specifically addressing vulnerability in legislation filters down to Bay of Plenty policies and plans; it is difficult to plan for vulnerability reduction if there is no focus on it. The interviews found that access to financial resources and strong social ties are key determinants of vulnerability. However there were also a number of seemingly contradictory sources of vulnerability such as a greater vulnerability of wealthy and urban communities relative to poor or rural communities. This underlines how difficult it is to plan for complex social problems. The obvious implication of this research is that vulnerability is a complex and diverse problem that is not mitigated by placing people into broad categories divorced from the sum of their circumstances.

Key words

Land-use planning, vulnerability, resilience, risk, advocacy planning, Bay of Plenty, New Zealand

Acknowledgements

We live on a beautiful planet of magnificent vistas; however, the same forces that create these splendours we enjoy also pose great risk to our lives. It is my hope that this most minor of works will encourage planners and decision makers in the Bay of Plenty region to more adequately address the vulnerability of its residents.

My thanks go to Professor Bruce Glavovic for his supervision and wisdom along the long journey to the completion of this thesis. I also owe a debt of gratitude to the informants of this study for their generosity in time and candour about the challenges facing the region. To my long-suffering wife and family I thank you for giving me the time to complete this journey.

|

List of abbreviations and acronyms

ALARP	As low as reasonably practical
AP	Annual Plan
APA	American Planning Association
BA	Building Act (2004)
BOP	Bay of Plenty
BOPCEMG	Bay of Plenty Civil Defence Emergency Management Group
BOPRC	Bay of Plenty Regional Council
CDEM	Civil Defence Emergency Management
CDEMA	Civil Defence Emergency Management Act (2002)
CERZ	Current Erosion Risk Zone
CHEPA	Coastal Hazard Erosion Plan Area
CP	City Plan
DIA	Department of Internal Affairs
DP	District Plan
LGA	Local Government Act (2002)
LGOIMA	Local Government Official Information and Meetings Act (1987)
LIM	Land Information Memoranda
LTP	Long Term Plan
MCDEM	Ministry of Civil Defence and Emergency Management
MSD	Ministry of Social Development
NES	National Environmental Standard
NPS	National Policy Statement
NZCPS	New Zealand Coastal Policy Statement
NZPI	New Zealand Planning Institute
ODC	Opotiki District Council
PIA	Planning Institute of Australia
PIM	Project Information Memoranda
RMA	Resource Management Act (1991)
RPS	Regional Policy Statement
TCC	Tauranga City Council
UNISDR	United Nations International Strategy for Disaster Reduction
WBOPDC	Western Bay of Plenty District Council

WINZ Work and Income New Zealand (social security)

List of definitions

Hapu Sub tribe

Hui Meeting

Iwi Tribe

Marae The complex of buildings including a meeting house around a courtyard where formal greetings and discussions take place

Puha A small green leafy vegetable found native to New Zealand that is boiled and eaten

READYNET The emergency management database used by BOPCDEMG

Runanga Tribal council

Whanau Extended family

Whare House

Maori language definitions are based on translation sourced from Moorfield (2013).

Table of contents

Abstract

III

VI

Key words	III
Acknowledgements	IV
List of abbreviations and acronyms	V
List of definitions	VI
Table of contents	VII
List of figures and tables	XI
1.0 Chapter One – Introduction	1
1.1 Introduction	1
1.2 Research question	2
1.3 Thesis outline	2
2.0 Chapter Two – Land-use planning for natural hazards: a review of literature	4
2.1 Introduction	4
2.2 Natural hazards and disaster	5
2.3 Risk	6
2.3.1 Acceptable/tolerable level of risk	8
2.4 Vulnerability	10
2.4.1 Problems defining vulnerability	10
2.4.1.1 Definition of exposure	11
2.4.1.2 Definition of vulnerability	11
2.4.2 Factors determining vulnerability	13
2.5 Resilience	16
2.5.1 Adaptive/coping capacity	18
2.6 Land-use planning for natural hazards	18
2.6.1 Pre-event plans	23
2.6.2 Climate change	24
2.7 Conclusion	26
3.0 Chapter Three – Legislation	27
3.1 Introduction	27
3.2 Legislative/policy framework	27
3.2.1 Resource Management Act (1991)	28
3.2.2 Local Government Act (2002)	31
3.2.3 Civil Defence Emergency Management Act (2002)	31
3.2.4 Building Act (2004)	33
3.2.5 Local Government Official Information and Meetings Act (1987)	33
3.3 Conclusion/findings	34
4.0 Chapter Four – Case study area: The Bay of Plenty region	35
4.1 Introduction	35
4.2 Justification	35
4.3 The region	36
4.3.1 Opotiki District	39
4.3.2 Tauranga City	39
4.4 Conclusion	40
5.0 Chapter Five - Analysis of Regional/District/City policies and plans	41

5.1 Introduction	41
5.2 Data collection & method	41
5.2.1 Codes	44
5.3 Data analysis	45
5.3.1 Plan quality	45
5.3.1.1 BOPCDEM Group Plan	45
5.3.1.2 BOPRC LTP	46
5.3.1.3 BOPRC AP	47
5.3.1.4 ODC LTP	47
5.3.1.5 ODC AP	47
5.3.1.6 TCC LTP	48
5.3.1.7 TCC AP	48
5.3.1.8 Operative RPS	49
5.3.1.9 Proposed RPS	49
5.3.1.10 ODC DP	49
5.3.1.11 TCC operative DP	51
5.3.1.12 TCC proposed CP	51
5.3.1.13 Findings	52
5.3.2 Vulnerability in policies and plans	52
5.3.2.1 Age	54
5.3.2.2 Building and lifeline infrastructure strength	54
5.3.2.3 Financial	55
5.3.2.4 Education and preparation	56
5.3.2.5 Culture	57
5.3.2.6 Exposure	57
5.3.2.7 Resilience	58
5.3.2.8 Findings	58
5.3.3 Advocacy planning approach	59
5.3.3.1 BOPCDEM Group Plan	60
5.3.3.2 Operative RPS	61
5.3.3.3 Proposed RPS	61
5.3.3.4 ODC DP	61
5.3.3.5 TCC operative DP	61
5.3.3.6 BOPRC LTP	62
5.3.3.7 TCC LTP	62
5.3.3.8 Findings	63
5.3.4 Locational planning approach	63
5.3.4.1 Operative RPS	63
5.3.4.2 Proposed RPS	64
5.3.4.3 BOPRC LTP	64
5.3.4.4 ODC DP	64
5.3.4.5 TCC operative DP	65
5.3.4.6 TCC proposed CP	65
5.3.4.7 Findings	66
5.3.5 Design planning approach	66
5.3.5.1 BOPCDEM Group Plan	67
5.3.5.2 BOPRC RPS	67
5.3.5.3 ODC DP	68
5.3.5.4 TCC operative DP	68
5.3.5.5 TCC proposed CP	68
5.3.5.6 BOPRC LTP	69
5.3.5.7 ODC AP	70
5.3.5.8 TCC LTP	70

5.3.5.9 Findings	70
<u>5.4 Conclusion</u>	71
6.0 Chapter Six – Interviews with leaders & decision makers	72
6.1 Introduction	72
6.2 Data collection/method	72
6.2.1 Ethical considerations	74
6.2.2 Informants	75
6.2.3 Codes	76
6.3 Analysis of interviews	79
6.3.1 Exposure sources	79
6.3.1.1 Findings	81
6.3.2 Determinants of vulnerability	81
6.3.2.1 Aileen Lawrie	82
6.3.2.2 Campbell Larkin	84
6.3.2.3 Martin Butler	84
6.3.2.4 Mayor Crosby	85
6.3.2.5 Mayor Forbes	86
6.3.2.6 Mike Bryant	88
6.3.2.7 Roku Mihinui	89
6.3.2.8 Rosalie Crawford	91
6.3.2.9 Terri Eggleton	93
6.3.2.10 Terry Wynyard	94
6.3.2.11 Findings	96
6.3.3 Resilience/capacity to cope top codes	96
6.3.3.1 Accustomed to natural hazards	97
6.3.3.2 Social ties	99
6.3.3.3 Wealth	100
6.3.3.4 Community gardens	101
6.3.3.5 Findings	101
6.3.4 Improvements to policies and plans	102
6.3.4.1 Encouraging personal responsibility	103
6.3.4.2 Take a more risk-based approach to planning	103
6.3.4.3 Further guidance from higher levels of government	104
6.3.4.4 Do not categorise vulnerability	104
6.3.4.5 More flexible planning for individual communities	105
6.3.4.6 Better information before and after an event	107
6.3.4.7 Better identification of hazards	107
6.3.4.8 No build areas, retreat, retire	107
6.3.4.9 Planning cycle too slow	108
6.3.4.10 Assist social change	108
6.3.4.11 Better information collection	108
6.3.4.12 Economically viable building codes	109
6.3.4.13 Policies for low probability/high impact events	109
6.3.4.14 Consistency between territorial authorities	109
6.3.4.15 Distributing a 'first aid kit'	110
6.3.4.16 Maximise Iwi participation	110
6.3.4.17 New physical works	110
6.3.4.18 Understandable policies and plans	110
6.3.4.19 Site lifeline infrastructure out of harm's way	111
6.3.4.20 Transport Access	111
6.3.4.21 Findings	111
<u>6.4 Conclusion</u>	112

7.0 Chapter Seven – Findings and conclusion	114
References	118
Appendices	
Appendix 1: Interview questions	129
Appendix 2: Informant consent form	130

List of figures and tables

Figure 1 BOP CDEM Boundaries	1
Figure 2 Risk Categories	8
Figure 3 BOPCDEM Group Plan quality	45
Figure 4 BOP Long Term/Annual Plan quality	46
Figure 5 BOP RPS and District/City Plan quality	49
Figure 6 Vulnerability determinants in the BOPCDEM Group Plan	53
Figure 7 Determinants of vulnerability in BOP Long Term/Annual Plans	53
Figure 8 Determinants of vulnerability in BOP RPS and District/City Plans	54
Figure 9 Advocacy planning approach in the BOPCDEM Group Plan	60

Figure 10 Advocacy planning approach in RPS and District/City Plans	61
Figure 11 Advocacy planning approach in BOP Long Term Plans	62
Figure 12 Locational approach in BOP plans and policies	63
Figure 13 Design approach in RPS & District/City Plans	67
Figure 14 Design approach in BOP LTPs and APs	69
Figure 15 Exposure in the Bay of Plenty according to informants	81
Figure 16 Determinants of vulnerability according to informants	82
Figure 17 Determinants of resilience according to informants	97
Figure 18 Improvements to policies and plans	102
Table 1 Selected definitions of vulnerability	12
Table 2 a non-exhaustive list of land-use planning measures available to reduce vulnerability to natural hazards	21
Table 3 a summary of the legislative framework and the institutions, and policies for managing natural hazard risks in New Zealand	27
Table 4 Policies and plans collected from BOP local authorities	41
Table 5 Codes used to analyse policies and plans	44
Table 6 Codes used to analyse interviews	76

Chapter One

Introduction

1.1 Introduction

This research focuses on New Zealand's Bay of Plenty Region as shown in [Figure 1](#). It analyses plans and policy statements from the Bay of Plenty Regional Council (BOPRC), and two territorial authorities (Tauranga City Council (TCC), and Opotiki District Council (ODC)) as to how they employ measures to reduce vulnerability against 'best-practice' identified by [a review of literature](#). [This literature review informs the study and frames key informant interviews \(see Creswell, 2009 p.28\)](#) with planners, decision makers and community leaders to uncover ways in which these plans and policies can be improved to reduce vulnerability.

Figure 1 BOP Civil Defence Emergency Management Group Boundaries



Source: ([Bay of Plenty Civil Defence Emergency Management Group Plan](#), 2012, p1).

Vulnerability is a concept with a diverse definitions depending on which academic stream is using it. This thesis defines vulnerability as the degree to which communities and individuals face harm as a result of a natural hazard

interacting with social problems. These human social, economic and political factors are primarily responsible for a hazard event becoming a disaster (Cutter et al., 2000). Within a hazard event people are affected differently because of how these complex human systems interact with the hazard; consequently vulnerability is different from person to person and place to place, and changes over time. Determinants of vulnerability include: exposure, age, financial resources, gender, culture and ethnicity, access to education/preparedness, access to political power, health or disability, building and lifeline infrastructure strength, social ties and resilience (based on the works of Aysan (1993), Buckle (2000), Cannon (1994), Cardona et al. (2012), Cutter (1996), Cutter et al. (2000), Gallopín (2006), Murphy (2007), Paton & Johnston (2001), Wisner (2004), and Wisner et al. (2004)).

The region is exposed to a range of natural hazards including: volcanic hazards, earthquake hazards, weather related hazards, flooding, erosion, landslip, and inundation from the sea. It has a population of over 275,000 (Statistics New Zealand, 2011) economically diverse citizens in locations ranging from 'least deprived to 'most deprived' on the Ministry of Health 'atlas of socioeconomic deprivation in New Zealand' (Ministry of Health, 2008). The combination of exposure and vulnerable people provides the imperative for this study to ask:

1.2 Research Question

What is the role of land-use planning in reducing the vulnerability of the Bay of Plenty region to natural hazards?

1.3 Thesis outline

The literature review occurs near the start of the thesis in chapter two as it informs the study to follow. It defines key terminology such as risk, vulnerability, resilience and land-use planning. The next chapter outlines the legislative and policy framework in New Zealand as it applies to planning for natural hazards. Chapter four explains why the Bay of Plenty was chosen as a case study and provides background on the region and districts that this study will focus on.

The fifth chapter analyses policies and plans to see how well they address vulnerability and provides the method used in this analysis. Chapter six analyses interviews with decision-makers, planners and community leaders and also includes the method used in this analysis. The final chapter sums up the findings of the literature review, the plan/policy analysis and the interview analysis then recommends improvements that should be made to reduce vulnerability.

Chapter Two

Land-use planning for natural hazards: a review of Literature

2.1 Introduction

A well-established body of literature exists on the topic of land-use planning for natural hazards and within [this literature](#) there is debate on the definitions of important terms and concepts. Natural hazards and their interaction with a community give rise to potential disasters. Analysing the risk of such disasters uncovers vulnerabilities and opens the debate as to which areas are suitable for development and what level of risk is acceptable to current and future communities. Broadly, vulnerability to natural hazards is a result of exposure, the interrelationships of socio-economic-political factors such as age/ethnicity/wealth/access to power and [the effectiveness of](#) planning processes (Cardona et al., 2012). [The level of](#) resilience determines a community's ability to withstand, recover and thrive following an event (Buckle, 2000; [United Nations International Strategy for Disaster Reduction](#), 2009; Walker et al., 2004). [Some have argued that resilience is the antonym of vulnerability; others have described it as a constituent](#) component of vulnerability (Gallopín, 2006). [There are diverse bodies of knowledge on both terms.](#)

[Land-use planning](#) offers solutions to reduce vulnerability through traditional locational and design approaches such as retiring at risk land and setting minimum floor levels. But planning also offers an advocacy approach (see Davidoff, 1965) by pressing for social change, championing the cause of the vulnerable and encouraging public involvement in decision-making. It is important to plan now for future events and the effects of climate change not just because it is proactive and cost-effective to incorporate these into current policies and plans ([Ministry for the Environment](#), 2008) but to reduce the vulnerability of generations yet to come.

This chapter is structured as follows:

- Section 2.2 defines the terms natural hazards and disaster
- Section 2.3 defines risk and explains what acceptable/tolerable/intolerable levels of risk mean.
- Section 2.4 explores what vulnerability and exposure mean in a land-use planning context
- Section 2.5 describes the term resilience and its relationship to

adaptive/coping capacity

- Section 2.6 looks at the definitions of land-use planning and approaches to reduce exposure and vulnerability. It looks at the need to plan pre-event and the threat of climate change. This is followed by 2.7, the concluding section.

2.2 Natural hazards and disaster

A natural process that causes property or environmental damage, injury or loss of life is a natural hazard (UNISDR, 2009). A disaster is defined as consisting of serious and widespread “human, material, economic and environmental losses” which are as a result of the combination of exposure to a natural hazard, vulnerability and a lack of capacity to cope UNISDR (2009, p9). Haque & Etkin (2007) argue that a natural hazard in isolation is irrelevant unless the event has the potential to affect people. Likewise Wisner et al. (2004) assert that there can be no disaster without vulnerability. This thesis will focus on hazards as they relate to people and their vulnerability. There is little debate that disasters tend to magnify pre-existing social inequalities and more needs to be done to shrink vulnerability (Freudenburg et al., 2008). Effective land-use planning and enforcement have the potential to reduce vulnerability and prevent a natural hazard becoming a disaster (Wisner et al., 2004). Determining whether people are at risk and by how much are key for deciding where to deploy resources to mitigate the hazard and vulnerability to it.

2.3 Risk

Risk is an important concept in natural hazards planning; the measurement of which provides the basis for land-use decisions around mitigation. As with most terms in scholarship there are a variety of definitions for risk. Wisner et al. (2004) argue that risk must be defined as the combination of the hazard event with the vulnerability of a population. This can be expressed as the equation $R = H \times V$ where (R) is risk and (H) is the hazard and (V) is vulnerability. The UNISDR and the Civil Defence Emergency Management Act (2002) define risk as the likelihood of an event and its negative consequences (UNISDR, 2009;

CDEMA, 2002). This can be expressed as the equation $R = L \times C$ where (L) is the likelihood or probability of a hazard event and (C) is the consequences arising from the event such as injuries, deaths or displacement.

Saunders & Beban (2011) suggests that traditional approaches to natural hazards planning have focused too much on the likelihood of an event rather than the consequences side of the risk equation. She advocates shifting from an 'event likelihood' planning approach to a 'risk-based' approach that assesses development against the consequences of an event first, followed by its likelihood and then T (treatment) being a risk reduction initiative via land-use planning ($R = C \times L - T$). Saunders (2012, p39) further expands the definition of the equation by noting it as: $R = [C (HS + S + Ec + En) \times L] - T$, where the consequences are those on health and safety (HS), society (S), the economy (Ec), and the environment (En). However, it must be acknowledged that there is potential for error when trying to calculate adverse effects on a society. Natural scientists involved in natural hazards planning need to be aware of the complexity of the society they are planning for and the pitfalls of attempting to 'quantify' risk. Rittell & Webber (1973) warn that there are no panaceas for wicked problems. They argue that unintended and even negative outcomes can result from social interventions. It is difficult to remove all risk because of its dynamic nature and limits of human understanding (Handmer, 2008) Furthermore, Sterling (2010) cautions against claiming definitive measurements for unquantifiable uncertainty, ambiguity and ignorance. He advises against reliance on traditional quantification of risk as likelihood and consequence; holding instead that offering plural and conditional advice is more appropriate given the array of quantitative and qualitative scientific methods and is less open to political manipulation, leading to better decisions.

Calculable or incalculable risk can be transferred from high probability, low impact (or low consequence) events to lower probability, higher consequence events through improper risk calculation resulting in higher long-term vulnerability (Etkin, 1999) and risk can accumulate in certain areas due to the interaction of the hazard with the vulnerability of a particular neighbourhood (Cardona et al., 2012). For example, building levees to protect against a 1-50

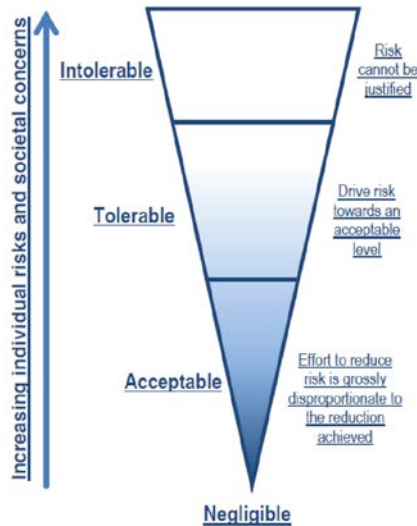
return period flood event may encourage development by making a community feel safer but that community will be more vulnerable when a 1-100 return period flood occurs that exceeds the levee's design. This phenomenon is otherwise known as the "safe development paradox" ([Burby, 2006](#)).

Risk is a part of the on-going story of development; we individually or collectively decide the places in which we will live based on weighing the benefits of occupying a site with the apparent risks. Likewise the benefits of further development in a certain area need to be weighed against the consequences of a disaster caused or contributed to by such development (Freudenburg et al., 2008). In the era of formalised and codified planning we need to articulate how we determine what an acceptable level of risk is in our policies and plans; particularly when population growth pressure results in less suitable land being developed which is at greater risk of disaster (Etkin, 1999). Standards Australia/Standards New Zealand (2005) and Saunders, (2012) divide risk into three broad categories using the ALARP (as low as reasonably practicable) approach:

- 1) Intolerable risk; whatever benefits an activity may bring, the consequences of a hazard are intolerable and risk reduction measures are essential regardless of cost.
- 2) Tolerable risk; where the consequences of an event and the benefits of land-use are weighed. It is a willingness to live with some level of risk.
- 3) Acceptable risk; where the risks are so small as to be negligible and no mitigation is required.

Figure 2 Risk Categories

Formatted: Font: Helvetica



Source: (Bay of Plenty Regional Council proposed Regional Policy Statement, 2012, p84).

2.3.1 Acceptable/tolerable level of risk

Local government in New Zealand has been accused of having a greater disposition to allowing development [in 'at risk' localities](#) rather than rejecting it (Glavovic, 2010); this presents a challenge for precautionary, 'risk-based' planning. UNISDR (2009 p4) defines acceptable risk as "The level of potential losses that a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions." However, defining an acceptable level of risk is difficult and complicated as communities are not homogeneous (Saunders, 2012).

Is it fair or just to require someone to close their business or move off the land that they have lived on for years? Puszkin-Chevlin et al. (2006/7) suggest that the balance between private property rights and reducing risk is no easy matter and that a tension exists between a community's economic need and the protection of life in the long run. Gamper & Turcanu (2009) also assert that simply removing people from harm's way is not without opportunity cost. They

pose the pertinent question: who is to decide what level of protection is appropriate and how much are they willing to pay? Burby (1998) and Tonkin & Taylor (2006) highlight a potential answer to this tension by advocating that land-use management needs to be assessed by the social and economic benefits of land-use against the frequency of a potential hazard. Lindell and Perry, (1992) as cited in Murphy (2007) suggest that those affected by hazard policies should help in the development of those policies. Tonkin & Taylor (2006) and Saunders & Beban (2011) also put forward that levels of risk should be determined through community engagement to determine what they believe is an acceptable level of risk. Effective risk communication not only involves informing residents of the risk (top down) but engaging with them about the problem and possible local solutions that decision makers may not have considered (bottom up); the public's view should not be seen as automatically inferior to expert opinion (Gordon et al., 2011) as participation can add knowledge that is complementary to that of experts (Gordon et al., 2011; Cardona et al., 2012).

Although people are generally competent at personal risk analysis, they are less so for low probability high impact events that they may never have come across in their lifetime (Etkin, 1999). When planners focus on shorter return period events, they risk ignoring future higher consequence events (Etkin, 1999). Preparation for and education about such events is needed to reduce vulnerability.

2.4 Vulnerability

There are three general themes in vulnerability studies: exposure (or physical vulnerability), social vulnerability and place vulnerability. Exposure focuses on the source of a hazard, its frequency and potential to intersect with the human population. Social vulnerability focuses on coping with a hazard event and mitigating the social causes of it. Place vulnerability combines the physical risk and social elements within a geographical area (Cutter, 1996; Weichselgartner,

2001). Whilst the term vulnerability may seem simple to a layperson, it is a concept that has been used with various and evolving meanings by various specialists with notable differences between natural scientists, political scientists, economists, planners, and emergency managers.

2.4.1 Problems Defining Vulnerability

A broad definition of vulnerability is the potential for loss. However, there are a number of divergent opinions on the detail as the term is used in different fields, each with their own conceptualisation of its meaning depending on their respective epistemological traditions. Whose loss do we define and what? Is it individual or social or biophysical vulnerability? Is it the vulnerability of a building or structure or the vulnerability that arises from the interaction of all these different vulnerabilities (Cutter, 1996; Weichselgartner, 2001)? Is vulnerability the antonym of resilience or is resilience a constituent part of vulnerability? These questions have occupied scholarship for decades and within such a wide debate there is the potential for the term 'vulnerability' to diminish in meaning. Wisner et al. (2004) express concern that the term is being used indiscriminately; that it risks becoming a catch-all term with its significance reduced as has occurred with the widely used term 'sustainability.'

Fuchs et al. (2012) broadly identify the different conceptions [of vulnerability as framed by](#) the natural and social sciences. They argue that natural scientists tend to see vulnerability as the likelihood of an event and its effects on the built environment; that is focusing on the susceptibility of the physical world to natural processes. Social scientists tend to view vulnerability as the culmination of socio-economic factors that affect a community's or an individual's capacity to cope with an event. Fuchs et al. (2012) add that from this perspective vulnerability does not change according to the magnitude of an event; rather that exposure changes and this is a key determinant of the level of risk. A fixation exclusively on vulnerability either as a structural or a social concoction is insufficient to holistically analyse vulnerability, consideration must be given to both (Fuchs et al., 2012); it must include the components that make up vulnerability such as gender, wealth, social ties and exposure.

2.4.1.1 Definition of exposure

[The](#) UNISDR (2009 p15) defines exposure as when people, their property or systems are present in a hazard zone and have the potential to suffer loss. Most definitions hold that exposure (which is also referred to as physical vulnerability) is a component of vulnerability (Gallopín, 2006). This thesis defines exposure as being a constituent part of vulnerability that is at the physical confluence of a potential natural hazard (NH) and a population (P) or $E = NH \times P$. Individuals and communities may be (although not necessarily; as we shall explore) more vulnerable when they are exposed to an area that is susceptible to the physical effects of a natural hazard (Cutter, 1996; Cutter et al., 2000; White & Haas, 1975 as cited in Cutter et al., 2000; Weichselgartner; 2001). Identifying the range of hazards that have the potential to affect a community is key to determining the level of exposure.

2.4.1.2 Definition of vulnerability

Exposure does not necessarily determine vulnerability (Cardona et al., 2012) as it does not always intersect with social aspects of vulnerability (Cutter et al., 2000); a group could be exposed to a hazard but still have the capacity to resist its impacts. A large-scale physical hazard may occur in a high value area where the majority of residents have insurance [and](#) consequently the economic costs will be high, but the social costs may be lower as residents are able to rebuild and get on with their lives quicker. Conversely if a moderate event occurs in a comparatively poor area, vulnerability may be higher due to less access to financial resources to recover. That being said whilst exposure alone might not determine vulnerability, an exposure is still required as the trigger to activate vulnerability to natural hazards.

There are a number of definitions of vulnerability that vary according to the field of study. It can mean the susceptibility of a structure or community or system (or the combination of these) to harm from a hazard.

Table 1 Selected definitions of vulnerability.

--

<u>Vulnerability - the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR, 2009 p30).</u>
<u>Vulnerability is a characteristic of individuals and groups of people who inhabit a given natural, social and economic space, within which they are differentiated according to their varying position in society into more or less vulnerable individuals and groups. It is a complex characteristic produced by a combination of factors derived especially (but not entirely) from class, gender and ethnicity (Cannon 1994, p19).</u>
<u>By vulnerability we mean the condition of a given area with respect to hazard, exposure, preparedness, prevention, and response characteristics to cope with specific natural hazards. It is a measure of capability of this set of elements to withstand events of a certain physical character (Weichselgartner & Bertens, 2000).</u>
<u>The characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Wisner et al., 2004, p11).</u>
<u>Vulnerability is the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/stressor (Turner et al., 2003).</u>

Unless otherwise stated, this thesis focuses on vulnerability as social vulnerability or the degree to which communities and individuals face harm as a result of a natural hazard interacting with social problems. A disaster is determined by the vulnerability that is generated through human systems; it is now widely accepted that human social, economic and political factors are primarily responsible for a hazard event becoming a disaster (Cutter et al., 2000). Within a hazard event people are affected differently because of how complex human systems interact with the hazard; consequently vulnerability is different from person to person and place to place, and changes over time. The forces that create disparities in wealth, power and access to resources are the same that make people more or less vulnerable (Cannon, 1994).

2.4.2 Factors determining vulnerability

Based on the work of Aysan (1993), Buckle (2000), Cannon (1994), Cardona et al. (2012), Cutter (1996), Cutter et al. (2000), Gallopín (2006), Murphy (2007), Paton & Johnston (2001), Wisner (2004), and Wisner et al. (2004), vulnerability is influenced by (in no particular order):

1. Exposure
2. Age
3. Financial resources
4. Gender
5. Culture and ethnicity
6. Access to education/preparedness
7. Access to political power
8. Health or disability
9. Building and lifeline infrastructure strength
10. Social ties
11. Resilience

Vulnerability to a hazard is first dependent on being exposed to that hazard. The opposite argument as outlined in Gallopín (2006) suggests that one can be vulnerable without exposure; that a person with low immunological defences is vulnerable to an infectious disease whether or not the person is exposed to it. One might be 'vulnerable' to the smallpox virus; however, this author does not intend to be vaccinated, as the virus is no longer present outside the laboratory. One could argue that we are all vulnerable to tsunamis; however, it is not credible to assert that Nepalese living in the Himalayas were as vulnerable to the 2004 Indian Ocean Tsunami as their counterparts living on the east coast of Sri Lanka; the difference between the two is exposure.

Individuals or groups are more or less vulnerable depending on socio-economic factors. Both the old and young can be vulnerable when reliant on others for care or transportation or a lack of physical strength that may be

required before, during and after an event. Having easy access to financial resources reduces vulnerability and vice versa following an event because it is easier to move to other accommodation, buy provisions and rebuild. Colten (2006) states that during the 2005 hurricane 'Katrina' poor residents were less likely to have access to private motor vehicles than the wealthy and thus were more vulnerable; the poor were less likely to evacuate out of New Orleans before the event and those that were relocated by emergency agencies found it more difficult to return after the event. Women may be more vulnerable than men due to pregnancy or being unable to call on as much physical strength during and immediately after an event. Those with limited skills in the predominant language of a society are more vulnerable as they may not be able to comprehend preparedness or warning communications. Indigenous peoples are more likely to suffer poorer socioeconomic conditions such as lower education/health levels and higher unemployment/poverty levels thereby increasing their vulnerability. Those with greater access to education about what to do and where to go during a disaster are less vulnerable than those who have not been educated on how to prepare. Communities that have less access to political power are more vulnerable because they may not be as successful in lobbying decision-makers to mitigate their exposure and vulnerability. The sick or those suffering a disability are more vulnerable due to the consequences of disruptions in medical care, transport difficulties or even difficulties communicating with the hearing, sight or the mentally impaired. Communities that have emergency services and lifeline infrastructure such as sanitation, telecommunications, and electricity located outside of hazard zones are less vulnerable as are those with key road, sea and air links out of harm's way.

Communities that have strong social ties through organisations such as sports, service groups and marae are less vulnerable than communities that are less connected. This is expressed in a number of forms such as groups with an existing membership able to mobilise in response to an event or those with connections to each other able to look after each other's physical and mental well being. Yamamura (2010) in a case study of Japanese disasters found that social capital prevented disasters, reduced their impact when they occurred and

was the most significant determinant in reducing damage for a small scale disaster (less than 100 casualties) with financial means only becoming significant in large scale disasters. Intriguingly, Cardona et al. (2012) argue that the existence of social groups could actually increase vulnerability, but only for those who are excluded from such groups.

It can be argued that resilience (a term that is discussed in the next section) is an eleventh determinant of vulnerability. Klein et al. (2003) debate whether resilience is simply the positive 'flip side' of vulnerability or whether it is one of its constituent parts. The danger of the former argument is that it can lead to 'circular reasoning' with a system being vulnerable if it is not resilient and vice versa (Klein et al., 2003). It should be noted that it is not just the differences between certain categories such as poor/wealthy or women/men but the differences within these categories that determine vulnerability (Cardona et al., 2012). For example, a woman may be more vulnerable than a man if she is both poor and caring for young children and has limited social ties.

Simplistically speaking, positive changes to any of these before mentioned influences should reduce vulnerability. However, vulnerability is a 'wicked' planning problem or complex social problem such as described in Rittel & Webber (1973) and planners need to keep an open mind about root causes and avoid the trap of assuming that all the determinants of vulnerability can be measured. Actions to mitigate the vulnerability of one group of people may increase the vulnerability of another group; opening floodgates to save a town by flooding a rural community is an example that Cardona et al. (2012) uses. Seemingly contradictory forces generate different levels of vulnerability. Age can both contribute to and reduce vulnerability. For example, an older couple may have access to a greater level of financial resources due to savings or greater political power due to time forged political relationships. Poverty does not necessarily result in vulnerability (Cannon, 1994); those able to afford beachfront real estate in Papamoa are arguably more exposed to tsunami than those living in rented accommodation hundreds of metres from the beach. Ethnic and cultural differences can even reduce vulnerability due to the social ties that often exist in minority groups. In 1886 supposedly more educated,

wealthier and technologically advanced Europeans took refuge in Maori buildings after the roof of a hotel collapsed during the Tarawera eruption (McSaveney et al., 2009).

Understanding and working to increase the resilience and adaptive capacity components of vulnerability by enabling communities to withstand, recover and then thrive through a hazard event is vitally important if land-use planning is to reduce vulnerability to natural hazards.

2.5 Resilience

The terms vulnerability, resilience and adaptive capacity all relate to responses to the disturbance of a social-ecological system; they are sometimes used interchangeably and sometimes used as polar opposites depending on the epistemological tradition of the scholar using them (Gallopín, 2006; [Miller et al., 2010; Turner, 2010](#)). [The development of vulnerability as a concept has largely come from social sciences. Resilience, however, is a term predominantly developed by the natural sciences \(Miller et al., 2010; Turner, 2010\).](#) Resilience is characterised as the capacity of a system or community to prevent a loss from occurring, enabling it to absorb and recover from the effects of a natural hazard while preserving its functions and structures (Buckle, 2000; UNISDR, 2009; Walker et al., 2004). After absorbing the effects of an event, a hallmark of resilience is successfully learning and adapting from the hazard experience to enable a better outcome in the future (Berkes, 2007). Folke, et al. (2003 p355) identify four key factors that build resilience:

1. Learning to live with change and uncertainty
2. Nurturing diversity in its various forms (including enhancing social memory of past events and nurturing the ecological memory of the ecosystem to regenerate itself)
3. Combining different types of knowledge for learning
4. Creating opportunity for self-organisation and cross-scale linkages.

A vibrant social infrastructure and economic life are important elements supporting resilience (Buckle, 2000) as are communities that exhibit examples of 'bottom up' decision making with input from the community into policy making (Cardona et al., 2012).

Turner (2010, p573) views vulnerability and resilience as different but complimentary terms: "the former seeks to identify the weakest parts (those most affected negatively) of coupled systems to disturbances, and the latter, the systemic characteristics that make systems more robust to disturbances." It has been argued that resilience is not simply the positive flipside of vulnerability but a constituent part of what determines vulnerability (Klein et al., 2003; Gallopín, 2006). Gallopín (2006) asserts that resilience is related to capacity of response segment of vulnerability thereby making it an unsuitable antonym of vulnerability. He argues that resilience does not include exposure (as vulnerability does) but is rather the reaction to it. If a suitable antonym of vulnerability is required Gallopín (2006) suggests that robustness may be more correct than resilience. Despite the differences in definitions both Turner (2010) and Miller et al. (2010) point to recent efforts to integrate resilience and vulnerability research.

2.5.1 Adaptive/coping capacity

The term resilience has broadly the same meaning in disaster risk management literature as coping or adaptive capacity has in climate change literature (Cardona et al., 2012). The definition of coping capacity in UNISDR (2009) is similar to that of resilience. Klein et al. (2003) also notes the similarity in terms; that adaptive capacity may determine resilience just as resilience can be framed as a constituent part of vulnerability. Cardona et al. (2012) also suggest that adaptive capacity is similar to resilience in its relationship with vulnerability, agreeing that a lack of capacity is one of the constituent parts of vulnerability. As capacity increases, vulnerability is reduced. The definitions of adaptive and coping capacity used in this thesis are the same as resilience.

2.6 Land-use planning for natural hazards

Having considered the terms disaster, risk, vulnerability and resilience we now look to land-use planning which offers a number of solutions to reduce vulnerability. The UNISDR (2009, p19) defines land use planning as:

The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses.

The American Planning Association goes further holding in their definition that planning is an activity conducted for the welfare of both present and future society by creating more equitable, healthful and efficient places; that good planning gives communities choices about how and where to live while balancing innovative change with protection of the environment (APA, 2012). The Planning Institute of Australia in their definition of urban design also highlight planning's role in creating economically successful, socially equitable and environmentally sustainable places (PIA, 2012). The emphasis on social equitability and welfare are hallmarks of the 'advocacy planning' paradigm. Paul Davidoff, one of the 'fathers' of advocacy planning (Heskin, 1980) argued that planners should be responsible for more than just the physical problems of land-use and structures; that they must not remain neutral but help solve social problems and engage in the political sphere (Davidoff, 1965). Principle 1(f) of the American Institute of Certified Planners Code of Ethics states:

We shall seek social justice by working to expand choice and opportunity for all persons, recognizing a special responsibility to plan for the needs of the disadvantaged and to promote racial and economic integration. We shall urge the alteration of policies, institutions, and decisions that oppose such needs (APA, [2009](#)).

This principle was inherited directly from Davidoff's directorship of the institute's predecessor, the American Institute of Planners (Checkoway, 1994; Stegman, 1985).

In contrast, the New Zealand Planning Institute definition of planning is less visionary and more process orientated without mention of social equability. It defines planning as a process from local through to national level focusing on land, air, water, the modified natural and physical environment as well as social, economic and cultural development (NZPI, 2012). The NZPI Code of Ethics merely directs professional planners to be aware of the "interrelatedness of decisions and the environment, social, cultural and economic consequences of planning actions" (NZPI, 2012). Given the influences on vulnerability stemming from socio-economic-political factors a case can be made that New Zealand planners should not be neutral 'experts' but actively involved in the social, economic and political spheres; advocating for the vulnerable and seeking to address the root causes that make people vulnerable. Cardona et al. (2012) assert that there is strong agreement and evidence that vulnerability is largely the result of poor land-use planning decisions. They find that effective local and national planning regulations contribute to resilience as do an urbanised, integrated economy with attention to human rights.

Making sure that people are not exposed to a natural hazard as far as practicable through effective land-use planning is a key to reducing disaster risk (Burby, 1998; Glavovic, et al., 2010; Mileti, 1999). Notwithstanding the political realities of different interests and agendas, when undertaken rationally, equitably, and sustainably, land-use planning is the most effective approach to mitigate the effects of a natural hazard (Mileti, 1999). Effective land-use planning decisions offer present and future generations reduced vulnerability through the use of measures such as managed retreat, restricting development and intensification as well as informing the public about hazards that could affect them. Table 2 lists some generally agreed upon common land-use measures that planners and decision makers have available to potentially reduce vulnerability.

Table 2 a non-exhaustive list of land-use planning measures available to reduce vulnerability to natural hazards

Land-use planning measures to potentially reduce vulnerability		
Locational approach:	Design approach:	Advocacy approach:
<ul style="list-style-type: none"> • Identification of land vulnerable to distinct natural hazards and the frequency of return of the hazard as well as damage potential. • No-build areas • Avoiding further intensification in at-risk areas. • Channelling growth by locating infrastructure outside hazard areas. • Managed retreat from areas that will become more vulnerable due to climate change. • Retirement of at-risk land (such as directly above a fault line). 	<ul style="list-style-type: none"> • Protecting and enhancing ecological infrastructure. • Physical mitigation works such as flood stop banks and strengthening buildings* • Minimum floor levels in areas prone to flooding. • Minimum earthquake strength 	<ul style="list-style-type: none"> • Informing the community about at risk areas. • Encourage participation in decision-making • Encouraging social and ecological infrastructure. • Advocating for social change that reduces vulnerability

* Physical mitigation can actually increase risk

Sources: (drawing on the work of Burby, 1998; Cannon, 1994; Cutter et al., 2000; Glavovic et al., 2010; O'Brian, et al., 2006; Puszkin-Chevlin et al., 2006/7; Tonkin & Taylor, 2006).

The design approach using structural hazard mitigation works such as levees, stop banks, and sea walls may make a community feel safer but can result in increased development and therefore risk. All structural works have their limits; when the force of a hazard exceeds the mitigation measure's design an even greater disaster can result from this 'safe development paradox' (Burby, 1998;

[Burby, 2006](#); Glavovic et al., 2010). Freudenburg et al. (2008) cite the perverse contradiction of what has occurred in New Orleans with the 2005 hurricane 'Katrina' compared with previous hurricanes: the more that is spent on physical mitigation works, the higher the cost of the next disaster. The locational and advocate approaches to land-use planning offer a safer and longer-term option for reducing risk.

Intensifying land-use through development and subdivision should be avoided in disaster prone areas and managed retreat should be considered for those worst affected (Tonkin & Taylor, 2006; Saunders et al., 2011). When considering future development in green-field sites, those areas that are the least exposed to future disaster should be utilised first. Essential lifeline infrastructure such as electricity, water and sanitation should be located as much as practicable outside of a potential hazard zone as should emergency services such as hospitals, police and fire stations (Tonkin & Taylor, 2006; Saunders et al., 2011).

Land-use planning has the benefit of being able to mitigate more than one hazard at a time. Protecting sand dunes and their function as an ecological barrier can mitigate erosion, storms, tsunamis and the creeping threat of sea level rise due to climate change. Puszkin-Chevin et al. (2006/7) suggest that such land remaining in its natural state is more capable of withstanding the destructive forces of natural hazards, and obviously when left vacant, poses little asset risk. In the same way, Glavovic (2008 p.131) advances that hazard resilient coastal communities require healthy coastal ecosystems for protection against storms and that this essential "ecological infrastructure" can also [contribute to](#) the economic wellbeing of a community. Godschalk et al. (1999) also argue that the imperatives to protect dunes are not just environmental, but also economic as they act as seawalls protecting people and their property. Protection of or restrictions on land available for development could be argued as an economically costly proposition that hinders livelihoods. Such a view, however, should consider the 'full-cost' approach to accounting the effects of a potential disaster that includes the potential cost of a disaster itself (Gaddis et al., 2007).

Consideration needs to be given to planning for low frequency and high impact events such as tsunami specifically through land-use measures (Glavovic, et al., 2010; Tonkin & Taylor, 2006). The Environment Court in *Save the Bay v Canterbury Regional Council* (C6/2001) stated that 10% or less of natural hazards cause 90% of damage to the environment; councils need to recognise this reality when preparing their plans (Saunders et al., 2011). Although infrequent, large scale disasters like tsunami can cause major loss of life and destruction of entire communities. In the case of the 2011 earthquake and tsunami in Japan 15,879 were accounted for as killed and 2,712 were missing as of 26/12/12 ([National Police Agency of Japan](#), 2012). This death toll could have been lower had historic warnings about building closer to the shore inscribed on stone markers been heeded (Ozawa, 2011).

An injustice exists when developers derive economic benefit and extract profits from creating development in at risk areas and the public sector, households, businesses and communities bear the cost and consequences of such development when a disaster occurs (Freudenburg et al., 2008; Handmer, 2008). The aged, poor, less educated, those with health issues, and other vulnerable citizens fare less well than others. Planners need to address the root causes of vulnerability such as equitability, education, social connectedness, and access to political power and advocate for the vulnerable without neglecting the responsibility to direct development away from at risk areas. Local government in New Zealand [has been predisposed](#) to allowing development [in at risk localities, and relying on mitigation measures](#), rather than rejecting it (Glavovic, 2010); ensuring that those who benefit from development take responsibility for risks and not transfer it to others is a challenge for successful land-use planning.

2.6.1 Pre-event planning

To reduce the potential of a future disaster, pre-event planning is needed to reduce the vulnerability of the current and future community. Such plans provide the opportunity to recognise and avoid hazards in areas yet to be developed,

reduce the risk in already developed areas and lay the foundation for a more effective recovery (Becker et al., 2008). In addition, plans need to tackle the social causes of vulnerability such as access to resources, political power, and health before an event occurs. Becker et al. (2008) assert that planning proactively before rather than reacting to an event reduces the impact of the hazard and gives the community the opportunity to have their views considered resulting in more effective decision-making. They also suggest that writing recovery plans before an event takes place means that recovery can get underway without delays to consider land-use changes; that resource consents can be gained in advance for activities such as the disposal of hazardous materials. Pre-event plans can include provision for post-hazard enhancement projects to improve amenity, land-use, sustainability, and minimise future hazard risk (Becker et al., 2008). Proactive planning needs to be underway now not just for hazards that have been observed in the past but also for the impacts of future climate change to reduce the vulnerability of future generations.

2.6.2 Climate change

The contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that climate change has been observed and is a reality (Solomon et al., 2007). The threat of climate change and associated impacts such as sea level rise and changing weather means that local authorities will need to make practical long term changes in their land-use planning as they are involved in the provisions of services as well as owning assets and infrastructure that might be at risk from future climate change related events (England, 2006; Glavovic et al., 2010; Hunter et al., 2010; MfE, 2008) Such adaption is more cost effective if it is integrated now into current policies and plans rather than leaving adaptive measures until events occur (MfE, 2008). Structural works and council policies should take into account any other hazards that can be guarded against at the same time which may include the managed retreat from some areas that will become more vulnerable (O'Brian, et al. 2006), such as coastal and flood plain areas.

Shaw et al. (2007) even suggest that adapting to climate change is a

fundamental part of achieving the goals of sustainable development. Laukkonen et al. (2009, p290) state that:

Sustainable development requires meeting today's needs without compromising the ability for future generations to cope with climate change or other environmental burdens.

Hallegatte & Corfee-Morlot (2010) assert that more adaption to climate change is needed at the local government level. Adaption to climate change should not be viewed by local authorities as an alien concept as adaption to existing natural hazards is already common place (Hunter et al., 2010) and despite the uncertainty about the effects of climate change in type and magnitude, councils can and do still make use of predictions and plan for the future as "all local government business takes place in a framework of uncertainty" (MfE, 2008, p86).

A challenge to successful planning for natural hazards arising from or exacerbated by climate change lies in making public funding available for a threat that is not yet clear and exists at some point in the future (Laukkonen et al, 2009). Hunter et al. (2010, p130) argues that councillor support is thus essential and that skill is needed to negotiate the political risk. They list three other challenges as being: access to reliable and relevant data, translating this picture from national to regional and local levels and finally assessing how climate change will impact different councils in different ways. Local authorities need to be aware of conflicting adaption measures too (Shaw et al., 2007) such as the benefits of urban density for mass transit versus spreading people out to reduce the risk per square kilometre.

As the climate changes so does the threat of disaster. Beginning the process of adapting to climate change now through policies and plans at a national level, and at both a regional and local level in the Bay of Plenty will enable our descendants to be both more resilient and less vulnerable.

2.7 Conclusion

The intersection of natural hazards with the complexities of a society encompassing varying degrees of vulnerability creates the potential for a disaster and therefore gives rise to the need for considered land-use planning; which is key to reducing risk (Burby, 1998; Glavovic et al., 2010; Mileti, 1999). An acceptable level of risk should be determined by the community when they have access to all the information they require to do so. However, there are limits to quantifying risk; it is better not to claim definitive measurements for what is uncertain and ambiguous and instead offer plural and conditional advice on risk (Sterling, 2010).

If a community is exposed to particular hazard(s), vulnerability is best mitigated through targeting social causes rather than treating exposure alone. Vulnerability is determined not by its individual factors such as health, wealth and social ties in isolation but through the combination and interaction of these together with a hazard. Land-use planning offers the opportunity to reduce this vulnerability through locational and design approaches but more significantly through the advocacy approach. Instead of being 'neutral' experts, planners need to advocate change, build capacity within the community and confront the socio-economic-political factors that generate vulnerability. Planning needs to be undertaken not just for frequent events but also for those that are low probability and high impact such as tsunamis and the creeping threat of climate change to reduce the vulnerability of generations yet to come. These findings form the basis for the analysis of policies and plans and interviews to follow in chapters five and six. In the next chapter we will explore the established legislative and policy framework in New Zealand dealing with land-use and natural hazards issues.

Chapter Three

Legislation

3.1 Introduction

In New Zealand land-use planning for the avoidance or mitigation of natural hazards occurs in multiple layers at the national, regional, city and district level. Much responsibility has been devolved from central government to local government through the Resource Management Act (1991) (RMA), Local Government Act (2002) (LGA), Civil Defence and Emergency Management Act (2002) (CDEMA), and the Building Act (2004) (Glavovic et al., 2010). This chapter outlines the main sections of these pieces of legislation and the Local Government Official Information and Meetings Act (1987) (LGOIMA) as they relate to natural hazards.

3.2 Legislative/policy framework

A number of institutions, policies and mechanisms sit under the RMA, LGA, CDEMA, and the Building Act for managing hazard risks; these are summarised in table 3 below.

Table 3 a summary of the legislative framework and the institutions, and policies for managing natural hazard risks in New Zealand

Legislation	Institutions, policies for managing hazard risks
Resource Management Act (1991) - Local Authorities are required to avoid or mitigate natural hazards	Ministry for the Environment / <u>Department of Conservation</u> <i>Mechanisms: National Policy Statements, National Environmental Standards.</i> <u>Regional Councils</u> <i>Mechanisms: Regional Policy Statements, Regional Plans, Processing resource consent applications.</i> <u>Territorial Authorities</u> <i>Mechanisms: District Plans, Processing resource consent applications, Exceptions for emergencies.</i>
Local Government Act (2002) - Core service of local authorities is	<u>Local Authorities</u> <i>Mechanisms: LTPs, Bylaws,</i>

to avoid or mitigate natural hazards	
Civil Defence Emergency Management Act (2002) - Local authorities are to work together for the sustainable management of hazards across the areas of reduction, readiness, response and recovery.	<u>Ministry of Civil Defence/Emergency Management / Department of Internal Affairs</u> <i>Mechanisms: National CDEM Strategy, National CDEM Plans (CDEM Group input)</i> <u>Local Authorities</u> <i>CDEM Group Plans, Maintain organisational structure, Recruit and train volunteers, Conduct training exercises, Provide warning systems, Provide communications, equipment, accommodation, Participate in MCDEM Strategy/Plans</i>
Building Act (2004) - Territorial authorities can restrict building on hazard prone land	<u>Department of Building & Housing</u> <i>Mechanisms: Building Code</i> <u>Territorial Authorities</u> <i>Project Information Memoranda (PIM), policies and controls on Earthquake prone buildings, Building consents and conditions on consents</i>
Local Government Official Information and Meetings Act (1987) - Local authorities are to make available information about land potentially affected by natural hazards	<u>Territorial Authorities</u> <i>Mechanisms: Land Information Memoranda (LIM)</i>

Sources: (Glavovic et al., 2010; Lee 2010; Tonkin & Taylor 2006)

3.2.1 Resource Management Act (1991)

Sections 34-58 of the RMA provide central government with the ability to guide local authorities through National Environmental Standards (NES) and National Policy Statements (NPS). NES could potentially be used to restrict the use of land, subdivision, and activities in the coastal marine area in order to lessen the impacts of a natural hazard (Tonkin & Taylor, 2006). A NES could be used to provide nationally consistent standards such as for tsunami early warning mechanisms. NPS are written to direct local authorities on matters that are nationally significant (s45); a council's plans must give effect to a NPS (s55(2)). A NPS on natural hazards could be prepared under s45 of the RMA because natural hazards have the potential to affect more than one region at a time

(Tonkin & Taylor, 2006) or to affect a place of national significance such as port or transport link. Section 57 of the RMA outlines the requirement that a New Zealand Coastal Policy Statement (NZCPS) be prepared by the Minister of Conservation. The NZCPS (2010) ([Department of Conservation, 2010](#)) requires local authorities to identify areas in the coastal environment that could be affected by natural hazards; reduce the effects of such hazards by avoiding development in affected areas and encouraging redevelopment away from the hazard. Under the NZCPS, lifeline infrastructure should be located away from a hazard area; physical mitigation works should be discouraged and natural defences such as dunes and vegetation should be protected or restored. Specific consideration must be given to the effects of tsunamis and how to mitigate them. [Under section 7 of the RMA, decision-makers at all levels of government must have regard to climate change effects.](#)

Part of the purpose of the RMA under section 5 is the sustainable management of resources in a way that provides for communities well-being and safety. Because natural hazards put these imperatives at risk, natural hazard management is required to achieve the purpose of the act (Tonkin & Taylor, 2006). Section 30 of the RMA states that regional councils are responsible for controlling the “use of land” for the “avoidance or mitigation of natural hazards and under s31 of the same act territorial authorities are responsible for the “effects of the use” of land for the “avoidance or mitigation of natural hazards.” The RMA does not prescribe how local authorities are to avoid or mitigate hazard risk and communities are free to tailor plans to their own circumstances.

Each regional council is required to produce a Regional Policy Statement (RPS) that sets out which local authority is responsible in whole or part for controlling land-use for the avoidance or mitigation of natural hazards (s62(i)). The Bay of Plenty RPS states that BOPRC maintains responsibility over setting objectives, policies and methods regarding natural hazards but delegates its responsibility to territorial authorities for managing development in natural hazard areas given that they also manage the effects of the use of land. However, BOPRC retains responsibility for the control of the use of land for the

avoidance or mitigation of flood risk due to their expertise in this regard and citing the need for consistency across the region ([Bay of Plenty Regional Council Regional Policy Statement](#), 2010). At the district level, each territorial authority must produce district plans to carry out their functions (which include those in regards to natural hazards under s31) and must give effect to the RPS. Both regional councils and territorial authorities have land-use rules at their disposal in their plans to reduce risk and vulnerability associated with natural hazards (Tonkin & Taylor, 2006). Such rules include: minimum floor levels, setbacks and the use of esplanade reserves in areas at risk of flood or tsunami; clustering activities including lifeline utilities in areas of low risk or large lot development in areas of increased risk (Tonkin & Taylor, 2006).

The resource consent process provides councils with the ability to require a developer to mitigate natural hazard effects if that council retains discretion over the matter in regional/district rules (Tonkin & Taylor, 2006). Examples of consent conditions could include: holding a bond for mitigation works to be completed, structural/non-structural measures to mitigate erosion, create no build areas, or minimum separation distances (Tonkin & Taylor, 2006). For example, [Western Bay of Plenty District Council](#) retains discretion over subdivision on areas of Minden hill where erosion is likely to occur; requiring satisfaction that any development will not result in slips damaging structures ([Western Bay of Plenty District Council](#), 2002 pp12-6,7). Despite the act being silent on the term vulnerability, it provides decision-makers from national through to local level with mechanisms to reduce the former and increase the latter.

3.2.2 Local Government Act (2002)

Under Schedule 1 of the RMA, through the preparation of plans and policy statements, local authorities must consult with [the minister for the environment and](#) affected: [other](#) ministers, iwi, other local authorities and also the affected public in accordance with s82 of the [Local Government Act](#). This section requires local authorities to give the opportunity to those who are or potentially

are affected by a decision to express their views with all the pertinent information to help them do so; councils are then to consider such views with an open mind (including any views regarding natural hazards). Section 11A(d) of the LGA states that the “avoidance or mitigation of natural hazards” is a “core service” of local authorities. They are required to produce long term plans (LTPs) (which include natural hazard risk management) that go out for public consultation and are supplemented by annual plans (s93). Regional councils also have the power to make bylaws for flood protection and control works under this act (s149). Again the term vulnerability is absent from this act but the legislation provides tools such as the power to make bylaws that can be used to reduce vulnerability.

3.2.3 Civil Defence Emergency Management Act (2002)

The purpose of the Civil Defence Emergency Management Act is outlined under section 3. It is to promote the sustainable management of hazards for the well-being and safety of the community; this echoes the purpose of the RMA. The CDEMA is intended to enable communities to achieve acceptable levels of risk through (but not limited to) identifying risks, consulting with the community about them, and managing these risks in a cost-effective way (s3(b)). The CDEMA provides for integrated national and local emergency planning; local authorities are required to co-ordinate civil defence activities together across the areas of reduction, readiness, response and recovery (s3(d)). Local planning is required to be aligned with the national CDEM strategy and plan (s3(e)). This act provides mayors with the ability to declare a state of local emergency (s25(5)) and the Minister of CDEM with the ability to declare a national state of emergency (s66). The emergency powers under the CDEMA provide CDEM groups and controllers with a range of powers including: providing rescue, evacuation, restricting public access, and requisition of equipment (part 5 of the act).

On a national level, the Minister of CDEM creates the CDEM Strategy (Department of Internal Affairs, 2008) that CDEM Groups on a regional level must act consistently with. The strategy’s vision is a “resilient New Zealand –

communities understanding and managing their hazards” (DIA, 2008, p6); it contains the goals of increased community awareness and participation, reducing hazard risk, enhancing capability to manage emergencies, and enhancing capability to recover. The national CDEM plan addresses these first two goals of the strategy and gives practical effect to goals three and four (Ministry of Civil Defence & Emergency Management, 2005). The objectives of the CDEM plan are to provide effective management of national emergencies and recovery as well as national support of local emergencies using a coordinated whole-of-government approach (MCDEM, 2005, pp7-8).

On a regional and local level, all councils are required to be a member of the CDEM group in their region; each group is governed by a board consisting of one elected member (mayor, chair or councillor) from each of the local authorities in that region (s13). The Bay of Plenty CDEM group consists of BOPRC, Tauranga City Council, WBOPDC, Rotorua District Council, Kawerau District Council, Whakatane District Council and Otago District Council. Each CDEM group must form a coordinating executive group of the chief executives of each council (or a staff appointee) and include a senior police, fire and health services official (s20); others may be co-opted by a CDEM group such as representatives from lifeline utilities. A CDEM group is responsible for identifying hazards in their region and to manage any emergencies that arise (s17). Each group is required to produce and implement a CDEM plan (s48) for their area identifying the hazards and how each one is to be managed (s49) while remaining consistent with the national CDEM strategy (s53). The CDEM groups provide a means for local government to work with central government to address local vulnerabilities (Lee, 2010). Risk is mentioned 18 times in the act but resilience and vulnerability are again not mentioned anywhere. However, the act gives rise to the national CDEM strategy that has the vision of a “resilient New Zealand.”

3.2.4 Building Act (2004)

The Building Act (2004) includes provisions to reduce hazard risk. Tonkin & Taylor (2006, p73) outlines four pertinent mechanisms:

1. Natural hazards must be recorded on PIMs (Project information Memoranda) (s35);
2. A building consent is required when building on land subject to a natural hazard and conditions on a consent can be imposed (s71-73);
3. Controls and provisions regarding buildings which are prone to earthquakes (s124; s128);
4. The ability to control building work through the Building Code and Building regulations.

Vulnerability is not even mentioned in relation to building strength in this act.

3.2.5 Local Government Official Information and Meetings Act (1987)

Section 44A of the Local Government Official Information & Meetings Act makes Land Information Memoranda (LIM) available to the public from records kept by territorial authorities. The information includes but is not limited to “potential erosion, avulsion, falling debris, subsidence, slippage, alluvion, or inundation” (s44A(2)(a)) and there is provision to include any other information that a territorial authority considers relevant (s44A(3)) such as additional natural hazards. Whilst silent on vulnerability, access to hazard information enables home purchasers to make a more informed choice about the level of exposure that is acceptable to them.

3.3 Conclusion/findings

The LGOIMA can provide the public with information about potential hazards affecting land and the RMA, LGA, CDEMA and Building Act (2004) are robust pieces of legislation that provide planners with the necessary legal foundation and tools to avoid and mitigate hazard risk (Glavovic et al., 2010); however, none of these pieces of legislation contains the term vulnerability and the potential of the tools they do give is yet to be fully realised and expanded upon.

The concept of vulnerability needs to be acknowledged in future amendments to legislation thus requiring local authorities to act to reduce it. As yet there is no

national policy statement on natural hazards enabling a consistent nationwide approach by local authorities to natural hazards, many of which have the potential to affect multiple territories and regions. There is scope for further national standards to provide more guidance to local authorities. The CDEMA's focus on risk is constructive as is the focus on resilience via the national CDEM strategy but there needs to be a complementary focus on vulnerability. In the next chapter we shall shift from the national scale and focus on New Zealand's Bay of Plenty region as a case study.

Chapter Four

Case study area: The Bay of Plenty region

4.1 Introduction

This thesis seeks to use a case study approach to illuminate the vulnerability of the BOP to natural hazards and the role land-use planning can play to reduce it. According to Creswell (2009), qualitative research methods such as case study are appropriate for exploring social/human issues. Moore et al., (2011) in their chapter on case study research explain that it is an investigative approach

suited to describe complex issues. The issue of vulnerability to natural hazards deals with immeasurably complex social systems and their adequacy or lack thereof to cope with disaster. Case studies employ the collection of a number of sources using different methods to 'triangulate' or find a common thread in the evidence to strengthen the validity of findings (Moore et al., 2011).

This research has [analysed](#) policies and plans from BOPRC, ODC and TCC as well as interviews with key decision makers in these organisations and community leaders; the analysis of which follows in chapters five and six.

This current chapter is structured as follows:

- Section 4.2 provides justification for undertaking a case study of the BOP region
- Section 4.3 gives a background of the region and its historical natural hazards as well as a profile of the comparative cases to be studied: Tauranga city and Opotiki district. A conclusion section follows this in 4.4.

4.2 Justification

Moore et al. (2011) hold that case studies need to define their purpose and boundaries. The purpose of this research is to shed light on the role of land-use planning in reducing the vulnerability of the BOP to natural hazards. In this researcher's view, effective planning in a region faced with certain future hazards is literally a 'life and death issue.' Aside from completing the requirements of an MRP thesis this research intends to illuminate to its informants and other stakeholders the importance of taking locational measures to reduce exposure and advocacy measures to reduce vulnerability.

The selection of New Zealand's BOP region was driven by three main considerations. Firstly, the researcher is a resident of the region and has knowledge, experience and networks in the area that has led to an [informed](#) selection of [participants. Despite this advantage the downside is possible selection bias.](#) Secondly, it is malandipitous that the region is exposed to a number and variety of natural hazards that intersect with the population. Finally, due to the time constraints associated with a 90-point thesis, travel to face-to-face interviews is easier and without the need for overnight stays away from

home. The selection of Tauranga city and Opotiki district as case comparisons within the region was made because of population distribution, socio-economic, cultural and geographic size differences. The other five territorial authorities in the region have been excluded due to time and resource constraints.

4.3 The Region

The 9,858^{km²} BOP region is geographically small and yet faces an array of potential natural hazards. The region lies directly on top a number of active fault-lines and near the boundary of tectonic plates between the Indo-Australian plate and the Pacific plate. It is consequently exposed to geomorphic hazards such as volcanoes, earthquakes and tsunamis. The BOP section of the Taupo volcanic zone includes the Okataina volcanic centre, home of the 1886 Tarawera Eruption. That eruption devastated the villages of Te Wairoa, Moura and Te Arika, and killed over 100 people (Park, 1911); destroying the famous pink and white terraces on Lake Rotomahana that were a vital economic asset to the local tourist trade. The majority of victims were local Maori who subsequently abandoned these village sites. The probability of a future large eruption within the region is estimated at 1 in 10 in any 100 year period and although rarer, an explosive rhyolitic eruption within the region has the potential to be as large as 10km³ ([Bay of Plenty Civil Defence Emergency Management Group](#) Plan, 2005). The region is also vulnerable to the effects of eruptions further afield such as at Lake Taupo, Mt Ruapehu and Mt Taranaki.

The region hosts a number of faults including the North Island shear belt. Moderate to strong ground shaking from earthquakes (including those centred outside the region) have an average return period of 50 years (BOPCDEM [G](#) Plan, 2005). In 1987 the Edgecumbe earthquake was widely felt throughout the region resulting in over \$370m worth of damage (inflation adjusted) (ICNZ, 2012). As well as damaging homes, the earthquake affected business and infrastructure such as the Bay Milk Products factory, Tasman Pulp and Paper mill, Matahina dam, and East Coast Main Trunk railway line (McSaveney, 2010). [Natural hazard events](#) in pre-European times have left their mark; an archaeological record exists of the effects of tectonic events including

subsidence and faulting on historic Maori settlements (McFadgen, 2008). On a longer timescale, two regional and four localised tsunami events over 5m have occurred in the greater BOP (which includes the eastern side of the Coromandel peninsular) over the last 4,000 years (Bell et al., 2004).

The BOP is exposed to meteorological hazards such as cyclones and hydrological hazards such as flooding. The region feels the effects of at least one tropical cyclone (usually the resulting depression rather than the cyclone itself) every year (BOPCDEM [G](#) Plan, 2005). Major effects can include property damage and landslips due to heavy rain and flooding as well as infrastructure failures and damage due to high winds. Frequent flooding events have caused evacuations and loss of property. Tauranga, the largest city in the BOP experienced landslides and flooding in 2005, which resulted in properties being evacuated, and then cleared with affected areas turned into reserves (Dunham, 2007). At the same time Matata suffered from debris flows destroying 27 homes and damaging another 87 (McSaveney et al., 2005) which caused concern in the community about whether to rebuild, mitigate or retreat (Macbrayne & Rowan 2005). Both these events cost the insurance industry \$30m allowing for inflation (ICNZ, 2012). In addition, the contribution of [Working Group II](#) to the IPCC 4th assessment report raises concerns about the scope and intensity of future weather related events on the region's population as a result of climate change (Hennessy, 2007, p509).

The BOP has a population of over 275,000 (Statistics New Zealand, 2011) that is economically diverse in areas ranging from 'least deprived to 'most deprived' on the Ministry of Health 'atlas of socioeconomic deprivation in New Zealand' (MoH, 2008). The population of the region is older, less educated, poorer and has higher level of unemployment than the New Zealand national average (Statistics New Zealand, 2006). Development in the region has drained swamps, cut native forest and levelled sand dunes. Settlements exist directly in the path of natural hazards; intensification and 'greenfield' residential developments along the coastline have increased exposure to tsunami, storm surge and flooding. The combination of natural hazards, people and thus exposure with a diverse set of socio-economic factors make the Bay of Plenty

region vulnerable to natural hazards. This provides the imperative for land-use planning measures to reduce vulnerability.

Current factors that mitigate vulnerability include, a first world economy, local democracy, a civil defence structure, and social ties. The region has democratic political representation via national legislative elections, elected regional and district/city councils and elected members on district health boards. The BOPCDEM Group exists to reduce hazard risk, increase preparedness (readiness), provide effective response, and recovery within the region (BOPCDEM G Plan, 2012). A regional lifelines group has been established to reduce the susceptibility of utilities and infrastructure in the region (BOPCDEM G Plan, 2012). There are various organisations that form social ties including churches, marae, sports clubs, service clubs, ratepayers associations, and community centres working with the disadvantaged that are funded by individuals, members, councils, government contracts, by the philanthropic, community, energy trusts and gaming trusts. Both the Opotiki district and Tauranga city are exposed to the previously mentioned natural hazards and their communities are indicative of the region's diversity.

4.3.1 Opotiki district

Drawing on information from Opotiki District Council (ODC, 2012a; ODC, 2012b; ODC, 2012c) and Statistics New Zealand (2006): Opotiki District has a small, population of around 9,000 with approximately half residing in Opotiki town and the remainder in small outlying communities. The Opotiki District covers 3098km² with 160km or some 50% of the BOP region's coastline. The majority of residents (59.3%) are of Maori decent and there are 20 marae in the district that serve as focal points for smaller communities. Opotiki district consistently ranks as one of the most deprived in New Zealand. The median income in the district is \$17,400 (2006) and the economy is primarily driven by agriculture, horticulture and forestry with 9.6% of working age residents unemployed in 2006. ODC had an operating and capital expenditure of \$14.9m in 2011 (DIA, 2011a).

The Opotiki district plan lists the hazards that the district may be exposed

to: river flooding, coastal hazards, earthquake hazards, volcanic hazards, storm surge, tsunami, land erosion hazards, wind and fire (Opotiki District Council District Plan, 2005, p80). Addressing socio-economic factors as they intersect with vulnerability in the Opotiki district presents a challenge.

4.3.2 Tauranga city

Drawing on information from Tauranga City Council (2012) and Statistics New Zealand (2006): Tauranga City has a growing population of over 110,000 that is projected to reach 141,000 within the next 10 years. Tauranga City is principally an urban area within a small 134km² territorial boundary surrounded by the Western Bay of Plenty District. The majority of residents are of European decent (74.6%) and the city has a median income of \$23,200 (2006) with 5.1% of working age residents unemployed in 2006. There is a higher proportion of the population over 65 years of age (17.4%) relative to the rest of New Zealand at 12.3%. Forestry, dairy and kiwifruit products have made the Port of Tauranga New Zealand's largest export port (Port of Tauranga, 2012). TCC had an operating and capital expenditure of \$284.8m in 2011 (DIA, 2011b).

Tauranga city is exposed to the following hazards according to the TCC proposed city plan: Earthquake related hazards, compressible soils, erosion, flooding and tsunami (Tauranga City Council City Plan, 2011). The city may also be affected by volcanic ash from events outside its boundaries (BOPCDEM Plan, 2005). The city presents both a challenge and an opportunity for land-use planning. The challenge being further intensification within a region known for natural hazards and the opportunity being management of new development to mitigate the effects of natural hazards in a sound and equitable way.

4.4 Conclusion

The confluence of natural hazards with a complex BOP community encompassing varying degrees of vulnerability means there is the potential for a disaster to occur at any time. Careful and informed land-use planning is required. In the next chapter we will analyse policies and plans in the Bay of Plenty region, focusing on those published by the Bay of Plenty Regional

Council (BOPRC), Opotiki District Council (ODC) and Tauranga City Council (TCC) to see how well they address the determinants of vulnerability and employ locational, design and advocacy planning approaches.

Chapter Five

Analysis of Regional/District/City policies and plans

5.1 Introduction

This chapter outlines the data collection, method and analysis of the natural hazards and civil defence sections of policies and plans from BOPRC, ODC and TCC to determine their quality and how they addressed vulnerability through advocacy, locational and design approaches.

5.2 Data collection & method

The following table lists the policies and plans collected and the local authority responsible for them. Only sections relating to natural hazards or civil defence in the policies and plans were included in this study.

Table 4 Policies and plans collected from BOP local authorities

Local Authority	Plan or Policy
Bay of Plenty Regional Council	BOPCDEM Group Plan 2012 (BOPCDEMG Plan, 2012)
	Long Term Plan 2012-22 (BOPRC LTP)

	Annual Plan 2011/12 (BOPRC AP)
	Operative Regional Policy Statement (BOPRC RPS)
	Proposed Regional Policy Statement (BOPRC Proposed RPS)
Opotiki District Council	Long Term Plan 2012-22 (ODC LTP)
	Annual Plan 2011/12 (ODC AP)
	District Plan (ODC DP)
Tauranga City Council	Long Term Plan 2012-22 (TCC LTP)
	Annual Plan 2011/12 (TCC AP)
	Operative District Plan (TCC DP)
	Proposed City Plan (TCC CP)

Plan evaluation is a systematic assessment of plans and policies, remembering their intentions and comparing outcomes against these and explicit indicators (Laurian et al., 2010; Hoch, 2002). As well as the benefits of determining whether a plan is logically capable of achieving its objectives, monitoring of the effectiveness of policies and plans is a legislative requirement under s35 of the RMA. There are a number of challenges to effective plan evaluation that Laurian et al. (2010) identify: There must be consistency between objectives and policies and the policies actually need to be implemented. Planning agencies need to have the commitment to evaluation and also the resources to do so. Finally, relevant data and indicators of success need to be sourced to measure mitigation outcomes.

It is important to note that Berke et al. (1996) in their analysis of local government plans for natural hazard mitigation in the United States find that simply having a requirement to plan for natural hazards does not guarantee high quality plans. They suggest that the actual content of plans and the active commitment to their implementation is what determines the quality of hazard mitigation in a community. Policies need to be clear and applicable to the local level. Ambiguous policy development in comprehensive hazard planning makes it difficult for communities to understand and have the interest to want to become involved with the process (Brody, 2003). Berke et al. (1996, p82) and

Brody (2003) in his analysis of hazard plan quality suggest three characteristics of quality plans identified by scholarship:

- 1) They should contain solid facts and analyses.
- 2) Have clear goals that can be validated.
- 3) There are specific policies that are proactive.

Mapping the work of these authors and Laurian et al. (2010) onto the policy landscape in the Bay of Plenty, local authority plans and policies should:

- 1) Identify natural hazards that could affect the region/territory and the extent of damage that may be expected in an event.
- 2) Clearly state objectives to mitigate the effects of natural hazards, the success of which can be measured.
- 3) Have specific policies that are implemented to reduce exposure and vulnerability.

The analysis of BOP policies and plans will be conducted based on the six steps of qualitative data analysis based on Creswell (2009 pp.185-190):

Step 1: Organise copies of policies and plans.

Step 2: Using the characteristics of quality plans (Berke et al., 1993; Brody, 2003; Laurian et al., 2010) and information gleaned from the literature review including the determinants of vulnerability (Aysan, 1993; Buckle, 2000; Cannon, 1994; Cardona et al., 2012; Cutter, 1996; Cutter et al., 2000; Gallopín, 2006; Murphy, 2007; Paton & Johnston, 2001; Wisner, 2004; and Wisner et al., 2004) read the relevant plans and policies carefully while making initial codes and taking notes to get a general sense of the emphasis that different councils and the region as a whole place on the importance of measures to reduce vulnerability.

Step 3: From the reading of policies and plans develop and organise additional

codes for plan data; paying attention to codes which do not fit into initial expectations.

Step 4: Use the coding to generate themes or categories for analysis that can be made into headings in the thesis.

Step 5: Decide how to represent the themes and categories such as through narrative or a table.

Step 6: Interpret the data by comparing them against the characteristics of quality plans.

The NVIVO 10 computer program was used to code and interpret the data.

5.2.1 Codes

The following codes were derived from the literature review and the initial reading of the policies and plans.

Table 5 Codes used to analyse policies and plans

Themes	Codes	Meaning
Plan Quality	Identify Hazards	Identify the hazards that have the potential to affect the region
	Damage Extent	Identify the extent of damage that may be expected in an event
	Objectives	Are there clearly stated objectives to mitigate effects of natural hazards?
	Measurable Outcomes	The success of objectives are able to be measured
Vulnerability	Age	The old or very young
	Building/Lifeline	Building and lifeline infrastructure strength
	Culture	Those of a different culture or ethnicity from the majority
	Education/Preparation	Access to...
	Exposure	To a hazard
	Financial	Lack of access to financial resources
	Gender	Women may be more vulnerable
	Health	Those with poor health or disability
	Political	Lack of access to power
	Resilience/Capacity	Lack of resilience/capacity to cope/adaptive capacity
	Social Ties	Those with lack of access to networks or connectedness
Advocacy Planning	Advocacy	Broad engagement is encouraged as in Davidoff (1965)

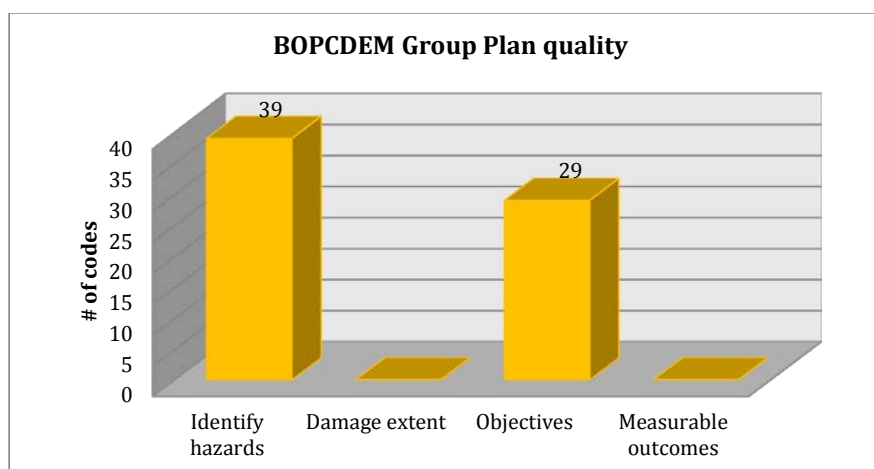
Approach	Participation	Participation in decision-making processes
	SES	Encouraging social and ecological infrastructure
	Social Change	Local authorities advocating change on behalf of their residents to address the root causes behind the determinants of vulnerability. Such as plans to address financial circumstances, build social ties, etc.
Locational Planning Approach	Growth Management	Avoiding further intensification in at risk areas and channeling new growth outside hazard areas
	Lifeline Location	(re)locate lifelines and emergency infrastructure out of harm's way
	No Build Areas	Areas where building is prohibited due to exposure
	Retreat/Retire	Managed retreat from exposed places or those that will become exposed as a result of climate change
Design Planning Approach	Ecological	Ecological infrastructure is protected
	Physical Works	Physical mitigation works such as flood stop banks or strengthening buildings.
	Limits	Acknowledging that physical works have their limits and can actually increase risk
	Regulations	Such as minimum floor levels or minimum earthquake strength

5.3 Data analysis

5.3.1 Plan Quality

Quality plans in the natural hazards space identify hazards and the extent of damage expected. They have achievable outcomes, which can be measured.

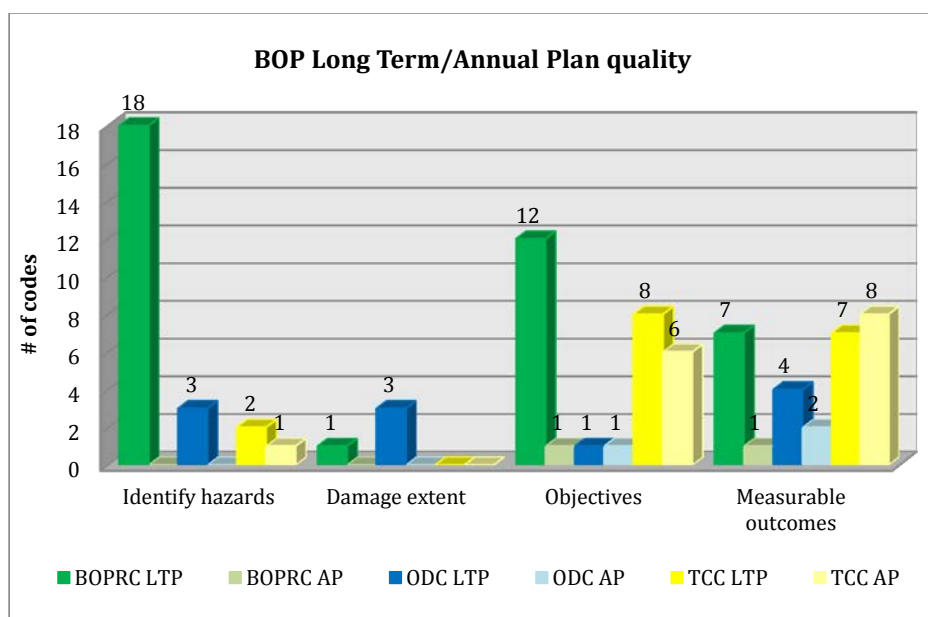
Figure 3 BOPCDEM Group Plan quality



5.3.1.1 BOPCDEM Group Plan

The group plan contained strong identification of hazards (39 codes) mentioning that “the [region] has the largest hazardscape in New Zealand, including more than 22 identified hazards” (BOPCDEMG, 2012, pi) but had no mention of the extent of damage expected. There are broad objectives (29 codes) within the areas of reduction, readiness, response, recovery and monitoring/evaluation but no mention of the measure to achieve these outcomes.

Figure 4 BOP Long Term/Annual Plan quality



5.3.1.2 BOPRC LTP

The BOPRC LTP contains the ingredients of a good plan by identifying hazards (18 codes), damage extent (1 code), objectives (12 codes) and measureable outcomes (7 codes). The hazards identified are largely flood and drainage related; the single 'damage extent' code is on the possible effects of climate change "Future sea level advice for New Zealand is a base rise of 0.5m and potential rise of at least 0.8 m by 2090 based on Ministry for the Environment Guidelines" (BOPRC LTP, 2012, p78). Objectives are clearly defined such as: "Provide region-wide river management and engineering advice to reduce flood risk" (BOPRC LTP, 2012, p180). So are measureable outcomes such as: "Timely, up to date information on river engineering and flood risk is provided to the community through the website and response to requests. All requests are initially responded to within five working days" (BOPRC LTP, 2012, p180).

5.3.1.3 BOPRC AP

This plan only contains two plan quality codes: one objective and one measurable outcome. The objective being "Council helps prepare the region to be resilient from the effects of natural and other hazards" (BOPRC AP, 2011,

p55). The measurable outcome is a survey the measures the number of residents with an emergency kit.

5.3.1.4 ODC LTP

In this plan the only codes identifying hazards are in relation to the effects of climate change; there are three codes related to an increase in the extent of damage predicted such as:

An increase in the intensity of rainfall [raising] the flood risk to floodplains; and more frequent and intense storms which could change flood protection design levels, increase erosion impacts, increase coast storm effects, and increase run-off from upper catchments leading to an increase in sediment transport to harbours and estuaries (ODC LTP, 2012, p31).

The emergency management objective is clearly identified with measureable outcomes in a tabular format. The objective: "The Council will provide an emergency management service that meets statutory requirements and community expectations" (ODC LTP, 2012, p78). A measurable outcome: "Civil Defence refresher training courses are undertaken by staff on basis of one shift group for the Emergency Operating Centre per annum" (ODC LTP, 2012, p78).

5.3.1.5 ODC AP

The emergency management section of the ODC AP consists of two sparsely worded pages and only contains one code relating to objectives and two 'measurable outcomes' codes. The objective: "The Council will provide an emergency management service that meets statutory requirements and community expectations" (ODC AP, 2011, p37). A measureable outcome: "[The] number of public educational activities undertaken to raise awareness of emergency management procedures" (ODC AP, 2011, p37).

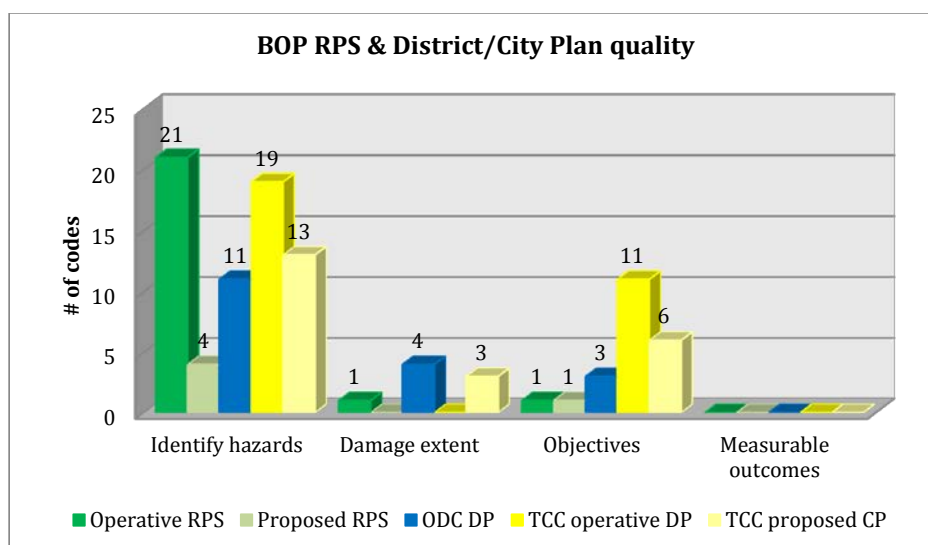
5.3.1.6 TCC LTP

This plan does not specifically name hazards but has hazard identification as a priority: “With regards to reduction: Council identifies potential hazards and then develops planning guidelines to minimise the risks associated with those hazards” (TCC LTP, 2012, p243). There is no mention of damage extent and intriguingly, objectives are worded in relation to their measureable outcomes as “what this measure tells us.” For example, “Community readiness to respond to a major emergency (perception)” (through a residents survey) (TCC LTP, 2012, p246) would be written as ‘Community is ready to respond to a major emergency’ if it was worded as an objective. Therefore the statements under “what this measure tells us” have been coded as ‘objectives.’

5.3.1.7 TCC AP

Like the TCC LTP there was only one code that mentioned identifying hazards: “Council identifies and reduces risks relating to hazards that are identified in the Group CDEM Plan, e.g. earthquakes and coastal flooding, by addressing them in the Tauranga District Plan (and the Code of Practice for Development), Council policies and building regulations” (TCC AP, 2011, p125). Again there were no ‘damage extent’ codes but there were a number of ‘measurable outcome’ codes and ‘objectives’ codes worded as “what this measure tells us.” An example of an objective and its measureable outcome are: “Council’s ability to respond at short notice to an emergency (factual)” and “The local emergency operations centre can be effectively activated within one hour of notification of a civil defence emergency, and maintained for as long as the emergency declaration remains in place” (TCC AP, 2012, p125).

Figure 5 BOP RPS and District/City Plan quality



5.3.1.8 Operative RPS

There are only two items coded in the operative RPS: ‘Identify hazards’ (21 codes) and ‘damage extent’ (one code). Seven hazards are identified in the region by name: “Human life, property and ecosystems in the region can be adversely affected by the following natural hazards: (a) Flood events; (b) Coastal erosion (separately or in combination with storm events); (c) Earthquakes; (d) Major forest fires; (e) Volcanic eruptions and associated effects; (f) Landslips; and (g) Tsunamis” (BOPRC RPS, 2010, p142). The one ‘damage extent’ code mentions the capacity of tsunamis and storm surges to cause damage to settled coastal areas.

5.3.1.9 Proposed RPS

The only code mentioned is ‘identify hazards’ (4 times), far less than the operative RPS.

5.3.1.10 ODC operative DP

The Opotiki District plan includes no measurable outcomes like the RPS. But does identify hazards comprehensively. ODC DP (2005, p80) says:

Those natural hazards that have the potential to affect the

district include:

- River flooding - inundation and erosion hazards
- Coastal hazards - inundation and erosion hazards
- Earthquake hazards - ground shaking and liquefaction
- Volcanic hazard - ash fall and lahars
- Storm surge - combination of low barometric pressure on-shore wind, and high tide events leading to coastal inundation
- Tsunami
- Landslide and land erosion hazards
- Wind
- Fire.

Exposure to the future effects of climate change are also mentioned. Damage extent is well described:

The effects of natural hazards can include destruction of habitats, structural damage to buildings and services, disruption to transportation routes, destruction of commercial centres and residences, loss of crops and stock and can result in the loss of human life. There are resultant financial, personal, psychological, social, and environmental costs associated with the effects (ODC DP, 2005, p80).

There are objectives and policies to achieve those objectives but no measureable outcomes. For example:

Objective 1. Ensuring that the effects of natural hazard occurrence within the district are avoided or mitigated when making resource management decisions.

Policies 1.1 To control activities and the location of buildings to avoid or mitigate the effects of natural hazards (ODC DP, 2005, p82).

5.3.1.11 TCC operative DP

There are two types of codes, 'Identify hazards' and 'objectives.' This plan focuses on coastal hazards which is understandable considering growth and existing development in the coastal areas of Mt Maunganui and Papamoa. Objectives such as 6.1.4 "To avoid, remedy or mitigate damage or adverse effects to land, *structures* and the *environment* arising from coastal erosion and inundation" (TCC DP, 2006, p3) have clear policies to implement them around dune protection, relocation of existing structures and avoidance of new development. As with the RPS and Opotiki District Plan there are no measurable outcomes.

5.3.1.12 TCC proposed CP

The city plan comprehensively identifies hazards and to a minor degree the extent of damage that may result such as liquefaction.

Natural hazards identified within the

Tauranga City environs include, but are not limited to:

- a) Earthquake induced subsidence and/or flooding, including liquefaction;
 - b) Peat deposits and other highly compressible soils;
 - c) Erosion and land slippage associated with relic land slips and slip debris or overly steep topography;
 - d) Flooding associated with stormwater overland flow paths and/or ponding;
 - e) Flooding associated with sea-level rise;
 - f) Tsunami or storm-induced flooding and coastal erosion along and within the open and harbour coastlines
- (TCC CP, 2011, p2).

The city plan like the other plans discussed has a number of objectives

(such as protection of the coastal environment) and policies (such as ensuring development does not compromise natural defences) but no measurable outcomes to measure the success of the policies.

5.3.1.13 Findings

The BOP CDEM Group plan had excellent identification of hazards but no outcomes that are measureable other than being simply achieved or not achieved. The LTPs and APs have clear objectives and measureable outcomes such as the time it takes to activate an emergency operations centre or survey data of resident's perceptions of preparedness. The only criticism is a lack of hazard identification in the relevant natural hazards sections of LTPs and APs.

The relevant sections of the RPSs, DPs and proposed CP all strongly identify hazards and have clear objectives and policies but no measures of the outcomes of these objectives and policies are mentioned. It may be helpful to have such measures as a way of monitoring compliance; for example, 'zero non-relocatable buildings erected in the Coastal Hazard Erosion Plan Area recorded by enforcement officers.'

5.3.2 Vulnerability in policies and plans

There were a number of determinants of vulnerability to natural hazards missing from BOP policies and plans. There is no acknowledgement of gender, health status, poor social ties, or access to power as factors that influence vulnerability. Age is only referred to as a determinant once in the BOPCDEM Group plan. The most frequent codes are 'education/preparation' followed by 'building/lifeline infrastructure strength' and then 'resilience.'

Figure 6 Vulnerability determinants in the BOPCDEM Group Plan

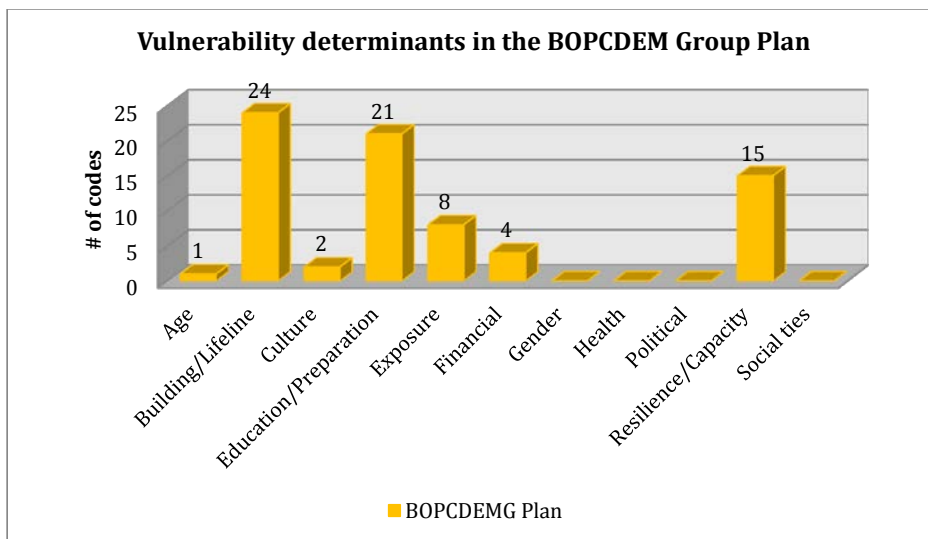


Figure 7 Determinants of vulnerability in BOP Long Term/Annual Plans

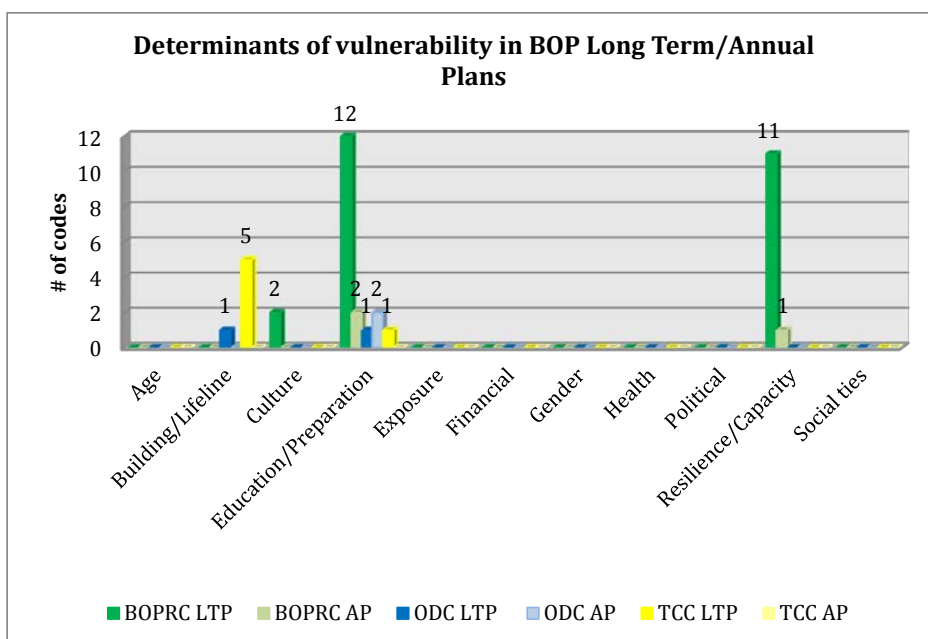
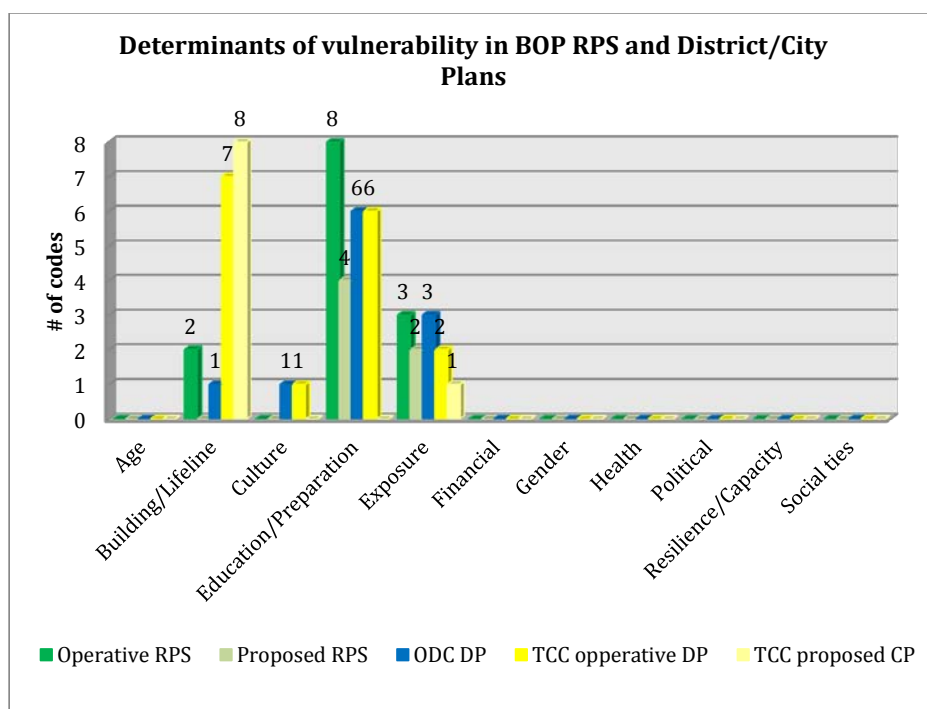


Figure 8 Determinants of vulnerability in BOP RPS and District/City Plans



5.3.2.1 Age

The BOPCDEM Group Plan states that there are a slightly higher proportion of people over 65 in the region than nationwide in the risk profile of the BOP.

5.3.2.2 Building and lifeline infrastructure strength

This code was mentioned 24 times in the BOPCDEM Group plan; one of the key priorities identified is the protection of critical infrastructure. The BOP lifelines group was established in 2006 and consists of utility providers. Its purpose is to

Reduce the vulnerability of the [BOP's] water, wastewater, storm water, telecommunications, electricity, gas and transportation networks including road, rail, airports and ports to local, regional and national emergency events. The focus is on building redundancy, developing relationships, establishing what interdependencies exist and strengthening response

coordination (BOPCDEMG, 2012, p34).

The ODC LTP has one code that states the need to design new and adapt existing infrastructure to withstand future climate change effects. The council will keep the flexibility to adapt as newer climate change predictions become available. TCC's LTP mentions the utility management and contingency plans in place to reduce the risk of failure in a hazard event.

Policy 11.3.1(b)(xi) of the operative RPS is in place to instruct territorial authorities "to avoid or mitigate the vulnerability of existing urban subdivision, use and development, and significant infrastructure that are at risk from natural hazards" (BOPRC RPS, 2010, p144); in place of vulnerability, exposure would have been a more accurate term to use in this instance. It should also be noted that there are no references to building or lifeline infrastructure strength in the proposed RPS. ODC's DP emphasises the interest council has in natural hazards due to the infrastructure and loss of services that can occur. The TCC operative DP, with its focus on protecting the coastal environment, mentions the maintenance and minor upgrade of lifeline utilities as an exception to works that can be undertaken in the Coastal Hazard Erosion Plan Area (CHEPA) provided that reinstatement of the dune system is undertaken on completion. The proposed city plan continues with this exception and outlines it in more detail. Building and lifeline infrastructure strength was not coded at all in the BOPRC AP, BOPRC LTP, TCC AP, ODC AP, or the Proposed RPS.

5.3.2.3 Financial

There are four codes on the financial determinants of vulnerability, all in the BOPCDEM Group Plan. In the risk profile of the economic environment and using figures from the 2006 census it is acknowledged that the median income in the region at \$22,600 is below the national median income (\$22,400) and unemployment is higher (6.1%) than the national percentage (5.1%). Under section 8.6.6 if there is going to be "a significant number of people suffering financial hardship and more immediate relief is required, the CDEM Group may establish either a Regional Relief Fund or individual Mayoral Relief Funds depending on the circumstances" (BOPCDEMG, 2012, p61)."

5.3.2.4 Education and preparation

Education and preparation was the most coded determinant of vulnerability although intriguingly, the TCC proposed city plan and the TCC AP had zero codes. The majority (21 codes) were in the BOPCDEM Group plan, which stated that, an aware and prepared community is a resilient community (p4). The importance of preparation in rural and isolated areas is also stressed, as is the principle of making hazard information freely available “to enable the community to engage in decisions about the acceptability of the risks they face and to equip individuals to act to reduce their own risk” (BOPCDEMG, 2012, p15).

The BOPRC LTP largely provides information to those affected by flood risk; it provides information on how to manage and mitigate this risk. A key assumption that affects how this council acts is that “Increasing public knowledge will help change behaviour” (BOPRC LTP, 2012, p101). Implementing a “regional public education strategy for CDEM” is a key project mentioned in the BOPRC AP (BOPRC AP, 2011, p53). In addition both the ODC LTP and AP mention the “number of public educational activities undertaken per year to raise awareness of emergency management procedures” as a key performance indicator of their objective to provide CDEM that meets both statutory and their community’s expectations (ODC LTP, 2012, p78; ODC AP, 2011, p37). The TCC LTP mentions this code only once in relation to increasing information available and improving community engagement.

The operative RPS instructs territorial authorities to “Identify district and relevant regional natural hazards within natural hazards registers or district plans, and provide this information in project or land information memoranda” (BOPRC RPS, 2010, p146). It even goes on to describe the access of such information as “a fundamental right of every citizen” (p146). The proposed RPS mentions education and preparation in a more limited way but still requires territorial authorities to communicate natural hazard information to the public,

especially through LIM. The ODC DP includes an “informed community aware of the natural hazards that can occur in the district, including the likely frequency, scale, and intensity anticipated from these hazards” as one of its objectives (ODC DP, 2005, p83) and is consistent with the RPS by providing LIM to the public. The TCC operative district plan also provides for LIM and states in its introduction “Civil Defence planning focuses on informing and preparing the community for such emergencies” (TCC DP, 2006, p1). LIM are not mentioned in the natural hazards section of the proposed city plan or in the TCC AP.

5.3.2.5 Culture

Culture as a determinant of vulnerability was only mentioned in the BOPPCDEM Group plan, BOPRC LTP, the ODC DP and the TCC operative DP; there was no mention of culture in the TCC proposed CP. The BOPPCDEM Group plan outlines the challenge that different cultures and languages present to engaging effectively with all BOP communities. The BOPRC LTP, ODC DP and TCC operative DP all outline the importance of consultation with iwi.

5.3.2.6 Exposure

The BOPPCDEM Group plan mentions exposure more than any other plan with eight codes. In the operative RPS and ODC DP there are instances of the term vulnerability being used when exposure would be a more precise term.

In the BOPPCDEM Group plan, exposure is specifically mentioned in relation to business, infrastructure and community. Indirectly, population density and growth are referred to in the regional risk profile section; this has been coded as ‘exposure’ as it is a determinant of exposure. Under ‘anticipated environmental results of the operative RPS there are two references to vulnerability that would be more accurately described as exposure: “The vulnerability of existing development is avoided or mitigated” and “new urban subdivision and significant infrastructure avoids vulnerability to significant seismic and volcanic hazards” (BOPRC RPS, 2010, p141). The proposed RPS does not mention exposure by name but refers to the concept indirectly through

highlighting the significance of events “when they adversely affect human life, property, or other aspects of the environment” (BOPRC Proposed RPS, 2012, p83). ODC’s DP also confuses exposure and vulnerability stating “some practices such as planting forests and protecting wetlands, limit the vulnerability of some areas to flooding, land erosion, and other damage” (ODC DP, 2005 p81). The first issue identified in the TCC operative DP is the land-use and development in areas potentially affected by natural hazards that exposes people and their resources to unacceptable risk (TCC DP, 2006, p1). The proposed CP only mentions exposure by name once in relation to activities that must be re-locatable if they are exposed to erosion or inundation.

5.3.2.7 Resilience

Resilience was found only coded in the BOPCDEM Group plan and BOPRC plans. It is not used in the RPS, which may be why the term is missing from territorial authority plans. In the BOPCDEM Group plan there is an emphasis on community and business resilience. Indeed the vision of the BOPCDEM Group is “A resilient Bay of Plenty: communities understanding and managing their risks” (BOPCDEMG, 2012, p3). Resilience is mentioned in both the BOPRC LTP and the AP and adaption to climate change is mentioned in the LTP.

5.3.2.8 Findings

There was only one mention of age as a determinant of vulnerability. Building and lifeline infrastructure strength was the second most mentioned code in policies and plans with 24 codes in the BOPCDEM Group plan alone. This plan mistakenly used vulnerability to describe the exposure of infrastructure. The financial codes were exclusively in the BOPCDEM Group plan, which also had the lion’s share of ‘education/preparation’ codes. The operative and proposed RPS instruct territorial authorities to identify hazards and provide information about affected properties in LIM. Current operative district plans mention this however, the TCC proposed city plan does not. With regards to the culture determinant, only the CDEM Group plan mentions potential linguistic difficulties in disseminating hazard information. The BOP LTP, ODC DP and TCC operative district plan refer to the need to consult with Maori. Exposure is

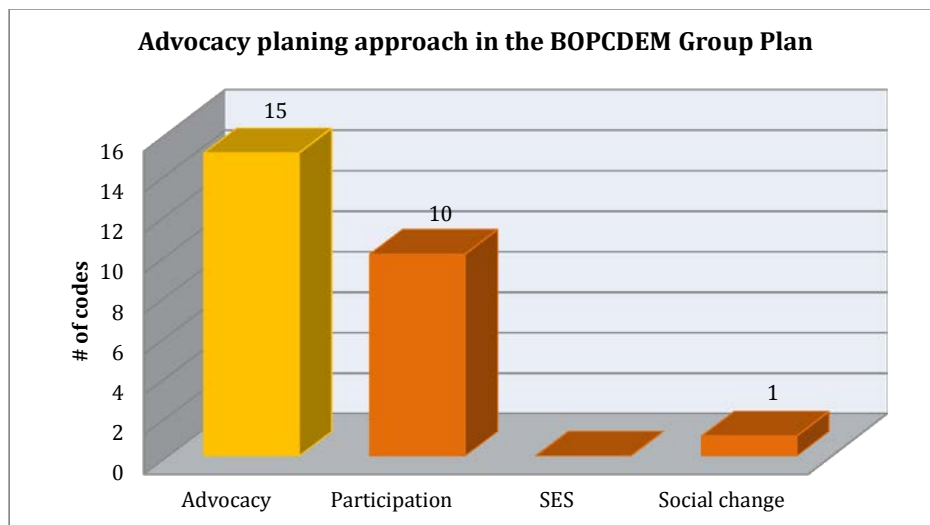
referred to as vulnerability in error in both the operative RPS and the ODC DP. Resilience is only used in the BOPCDEM Group plan and the BOPRC LTP and AP. The term is not used in the RPS, which may be a reason why it is absent in territorial authority plans.

The proposed RPS uses only two codes (education/preparation and exposure) in a smaller number than the operative RPS which uses three codes (including building/lifeline). Likewise, the TCC proposed CP only codes 'building/lifeline' and 'exposure' whereas the operative DP mentions four codes. Gender, lack of health, poor social ties, and access to power as determinants of vulnerability are all ignored in the studied sections of policies and plans. These determinants need to be acknowledged for change to occur; future plans and policies need to build on their preceding documents and not leave out influences of vulnerability that still require attention.

5.3.3 Advocacy planning approach

This approach to planning was first comprehensively defined in the work of Davidoff (1965) 'Advocacy and pluralism in planning.' The advocacy planning approach mapped onto planning to reduce vulnerability encourages public participation in decision-making, advocates social change, builds capacity within the community and urges changes to socio-economic-political factors that generate vulnerability.

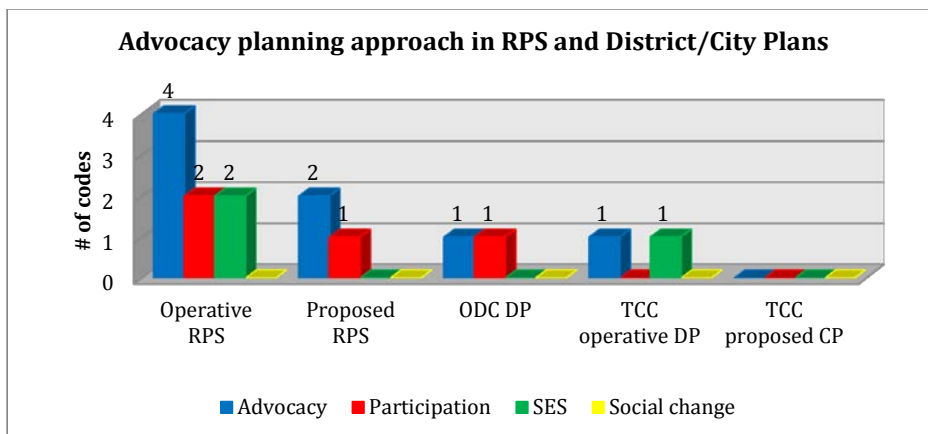
Figure 9 Advocacy planning approach in the BOPCDEM Group Plan



5.3.3.1 BOPCDEM Group Plan

This plan has a strong advocacy approach with 26 codes. The plan advocates public participation, taking advantage of local knowledge and acknowledging the diversity of the community. It contains the only social change code in all policy and plan sections reviewed: “strengthen planning capability and capacity across all agencies, the wider community and businesses to promote sustainability and provide for the long term regeneration of communities” (BOPCDEMG, 2012, p40).

Figure 10 Advocacy planning approach in RPS and District/City Plans



5.3.3.2 Operative RPS

The RPS encourages social-ecological systems; policy 11.3.1(b)(vi) states: “give preference to the avoidance of adverse effects on sites of ecological, cultural or natural character value, when considering hazard mitigation works” (BOPRC RPS, 2010, p143). The regional council and territorial authorities will cooperate to “encouraging public participation in and contribution to measures to raise risk awareness” (BOPRC RPS, 2010, p144).

5.3.3.3 Proposed RPS

In contrast to the operative RPS, the proposed RPS does not mention social-economic systems and only mentions participation once as an issue when determining an acceptable level of risk.

5.3.3.4 ODC DP

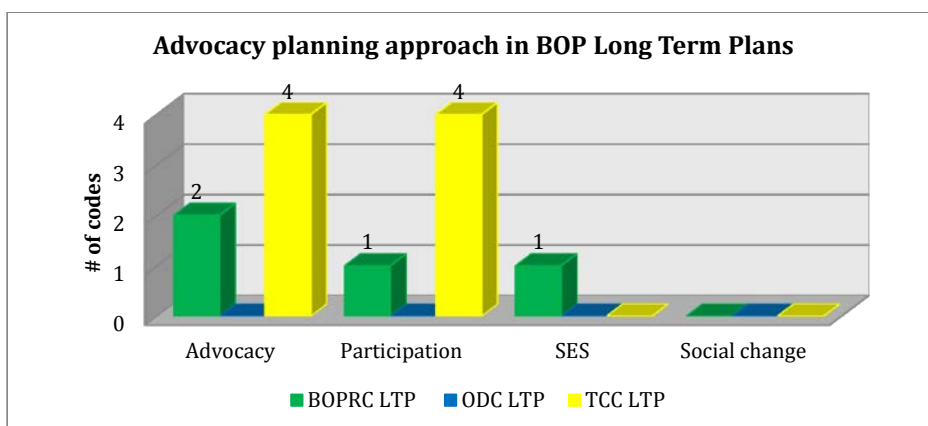
This plan encourages landowners to “amalgamate natural hazard concerns into Environmental Plans that are lodged with the Bay of Plenty Regional Council” (ODC DP, 2005, p87).

5.3.3.5 TCC operative DP

The DP mentions social-ecological systems in relation to policy on effects on the coastal environment:

Subdivision, use and development should not compromise the integrity of natural defences to coastal hazards, the natural character of the coastal environment (particularly in areas where little development has occurred), the relationship of Maori and their culture and traditions to the coast, or public access to the coast. (TCC DP, 2006, p3).

Figure 11 Advocacy planning approach in BOP Long Term Plans



5.3.3.6 BOPRC LTP

The long-term plan encourages social-ecological infrastructure by managing drainage schemes to “protect natural, physical and cultural heritage sites (including several marae) from the adverse effects of flooding and erosion” (BOPRC LTP, 2012, p178).

5.3.3.7 TCC LTP

TCC’s LTP cites work over the next three years to increase community engagement through training volunteers and rolling out READYNET, which is a web-based program that provides CDEM with the means to quickly contact groups and organisations in an emergency (TCC LTP, 2012, p244).

5.3.3.8 Findings

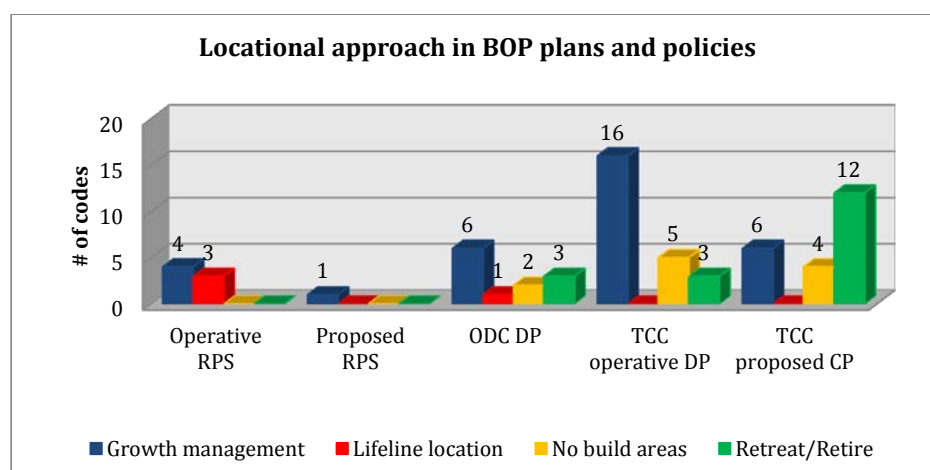
There are no advocacy planning codes in the BOPRC AP, ODC LTP, ODC AP, TCC AP, and the TCC proposed CP. Newer versions of plans have less codes

than their predecessors (proposed RPS, TCC proposed CP). New policies and plans should seek greater public participation and protection of social/ecological systems and further study needs to be undertaken to see if current provisions for participation is adequate. Only the BOPCDEM Group plan has a social change objective in the recovery phase with regards to the regeneration of communities affected by a hazard.

5.3.4 Locational planning approach

None of the locational planning codes are mentioned in the BOPCDEM Group plan (as this plan does not control land-use), BOPRC AP, ODC LTP, ODC AP, TCC LTP or the TCC AP. Due to the controls on land-use set out in RPS and DPs these plans feature a number of codes as would be expected.

Figure 12 Locational approach in BOP plans and policies



5.3.4.1 Operative RPS

The 'No build areas' and 'Retreat/Retire' codes are not mentioned in the RPS. However, the difficulty of relocating existing settlements is acknowledged in the policy, stating that in many cases it is not "a practicable option" (BOPRC RPS, 2010, p143). The 'growth management' code is mentioned four times with an example being: "new development should be located and designed to avoid significant natural hazards unless there is a specific need for the development in the risk area" (BOPRC RPS, 2010, p147). With regards to lifeline

infrastructure, the RPS has policy 11.3.1(b)(x) that requires significant infrastructure to be “located and designed to avoid significant natural hazards” (BOPRC RPS, 2010, p143) and policy 11.3.1(b)(xi) that requires the avoidance or mitigation of significant infrastructure that is at risk.

5.3.4.2 Proposed RPS

Like the operative RPS the proposed RPS doesn’t mention ‘No build areas’ and ‘Retreat/Retire’ codes. It does not mention lifeline location and has only one limited ‘growth management’ code: Policy NH2B “Managing natural hazard risk for new development” (BOPRC [Proposed](#) RPS, 2012, p86).

5.3.4.3 BOPRC LTP

The BOPRC LTP only mentions ‘growth management’ and that only once in the form of encouraging development elsewhere through advice:

We provide engineering and technical advice on flood management, flood risk and flood hazard mitigation. We do this to prevent development in flood prone or hazardous areas, and increase the region’s resilience to flood events (BOPRC LTP, 2012, p41).

5.3.4.4 ODC DP

Opotiki’s district plan acknowledges the need for growth management by stating that new development must be located “so that the need for hazard protection works is avoided” (ODC DP, 2005, p82). This DP was the only DP that specifically mentioned locating lifeline infrastructure out of harm’s way. Regarding the ‘No build areas’ code, building within the Ohiwa Spit Coastal Hazard Overlay Area is a non-complying activity (p87); therefore a resource consent is required. Retreat or retirement of at risk land is mentioned within the plan; policy 2.3 states “abandonment or relocation of buildings and other assets will be considered among options when subdivision land is threatened by a coastal hazard” (p83).

5.3.4.5 TCC operative DP

This plan recognises that the risk of potential erosion and inundation in the Current Erosion Risk Zone (CERZ) is too high to allow any further subdivision or new buildings (TCC DP, 2011, p9) and this was coded under 'growth management.' However, the plan cites the existing use provisions in section 10(1)(a) of the RMA which protect existing or occupation so long as the activity was "lawfully established" before the plan was notified and the effects of the activity are "similar in character, intensity and scale." For land that is yet to be developed there are no constraints on district plans; policy 6.1.4.8 on subdivision states, "Subdivision shall not be undertaken on land wholly located within the CERZ" (p4). The council has a policy of retreat/retire from areas exposed to erosion and inundation; policy 6.1.4.2 states

Relocation, avoidance of further development and/or retreat of lawfully established existing buildings and activities are the appropriate means of managing coastal erosion and inundation hazards in the CHEPA (p3).

However, existing use provisions of the RMA still apply and the DP does not have the ability to require relocation of activities that were lawfully established prior to its notification.

5.3.4.6 TCC proposed CP

The proposed CP has a lower proportion of codes in growth management than the operative DP but substantially more 'retreat/retire' codes. Like the DP it has no 'lifeline' codes. On growth management this plan has a policy that further development in existing areas does not result in increased vulnerability. With regards to no build areas, policy 8B.3.1.5 on the CERZ prohibits development unless it "maintains or enhances the natural buffering effect of the foredune" (TCC CP, 2011, p5); this policy has been appealed. The largest code mentioned in the CP is 'retreat/retire;' this is coded 12 times against three times in the TCC operative DP. Within the CHEPA "buildings and structures must be able to be relocated and removed with minimal disturbance to the land or

adjacent land” (p10). Policy 8B.3.1.3 (a) on managing erosion and inundation for existing buildings and activities is “relocation and avoiding further development and/or retreat of lawfully established existing buildings and activities within the CHEPA” (p10). Again this policy is subject to appeal and it is questionable how effective it will be considering the existing use provisions of the RMA.

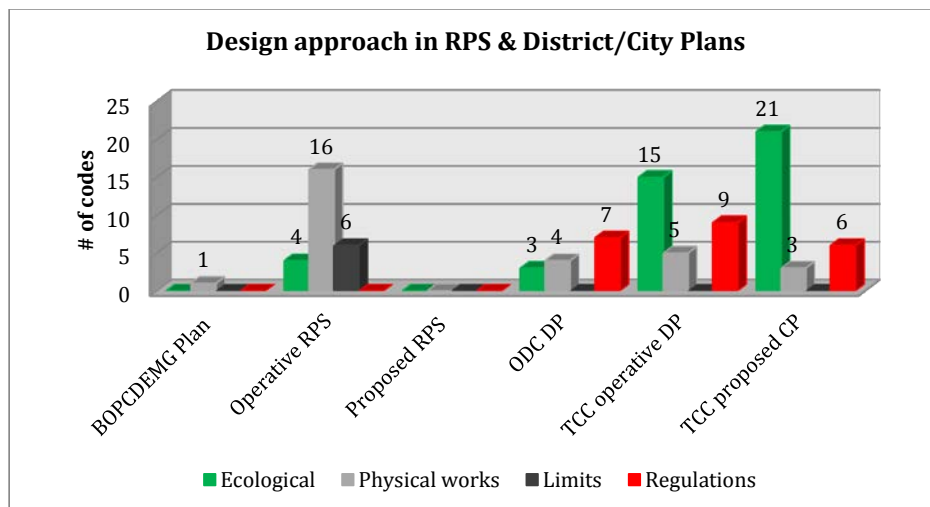
5.3.4.7 Findings

There are no ‘retreat/retire’ or ‘no build’ codes in either the operative or the proposed RPS so it is curious that there are a number of these codes in the ODC DP, TCC operative DP and proposed CP. Retirement or relocation of buildings and other assets policies are mentioned in The DPs and CP but it is questionable whether these policies can be implemented considering the existing use rights given in the RMA. Perhaps there is a glimpse of a solution to this conundrum in the BOPRC LTP, which encourages development out of harm’s way through education/advice. The ODC DP was the only plan to mention keeping lifeline infrastructure out of harm’s way.

5.3.5 Design planning approach

This approach consists of using design measures such as protecting and enhancing sand dunes as a buffer to erosion, building stop banks along rivers, setting minimum floor levels for flood risk and minimum earthquake strength. All structural works have their limits though and reliance on design can actually increase risk. The proposed RPS (in contrast with the operative RPS), BOPRC AP, ODC LTP, and TCC AP do not mention any design codes.

Figure 13 Design approach in RPS & District/City Plans



5.3.5.1 BOPCDEM Group plan

As this plan does not determine requirements for design it is not surprising that there is only one 'physical works' code referring to the fact that "flood protection is usually provided to a higher degree of safety in urban areas than rural areas" (BOPCDEM, 2012, p10).

5.3.5.2 BOPRC RPS

The protection of ecological infrastructure to maintain "the integrity of natural ecosystems that are natural defences against flooding, inundation or erosion" (BOPRC RPS, 2010, p143) is one of the objectives of the RPS. 'Physical works' is coded more than any other design code in the document due to the flood management role of BOPRC. However, there are six codes that warn against the dangers of relying on these kind of physical works such as:

Natural hazard mitigation works can sometimes have the following adverse effects on people and communities...

(b) Expectations of protection are not met because it is physically impossible to build effective protection works for some types of natural hazards; and (c) Protection works may encourage further development and consequent increasing vulnerability when design levels are exceeded" (p143).

5.3.5.3 ODC DP

Ecological infrastructure is encouraged in the plan such as dune planting programmes (under methods) and the benefits of planting forests (in the introduction). Protection works will be considered when activities are threatened by a hazard but “should only be permitted where they are the best practicable option for the future” (alluding to limits) (ODC DP, 2005, p83). ‘Regulations’ codes include requiring “detailed site investigations prior to subdivision, use, or development of land subject to or likely to be subject to natural hazards” (p82).

5.3.5.4 TCC operative DP

There is strong mention of protecting ecological infrastructure (15 codes) and in particular the coastal environment as a defence against erosion and inundation. Dune protection and road policies both require enhancing the capacity of dune to act as a buffer to natural forces whenever possible. The plan makes mention of physical works five times, all in relation to storm water management but does not acknowledge the limits of such works. Design regulations also focus on coastal hazards as well as flooding. Minimum ground or floor levels of 2.7m-2.9m (+/- 200mm) for new development are a requirement (TCC DP, [2006](#), p7) but if this is unable to be achieved “alternative mitigation methods, as determined at the time of subdivision or land use consent” (p7) will need to be employed.

5.3.5.5 TCC proposed CP

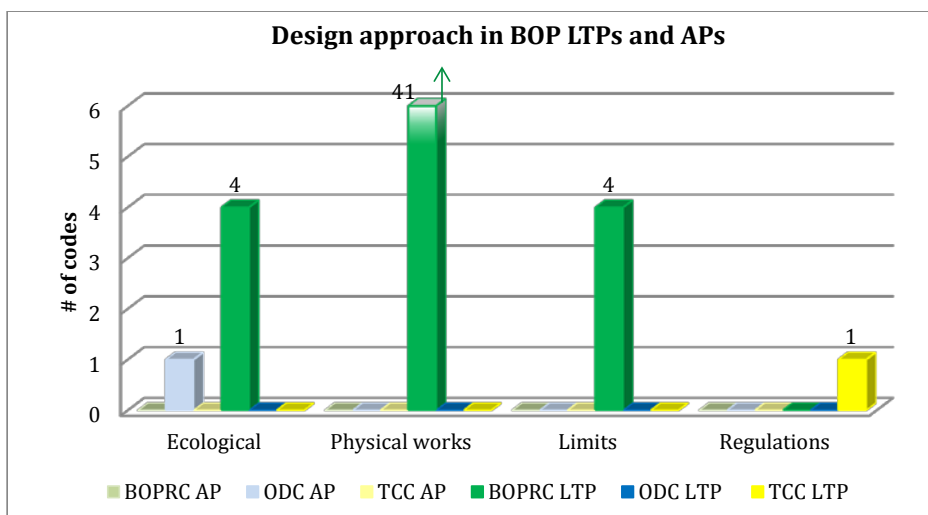
This proposed plan includes 21 ecological codes (six more than the operative DP) and again focuses on maintaining or enhancing the strength of natural coastal defences. Regarding activities in the CHEPA:

All activities shall ensure that the site is reinstated so the natural buffering ability of the foredune is not compromised. All excavated materials from the site and other sites which comprise sand material shall be respread within the CHEPA and be re-vegetated with native dune plants. Revegetation

planting shall be established within 6 months of the respreading of the sand material (TCC CP, 2012, p9).

There is provision for physical works to protect infrastructure and lifeline utilities; however, such works should enhance natural protection where possible. As with the operative DP there is no acknowledgement of the limitations of physical works. Regulations within the CHEPA include: “buildings and structures must be able to be relocated and removed with minimal disturbance to the land or adjacent land” (p10) and “increasing the gross floor area of a structure by more than 20m² or projecting a building further seaward [is] prohibited” (p11).

Figure 14 Design approach in BOP LTPs and APs



5.3.5.6 BOPRC LTP

Regarding ecological infrastructure the BOPRC plans to “enhance the resilience of ecosystems by protecting significant natural habitats and ecosystems” (BOPRC LTP, 2012, p78). This plan has more design codes than any other with 41 physical works codes alone; the major focus being on the maintenance and construction of works to control flooding. There appears to be continued enthusiasm for more physical works in the future in response to climate change “We have planned to incrementally build the capacity of the assets across time

to meet the anticipated climate change predictions” (p192). However there is some acknowledgement of the limits of physical works in four codes including: “we cannot avoid all risk of damage from flooding, particularly if there is an intense flooding event above a scheme's design protection level” (p41).

5.3.5.7 ODC AP

There is only one ecological code in the small two-page section on emergency management.

5.3.5.8 TCC LTP

The LTP states in its only code, ‘regulations’ that “there are a large number of hazards controlled by [plans and regulations] which include determining minimum floor levels to prevent flooding and ensuring buildings are to the desired earthquake standard” (TCC LTP, 2012, p243). This author would argue that plans and regulations do not control hazards but when implemented the effects of hazards can be mitigated.

5.3.5.9 Findings

Within the operative RPS and the BOPRC LTP there is a major focus on the maintenance and construction of physical works in an attempt to control flooding. Whilst this may be a result of inherited catchment and drainage responsibilities, the creeping threat of climate change [and the threat of creating a “safe development paradox” \(Burby, 2006\)](#) raises the issue of how practical it is to continue upgrading existing works in the long term. In comparison, the proposed RPS does not have any physical works codes, but neither does it contain any ecological nor regulations codes unlike the operative RPS. Both the TCC operative DP and proposed CP have a strong emphasis on protecting ecological infrastructure in relation to the coastal environment. The TCC LTP needs to reconceptualise its terminology on natural hazards after suggesting that plans and regulations can control hazards. It would be more correct to say that exposure can be [regulated](#) by these means.

5.4 Conclusion

The region has a plethora of policies and plans that can be used to reduce vulnerability. To make sure these documents are effective they need to have outcomes that are measurable so they can be improved. For vulnerability reduction, the financial, gender, health, political and social ties determinants of vulnerability need to be acknowledged and addressed better as a starter. Genuine public participation and engagement is needed in the formation of policies and plans and the 'existing use' rights conundrum presented by the RMA requires serious thought if we are going to make meaningful locational decisions to reduce exposure. Future design measures may need to be reconsidered in the light of future climate change and the risk of creating a 'safe development paradox.' In the next chapter we will review how to more effectively reduce vulnerability according to information and opinions gleaned from informants from around the Bay of Plenty.

Chapter Six

Interviews with leaders & decision makers

6.1 Introduction

In addition to the analysis of policies and plans, interviews were conducted with BOP decision makers, planners and community leaders. This chapter outlines

the data collection method, ethical considerations of the study and a brief outline of the informants. The interviews were coded and analysed to glean how the informants thought plan and policy intentions are addressing vulnerability and any suggested improvements to them.

6.2 Data collection/method

Gray (2009 p164) explains that the role of the researcher in a qualitative study is to gain a 'holistic' understanding of the subject being studied by interacting with the individuals and organisations involved within their own context. On page 370 he lists a number of advantages that interviews have over other data gathering techniques such as surveys or questionnaires: Interviews can potentially produce a higher response rate and informants may enjoy discussing their work more than filling out a survey form; interviews allow the interviewer to elaborate should a question not be clear to a participant and allow the researcher to probe for more detailed answers. This last reason will be beneficial in particular as the researcher will be seeking the participant's perceptions of how well policies and plans reduce vulnerability.

Ten informants agreed to be interviewed within the time frame of the study. Initial approaches were made to key decision makers and planners in Bay of Plenty regional council, Tauranga city council and Opotiki district council. Two informants (Martin Butler and Campbell Larkin) were sourced on referral from these contacts and deemed by them to be experts in their field. Martin Butler was selected on advisor of the researcher's supervisor to find an opinion from the Ministry of Social Development. The community development advisor at BayTrust referred Aileen Lawrie. A semi-structured interview approach was selected as defined in Gray (2009). In this approach the interviewer had a list of open-ended questions (see appendix 1) gleaned from the literature review that provided some consistency and structure to the interview. Not all questions needed to be rigidly answered; under this approach unintended additional questions were asked in the flow of conversation as new information came to light.

As with the policy and plan analysis, the notes taken from the

transcriptions were analysed based on six steps identified in Creswell (2009 pp.185-190).

Step 1: Type up notes and transcriptions from the interviews

Step 2: Read through the transcripts and notes carefully to get a general feel for the results and record these thoughts. Consider the depth and credibility of the data.

Step 3: Code responses from the notes and transcripts into common categories. Look for codes that are surprising and unusual as well as those expected.

Step 4: Identify the broad themes that occur during the coding process that could be used as headings in the thesis

Step 5: Present the analysis of the themes that emerge through tables and a narrative.

Step 6: Interpret the data gleaned from decision makers, community leaders and planners through the information gathered in the literature review and the analysis of policies and plans. Conclude with recommended steps that decision makers and planners should take to reduce vulnerability.

Data are presented in both a person-by-person basis and thematically; the researcher has experimented with different data presentation techniques with the goal of broadly covering the story of vulnerability in the Bay of Plenty. Using the person-by person narrative, the integrity of each informant's individual views with regard to the determinants of vulnerability are protected and reflects their connection with their particular communities. The remainder of the analysis is presented thematically, which has enabled to researcher to extrapolate other key themes that came out of the interviews.

6.2.1 Ethical considerations

The overriding principle in data collection is that [informants](#) must not be harmed by the process (Creswell, 2009; Gray, 2009; Massey University, 2010). The use of the interview process raises ethical issues that need to be resolved. Drawing upon the foregoing sources several potential ethical issues and steps to ameliorate them were identified.

Interviewees were offered confidentiality in their responses (Creswell, 2009; Gray, 2009; Massey University, 2010) and some comments 'off the record' were not used in the study. The names of decision makers, community leaders and planners who participated [d](#) are given because they consented to their names being released. [Informants](#) had the opportunity to end the interview at any time and were offered a transcript for their consideration and correction if they desired. Raw and analysed interview data will be destroyed within two years of collection and will be used exclusively for the writing of this researcher's thesis and any related scholarly publications. Written consent was sought from [informants](#) in a form (appendix 2, adapted from the Massey University consent form template) with an information sheet attached addressing ethical considerations.

Finally, it is important that there is reciprocity of benefit for the [informants](#) for taking part in the research. A copy of the findings will be given to the [informants](#) so that they can judge the validity for themselves and whether there [is](#) any [learning that](#) they may wish to apply.

6.2.2 Informants

[A prominent developer in the region initially agreed to be interviewed but subsequently was unable to find the time. This was a perspective that the researcher regretted not being able to cover given the role that developers play in subdivision location, density and design and it has limited the scope of this thesis' findings.](#) One planner who replied late was not interviewed due to time constraints. Initial contacts within organisations proved fruitful with both BOPRC and TCC staff helping to find the most appropriate and knowledgeable people to make contact with. The following is a very brief background of each participant:

Aileen Lawrie is the CEO of Opotiki District Council and Chair of the BOP Civil Defence Coordinating Executives Group.

Campbell Larkin is a Senior Policy Planner at Tauranga City Council working in the natural hazards field

Martin Butler is the Regional Planner at BOP Regional Council with responsibilities in the natural hazards field.

Mayor Stewart Crosby is Mayor of Tauranga City; he was the first mayor in Tauranga's history to declare a local civil defence emergency.

Mayor John Forbes is Mayor of Opotiki District and BOP Civil Defence Joint Committee Chairman.

Mike Bryant is the Regional Commissioner of the wider BOP region for the Ministry for Social Development and Chair of the BOP Civil Defence Welfare Advisory Group.

Roku Mihinui is [CEO](#) and a former board member of the Te Arawa Lakes Trust (formally the Te Arawa Maori Trust Board) and holds a variety of leadership positions in the wider BOP including membership of the Maori Reference Group and Family and Community Advisory Groups for the Ministry of Social Development.

Rosalie Crawford is a community leader in Tauranga and founder of 'Rise up Tauranga.' Rosalie coordinated projects to help support Cantabrians relocating to Tauranga as a result of the Canterbury earthquakes and formally promoted health and social services in the region through the website 'Webhealth.'

Terri Eggleton is the Community Development Advisor for BayTrust, a community trust that invests \$160m and distributes the return to projects that build, strengthen and enhance BOP communities.

Terry Wynyard was the former Disaster Recovery Manager at Tauranga City Council and is currently contracted to EQC assisting with land remediation work in Christchurch.

6.2.3 Codes

The following codes were derived from the literature review and common themes that arose following the initial reading of interview transcripts. They form the basis for the remainder of the discussion in this chapter.

Table 6 Codes used to analyse interviews

Themes	Codes	Meaning
Exposure	Flooding	Hazard events
	Earthquake	
	Landslip	
	Volcanic	
	Meteorological	
	Tsunami	
	Climate Change	
	Coastal Erosion	
	By Enviro-degradation	
	Compressible Soils	
Determinants of vulnerability according to informants	Financial	Lack of access to financial resources
	Health	Poor health or disability
	Building/LL Strength	Building and lifeline infrastructure strength
	Access to Transport	Such as a private car or public transport links
	Social Ties	Lack of access to networks or connectedness to each other
	Wealthy	When they locate on cliffs, by the sea, water, etc.
	Age	The old or very young are more vulnerable than the population as a whole
	Education/Preparation	Lack of access to education and preparedness
	Urban Communities	Who are reliant to the provision of services and conveniences of an urban environment
	Political	Lack of access to power
	Culture	Those of a difference culture or ethnicity from the majority
	Assistance Unfamiliarity	Those who are not used to seeking assistance from government or social agencies
	Attraction to Exposed Places	Those who are attracted to

		the beauty of exposed places such as the beach or hillsides
	Businesses	Companies may have to shut down production and lay off staff
	Targets of crime	Following an event the vulnerable can be preyed upon by unscrupulous persons
	Civil Defence Technology Fail	In an event such as communications or sirens
	Time	Vulnerability varies according to time of day such as when children are returning from school isolated from parents
	Gender	Women can be more vulnerable than men
	Resilience	Ability to absorb the effects of a natural hazard and adapt/thrive
Determinants of resilience according to informants	Accustomed to Natural Hazards	Have had experience of hazard events in their lifetime
	Strong Social Ties	Access to networks, fellowship, connectedness to each other
	Wealth	Access to financial resources
	Access to Transport	Access to private or public transport
	Culture	Strong extended family ties in Maori culture and m arae catering for the displaced
	Not Infrastructure dependent	Can cope without power and being cut off from supplies
	Education/Preparation	Access to education and preparedness
	Assistance Familiarity	Aware of how to receive govt. or community assistance
	Self-reliant	Able to cope without assistance
	Have Communications	After an event such as phone or internet
	Loose Commitments	Don't have strong ties to the land or the need to provide for others. They can evacuate easily
	Youth	Young and well people may be more capable of caring for themselves
	Access to a Community Garden	Community gardens provide food without the need to rely on transport from outside the area
Improvements to policies and plans	Encourage Personal Responsibility	Encouraging people to have their own survival kits, evacuation plans
	Guidance from Higher Levels of Govt.	In the form of how to determine risk or a national standard

	Don't Categorise Vulnerability	It is unhelpful to categorise people according to the perception of their vulnerability
	Risk Based Planning	Planning for the consequences and likelihood of an event rather than just probability
	Flexible Planning for Communities	Allow smaller communities to have plans that reflect their unique communities/hazards
	Better Information Pre/Post-event	Have a constant stream of information to communities even if the news is bad
	Better Identify Hazards	Continue to research the nature and extent of hazards
	No Build Areas/Retreat/Retire	More locational planning tools to reduce the number of people in harm's way
	Slow Planning Cycle	It takes years to review policies and plans. New learnings need to be incorporated quicker
	Assist Social Change	Better policies and plans to assist social change, address financial circumstances, build social ties, etc.
	Better Info Collection	Quickly gathering data from the community about those affected post-event
	Economically Viable Building Code	Balancing the need to create safer buildings with the cost of doing so
	Policy for Low Prob./High Impact	Councils need to consider events like tsunami or eruption
	Consistency between Territorial Authorities	Neighbouring councils should not have different land-use policies for the same hazard
	First Aid Kit	All ratepayers need to be given a survival kit
	Maximise iwi Participation	Encourage Maori to meaningfully participate in the planning process
	New Physical Works	More structural works such as levees or sea walls
	Plans Understandable	Plans should be able to be followed by lay people
	Site Lifelines out of Hazard Zones	Telecommunications, sanitation, water infrastructure needs to be outside of hazard zones as far as practicable
	Transport Access	Improve access to transport such as through bus services

6.3 Analysis of Interviews

As with the analysis of policies and plans the NVIVO 10 program was used to code interview data. Informant's responses on the determinants of vulnerability and resilience were included as were their suggested improvements to policies and plans. Only the top three resilience codes and one on community gardens are presented here due to time and word limit constraints.

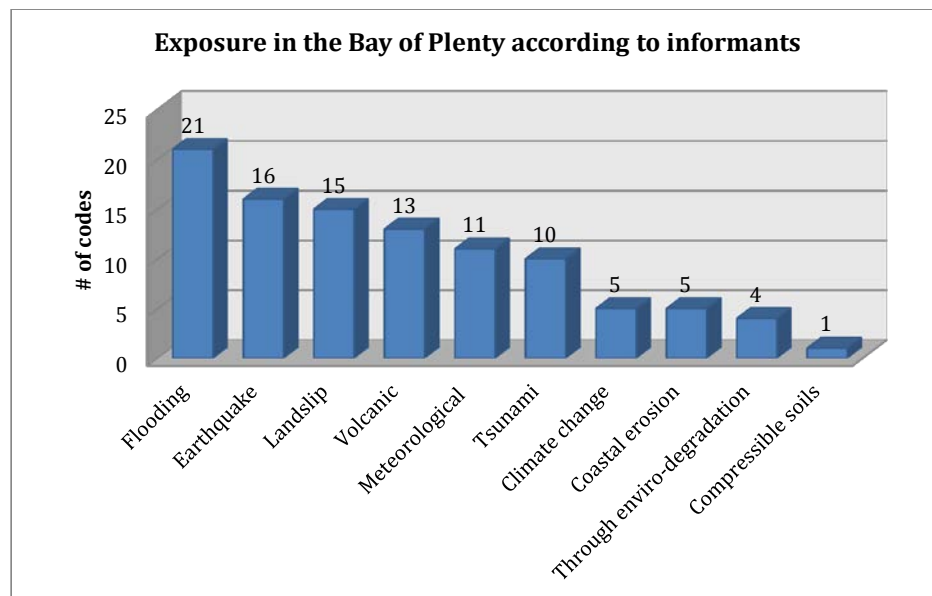
6.3.1 Exposure sources

The top three hazards that informants referred to are flooding, earthquake and landslip. Flooding is the most common hazard faced in the region. "Flooding events and catastrophic rainfall, the community's is kind of used to it and kind of lives with it" (Aileen Lawrie). "Whakatane is very prone to flooding and in fact probably in the last 3-4 years there's been at least two to three civil defence events as a result of flooding" (Mike Bryant). "Flooding is huge" (Rosalie Crawford). The next top code was 'earthquake', with memories of the 2010-11 Canterbury earthquakes and recovery still fresh in the informants' minds. "Flooding is frequent but not overly dangerous whereas earthquakes are" (Mayor Forbes). "Obviously everybody is potentially at risk from earthquakes" (Mike Bryant). Landslip was third; this was the most recent high impact event in the region with the 2005 landslips in Tauranga and Matata destroying homes and resulting in the retirement of land. "This city sits on a layer of Tarawera Ash depending where you are, a couple of metres underground; it's still causing problems today. You know when the water gets to it, it just turns to slush and disappears" (Mayor Crosby). "Matata shouldn't have been built. There are people who have been drilling holes who have told me ... that there is this kind of sludge, you go down and you hit a rock and then you hit another rock so that eventually when the rain goes through, those rocks will come down in a flood.... it has happened before many, many times" (Terri Eggleton).

Other hazards in the region mentioned by informants (in order of number of codes) were volcanic, meteorological, tsunami, climate change, coastal erosion, environmental-degradation and compressible soils. Exposure to volcanic events poses the greatest risk in much of the region "Volcanoes are the biggies" (Mayor Forbes). Meteorological hazards include "coastal storms,

land based storms, rainfall events” (Aileen Lawrie). Although tsunami is a low likelihood event it was the sixth most referred to hazard in the BOP. This is likely due to international and local media coverage following the 2004 Indian Ocean tsunami, 2009 tsunami that impacted Western Samoa, and the 2011 Japan tsunami. Climate change was only referred to five times, possibly because its effects are longer term and less noticeable in the short term. Coastal erosion was also only mentioned five times by informants, which is unusual given the emphasis on it in the TCC DP, proposed CP, operative RPS and proposed RPS as well as the lengthy coastline in the region. Rosalie Crawford, Mayor Crosby and Mayor Forbes referred to environmental degradation. The Opotiki Mayor told of the impacts of forest removal and road construction in the headwaters of rivers resulting in frequent flooding in Opotiki township in the 50 years before the major 1964 flood. Compressible soils were mentioned once by TCC planner Campbell Larkin in relation to development on areas with peat soils.

Figure 15 Exposure in the Bay of Plenty according to informants



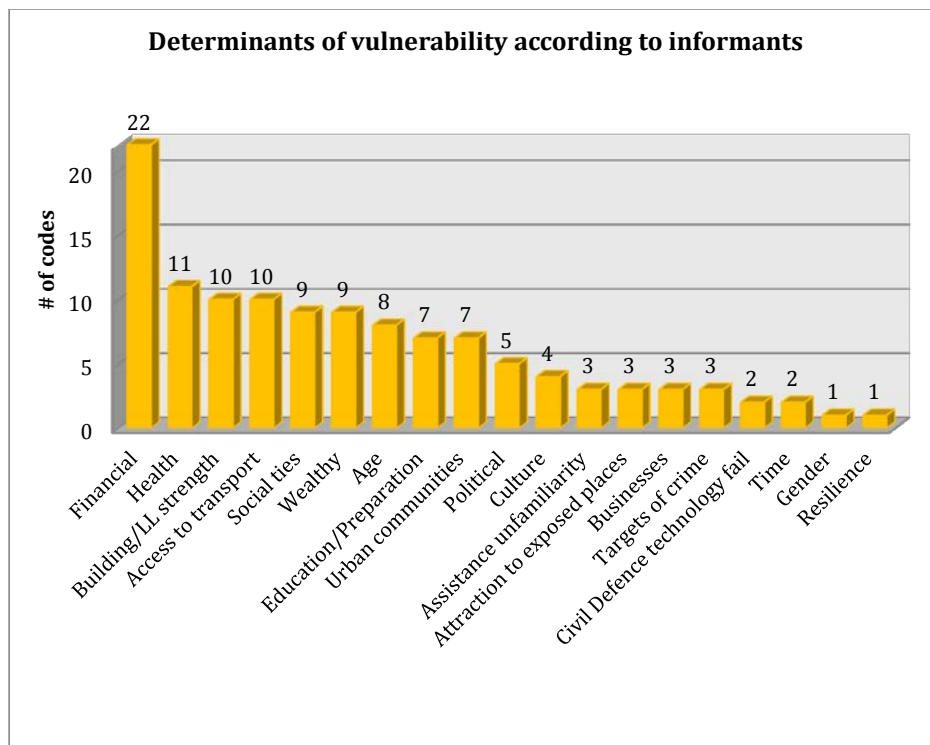
6.3.1.1 Findings

Overall informants had a reasonable understanding of exposure sources with none unaware of less than three sources, which is understandable given the exposure of the region in which they live.

6.3.2 Determinants of vulnerability

When the informants were asked which groups of people were vulnerable and why there was a wide range of responses. Finance was identified as the most significant determinant, which is in line with the findings of the literature review. There were a number of determinants identified by informants that were not mentioned in the literature review such as access to transport, assistance unfamiliarity and time.

Figure 16 Determinants of vulnerability according to informants



6.3.2.1 Aileen Lawrie (CEO of Opotiki district council)

Aileen identified four different types of vulnerability, building and lifeline infrastructure (3 codes), social ties (1 code), she identified the vulnerability of urban relative to rural communities (2 codes) and finally a potential fail in civil defence technology such as communications (1 code).

Giving an example of the importance of infrastructure, Aileen said:

There was the lady who needed to go to hospital... they took her in a boat across Ohiwa harbour during the night to pick her up on the other side. So in terms of medical connectivity, medical reasons, being isolated is actually quite a problem. The other issue is around economic factors, as soon as we become isolated milk tankers start dumping their milk it ends up with ecological issues, goes into a stream, so you have economic losses; you've got your crayfish sitting in a boat in Te Kaha not

being able to get out.”

On the importance of social ties Aileen said: “You see that playing out in social ways you know in anti-social behaviour, there is definitely a chunk of the community that are disaffected, don’t know where they are from, don’t care, no hope, certainly.

Aileen identifies how failures in technology important to the provision of civil defence can leave people vulnerable: “The difficulty for us though is cell coverage out east is very limited.” She asserted that higher socio-economic urban groups are more vulnerable than lower socio-economic groups due to a dependence on goods and services and the supply chain to deliver them. She suggests that rural groups may be used to ‘making do’ and subsisting when supplies are cut off.

Town folk [are] not as well prepared, not used to being in isolation, the communities like Te Kaha are used to having to cope or perhaps they are really connected to the land so they go hunting. I don’t know if you heard the story recently about Tuhoe (a maori tribe). There _____ was a big rain event recently and they were cut off and they got a _____ helicopter to go in and take a lot of food. And the people there said ‘we _____ live in the Uruweras, what do we need food for, we need medicine.’ So _____ the assumption of someone in Whakatane was ‘these people are isolated, we’d better get some food to them,’ completely the wrong assumption. The people out in the back blocks, they don’t need the rest of us necessarily and we shouldn’t make assumptions about what their needs are.

6.3.2.2 Campbell Larkin (Senior policy planner, TCC)

When questioned on which people were vulnerable and why, Campbell suggested four codes: Age (2 codes), Building and lifeline infrastructure strength (2 codes), the transport disadvantaged (1 code) and finance. He

asserts that age is a determinant of vulnerability but that it like all determinants is less relevant in a large magnitude event.

The elderly are vulnerable to these hazards, the answer to that question is yes, philosophically they are because their need is different to my need as a 30 odd year old. I have resources available and I have places to go and I also know that the hazard is there. That said, the wave comes, we're talking about a tsunami at two in the morning, does it matter? You're all vulnerable and there is no way out of those vulnerabilities.

On building strength, lifeline and other emergency infrastructure, Campbell suggests that a community is as vulnerable as the emergency services, infrastructure and lifeline utilities on which they depend. He explains that some infrastructure such as wastewater is not just dependant on the end point being resilient, but the kilometres of underground pipe that leads to it as well. "[That] is the starting point for land-use planning, should core infrastructure that provides a service and is the end point of that service not be located in hazard zones?" In relation to a lack of financial resources and transport, Campbell points out that those who lose their vehicle in an event consequently can't afford another one are vulnerable.

6.3.2.3 Martin Butler (Regional Planner, BOPRC)

Martin Butler mentioned eight determinants of vulnerability as he saw them:

Age and health (1 code each), building and lifeline infrastructure (1 code), education and preparation (1 code), a lack of finances and the transport disadvantaged (1 code each), the wealthy (3 codes) and the attraction to the amenity of exposed places (2 codes).

On age and health Martin said: "Some sectors... will find it difficult to evacuate on foot which is the recommended option. [The elderly] infirm and the otherwise immobile are particularly vulnerable." Regarding building strength, he suggests there are limits to even the strongest designs: "I saw some slides on vertical

evacuation in Japan, they had some designated buildings for that purpose but there was one that had a ship go through it!"

Martin highlights the importance of education and preparation; that those unaware of where to go or what to do in an event are more vulnerable. Like Campbell Larkin, Martin asserts that a lack of financial resources can increase vulnerability if a person is unable to get transport. Paradoxically, Martin suggests that the wealthy may be more vulnerable because they have the ability to, and live in more expensive areas, which are beautiful but also more exposed. For example living on a frontal dune, cliff, or beside a lake formed by volcanic processes.

I'm thinking now of the Rotorua lakes and their exposure to volcanic hazards and again some of the prettiest lakes have got the most expensive housing and upper socio-economic people living around them; but they are vulnerable. Their vulnerability is quite high because they don't have a lot of evacuation opportunities and sure they might get a bit of notice to get out; if they can be persuaded to.

He argues that that this attraction to exposed locations is because of their natural beauty or amenity and is the strongest determinant of vulnerability.

6.3.2.4 Mayor Crosby (Tauranga)

Mayor Crosby identified seven determinants of vulnerability. Building and lifeline infrastructure (1 code), a civil defence technology failure in an event (1 code), education and preparation (2 codes), financial (1 code), health (2 codes), wealthy (1 code), and social ties (1 code). The Mayor acknowledges that building and infrastructure strength can reduce vulnerability as can new technologies for communicating (such as READYNET) following an event but cautions relying on technology too much as it can fail. On finances the Mayor says "I think the deprivation issue is an issue in terms of post an event in terms of a recovery in the short, medium and long term. There's no doubt about that.

Because people have insurance or they know how to access support they are probably going to recover quicker.” However he does not suggest that finances are the largest determinant of vulnerability instead he argues, “the greatest [determinant of] vulnerability is lack of knowledge.”

Mayor Crosby asserts that both physical and mental health play a part in determining vulnerability. “To answer the question who’s vulnerable? Those that don’t handle a stressful situation well. Obviously you have those with physical or restrictive abilities; again they don’t have to be physical.” He makes reference to wealthy but isolated new residents in comparison with lower socio-economic groups “I could also argue that those of lesser means are more able to cope with a stressful situation; they are probably better networked in some cases... [in comparison to] your reasonably well off person living in their ‘Dallas palace’ with fences all around them.”

6.3.2.5 Mayor Forbes (Opotiki)

Mayor Forbes identified five determinants of vulnerability: culture (1 code), financial (2 codes), businesses (1 code), urban communities (4 codes), and the wealthy (2 codes). He suggests that cultural factors within a community can reduce vulnerability when mentioning the strength of having a number of marae with communal sleeping and cooking facilities. “The thing about Papamoa is if you have 50,000 people and only three marae it doesn’t work but if you’ve got 5,000 people and 20 marae you’ve got that immediate response thing done.” The Mayor underlines the importance of having sufficient financial means to insure property if an event occurs:

Better parts of Papamoa, some of the coastal land around Tauranga would be insured. Insuring basically everything that opens and shuts whereas you get down here and you’ve probably got 30-40%. That was a big challenge for us the last time we had a decent flood, 2004.

He outlines the challenges of those less financial means:

This community has always been interesting because they say that you should have three days of food in your pantry. In Opotiki, some of our families, and its 3:05pm in the afternoon won't know where tonight's tea is. Tonight's tea isn't in the pantry so to ask them to put aside tonight's, tomorrow night's and so on [is difficult]"

Mayor Forbes asserts that damage to the underlying economy in an event is the greatest force for dislocation: "you go and put a metre of ash over your pastoral and horticultural country, what does that do, how long does it take to recover from that?" Paradoxically, Mayor Forbes holds that those from urban communities and the wealthy can be more vulnerable than those in rural areas due to reliance on supply chains and the expectations of levels of service that lead to urban dwellers being less self-reliant in terms of gathering food or operating without electricity.

You go and shut a supermarket in Auckland and turn the power off and all that within a day or two [and] everybody are 'munted' mate. Turning the power off in our community, and with our coastal community its quite a regular occurrence, it happens all the time but you go and shut the supermarket and quite a chunk of our community can feed themselves off puha and eels. [They] are reasonably used to going hungry so it kind of doesn't impact on them as much as [other] sectors of society. The less resilient are those higher up the economic echelons because they've got a lot more to lose. They're much more dependent on the system and the way it works, so a tsunami coming in and knocking over my million dollar home and closing my supermarket is going to be much more impactful on me than a flood coming down the river and knocking over someone's \$50,000 whare and closing the supermarket to them. It sounds a bit silly but those are the extremes.

6.3.2.6 Mike Bryant (Regional commissioner, MSD)

Mike identified nine determinants of vulnerability: age (1 code), financial (4

codes), gender (1 code), health (1 code), businesses (2 codes), wealthy (1 code), the attraction to exposed places (1 code), resilience/capacity (1 code) and social ties (1 code). Regarding age and health Mike says “Age would have quite a difference both in terms of being affected when the event occurs, your ability to look after yourself and then the physical ability to respond, not just age but physical disabilities or issues as well.” Mike suggests that finance is one of the major determinants of vulnerability:

Clearly the better position somebody is in economically, the more likely they are to respond, the more likely they are to have insurances and have protections in place that will enable them to respond. There would be plenty of people within the BOP region that wouldn't have stuff like insurances.

Mike mentions gender as a determinant only as far as physical strength is concerned. “I would say that in some situations gender would impact on people's ability to respond, particularly when it comes to lifting sand or the physical work that might be required. Physical efforts of protection or response may be more difficult for females than males.” Mike also raises business as a determinant of vulnerability, explaining that not being able to continue operations affects not only owners but staff too who may lose pay and employment. Like Martin Butler, Mike asserts that the wealthy can be vulnerable because of their ability to live in exposed places. He is the only informant that refers to resilience as a determinant of vulnerability by defining vulnerability as “as people's ability to respond and deal with life afterwards.” He highlights the value of social and community ties in terms of the assistance they can generate:

There's obviously stuff like family support and I guess even community support really. There will be some communities that band together more than others, but generally New Zealanders, in a civil defence situation always seem to pitch in and help out. So even the Rena (a ship that hit a reef and caused an oil spill in the BOP) situation was quite interesting really; there ended up

being 7000 volunteers to actually do the beach cleaning and stuff. Not saying that thousands of them actually got to do it but it was a huge voluntary response and I guess it was interesting that for reasons of hazard, some of the officials weren't keen to have the [public] involved at first. Some of the overseas experts were saying 'no, we don't want volunteers to be involved.' But when it was clear that people wanted to be involved, Regional and TCC set it up differently... volunteer registration took place and people were allocated and in fact the overseas experts came to the conclusion that was hugely successful and they should think about that in terms of other oil events around the world.

6.3.2.7 Roku Mihinui (CEO, Te Arawa lakes trust)

Roku identified 6 determinants of vulnerability: Education and preparation (1 code), financial (3 codes), Maori political disunity (2 codes), social ties (1 code), wealth (1 code), and political (1 code). Roku makes an interesting observation about how the treaty settlement process has created political disunity among Maori, broken down social ties and resulted in increased vulnerability.

One of the social vulnerabilities at this stage definitely [is] treaty settlements. The process has tended to fracture, isolate and even silo individual hapu and whanau, to quite bluntly try and get the best outcomes for themselves rather than as a collective... those things including the treaty settlements also affect the vulnerability of the wider community.

Roku was surprised at the lack of penetration of preparedness information to the grass roots level in the community.

When describing an informal survey of Maori in 'three to four' hui of around 300 people, Te Arawa Lakes trust in collaboration with some of the runanga in the region found that:

None of them had any emergency material for such a significant natural hazard. And that's even a little first aid kit or extra food, extra water. The majority of those that responded didn't even know... what to do, how to safeguard themselves even in terms of earthquake.

The majority of participants in the survey were of lesser financial means; being either unemployed or seasonal workers. Once again referring to the survey, the few who were identified as wealthy were also unprepared and lulled into a false sense of security because of their economic means. "By virtue of having a better bank balance they felt a lot more secure, which we identified was a false sense of security."

Referring to a lack of access to political power Roku challenged what he perceived to be lack of opportunities for participation in the planning process by Maori:

In terms of the current rules, policies and regulations in place that are administered or managed by territorial or regional authorities; regulations, policies and probably even the practices again challenge and minimise the opportunity for iwi, hapu and whanau to participate in decision making and management of various aspects of the community well-being and certainly there is the wider national political implications [of this].

6.3.2.8 Rosalie Crawford (Community leader)

Rosalie identified 11 determinants of vulnerability; building and lifeline infrastructure (2 codes), financial (5 codes), health (3 codes), targeted for crime (3 codes), transport disadvantaged (4 codes), unfamiliar with government or community assistance (3 codes), varies according to time of day (1 code), wealthy (1 code), social ties (3 codes), single people (4 codes), and urban communities (1 code). She commented on how vulnerable transport networks are within Tauranga where the main arterials cross bridges and pass by slips: "Tauranga is becoming the largest port, block off the road at the Kaimais la

| [mountain range](#) at Tauriko, cut off the Maungatapu causeway and you only have the harbour bridge and Greerton. It is not hard to cut Tauranga off.” On finance as a determinant of vulnerability, Rosalie referred to her experience working with Cantabrians who had evacuated to Tauranga following the 2011 earthquake “The most vulnerable were the ones without resources, money, food, transport [or], job.” She encountered a number of evacuees who had little or no social ties that they could draw on for support post-earthquake:

| People on their own I’ve found are more vulnerable to start drinking, one person felt overwhelmed... That family thing is really important because family go to families first. The single people were the most vulnerable I found, more vulnerable than children, because they had their parents.

When poor finances, no access to transport and a lack of social ties were combined the effects on evacuees were greater:

We had a women who texted me from Turret Road at 6pm without a car, she was sitting there she only had \$6 and didn’t know what to do or where to go, it was the worst experience trying to help her, she was crying, I rang the 0800 mental health at the hospital... Finally I managed to get in contact with ‘Haven of grace’ who took her in. She had to walk through the Maungatapu causeway, up Ohauti Road to walk 3km to get up to ‘Haven of Grace’ at night with her bags. We helped her into her own place.

Rosalie mentioned that “people who can’t help themselves” are vulnerable; particularly when their health intersects with a lack of social ties.

We had a woman... who was very fit who had a stroke and was lying for nine hours on the floor at the place she was renting till the people who lived above came home; she managed to call out to them, she was cold and they managed to get her to hospital. Being alone and on your own is huge.

Rosalie identified a disturbing occurrence not found in the literature review. Following an event the vulnerable can be preyed upon by unscrupulous persons:

[Cantabrians] were vulnerable in different ways you know they got preyed on, they got things stolen... One woman ended up having to go flatting with someone (whom she didn't know had a police record) drugs were going on and she nearly got violently assaulted, and the police came and then she had nowhere to live again. She was trying to find a place to live but she didn't have any social ties/family ties.... We helped her find a place to rent, WINZ gave her extra accommodation supplement while she found other people but... it was really tough going for her, she had someone who refused to give his name, then the other guy 'hit on' her so it's really hard as a single woman you are really vulnerable, financially and every which way that you could be vulnerable, for your safety."

Another determinant of vulnerability that Rosalie identified was unfamiliarity with government or community assistance. There were several references to evacuees being unfamiliar with WINZ "they couldn't stand up for themselves at WINZ because they felt so battered down."

Rosalie argued that vulnerability changes throughout the time of day "I guess [vulnerability] is linked in to the time of the day because if you are talking about school time you would have children much more vulnerable than in the weekends." As with Martin Butler and Mike Bryant, Rosalie contended that wealthy can be more vulnerable because of the increased exposure that results from them choosing beautiful places created by natural hazards in which to live, those with less economic means choose less expensive places to live. She cites local examples:

[The vulnerable] live in the good places; in Merivale, which is safe away from tsunami, volcano, flooding earthquakes... Then we've

got the Mount and Papamoa people. You've got quite huge ranges in income going on there [and exposure].

6.3.2.9 Terri Eggleton (Community development advisor, BayTrust)

Terri identified eight determinants of vulnerability: Age (1 code), culture (1 code), education and preparation (3 codes), financial (5 codes), health (1 code), transport disadvantaged (3 codes), political (2 codes), and social ties (2 codes). Terri asserts that age was the most significant determinant of vulnerability and that the elderly are particularly vulnerable because they are less able to cope both physically and mentally. She also suggests that they are less likely to move out of their community following an event. She says that strong cultural and family ties to tribal land and an unwillingness to relocate to less exposed places in other areas may make iwi more vulnerable. She identifies a lack of education or health as a root cause of vulnerability as well as financial circumstances. On a lack of transport as a determinant of vulnerability, Terri says: "I think that anybody that is not transportable; I mean young people just get up and go... but during an event the elderly and lower socio-economic groups don't have anywhere to go; they just sit there and take it."

Terri recounts how those with access to power fared better following the 1987 earthquake.

There are groups of people who for various reasons and are usually the lower-socio economic, less educated people who when a natural disaster occurs, don't have the ability to ensure that they get the best of whatever support is out there. Now when I look at what happened in the Edgecumbe earthquake, there were a number of wealthy farmers who got large subsidies from the Mayoral fund and bought themselves new cowsheds. There were lots of other people who were more deserving who could have got that but [others] were 'in the know' and knew how to get these things... Whereas 'Joe Bloggs' on the street living in Edgecumbe didn't get anything; certainly didn't get \$40,000

to spend on a cow shed, which was spent on home improvements anyway!.. It has to be because that group of people who are already vulnerable become vulnerable again because they don't have the ability to tap into those networks.

Terri strongly asserts that a lack of knowledge about grant making or lack of access to the right people results in a two speed recovery process with the poor recovering slower than the well networked and resourced.

6.3.2.10 Terry Wynyard (Former disaster recovery manager, TCC)

Terry identified six codes relating to vulnerability: age (3 codes), building and lifeline infrastructure (1 code), culture (1 code), health (2 codes), transport disadvantaged (1 code) and according to time of day (1 code). He identifies that age is a determinant of vulnerability for seniors who are not in professional care but still living in the community "because rest homes would have the ability to make a plan for evacuation and what they'd do." Terry cites the danger in relying on structural measures to protect against natural hazards. "Structural measures are kidding yourself. In Japan they had sea walls in the 2011 event that were overtopped." With regard to culture he suggests that language could be a problem when communicating information to speakers of other languages but asserts that culture in and of itself is no determinate of vulnerability. He also asserts that financial circumstances are not the most important determinant of vulnerability so long as people are healthy and have access to transport. "As long as you are mobile, as long as you can walk. I don't think that economic vulnerability is an issue." He cautions that trying to assign people as vulnerable because of their socio-economic status is too simplistic and hierarchical "you have to be very careful because if you create this social hierarchical system somehow that we're going to put people into these categories then we're creating a monster for ourselves."

Terry argues that vulnerability changes during the day particularly as people are at school or work:

What's the plan at 3:10pm when the kids are walking home from school and you don't know where they are? So there is a vulnerability there so when they're at school they could have a plan and mum and dad could be comfortable about that and when they're at home they can have a plan and be comfortable with that so the vulnerability diminishes but when they are in limbo and you don't know where they are, they're vulnerable... different sectors of the community can be more vulnerable at certain times of the day [such as] the young.

6.3.2.11 Findings

In line with the literature review, finances were coded more often than any other determinant of vulnerability. However the interviews gave rise to some interesting findings. Rural and poor communities can be less vulnerable than their urban and wealthier counterparts. Likewise Maori are not necessarily more vulnerable than those of the majority European ethnicity. In fact their culture greatly mitigates vulnerability through strong social ties and access to communal facilities in an emergency. Elderly people can be less vulnerable than the young and fit if they have good facilities, care and financial resources.

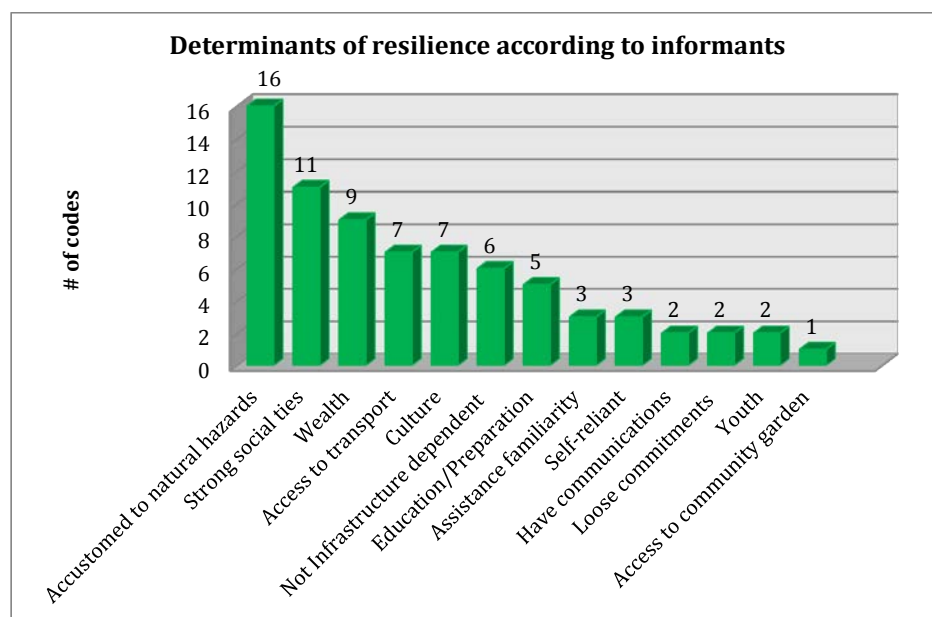
The attraction to exposed places affordable only to those of higher financial means increases their vulnerability. A lack of access to transport coupled with a lack of financial resources reduces the ability to evacuate pre-event and recover quicker post-event. Interestingly, exposure and vulnerability changes according to the time of day. Treaty settlement processes have siloed and fractured relationships between Maori, hurting the social ties that make them strong. A disturbing finding from the interview with Rosalie Crawford was the exploitation of already vulnerable people by unscrupulous members of society.

Planners need to be careful not to over categorise people according to individual determinants of vulnerability. The combination and interplay between determinants of vulnerability and factors of resilience are complex and not easily measured. Indeed the higher the magnitude of an event the less relevant individual determinants of vulnerability are.

6.3.3 Resilience/capacity to cope top codes

Informants were asked 'which people would have a greater capacity to cope and higher level of resilience in a hazard event?' The top three codes were being accustomed to natural hazards (16 codes), social ties (11 codes) and wealth (9 codes). Intriguingly 'youth' which mitigates 'age' as a determinant of vulnerability scored only two codes. Roku Mihinui raised a novel concept, that community gardening can feed people in an emergency while supply chains are down.

Figure 17 Determinants of resilience according to informants



6.3.3.1 Accustomed to natural hazards

Aileen Lawrie mentioned this code five times and gave an example to illustrate:

Flooding events and catastrophic rainfall, the community's is kind of used to it and kind of lives with it. The community here is very resilient. The community is used to being without power [or] a flushing toilet for days. In the township here when it rains we pump 14 times the dry weather flow through our sewerage system. 50 toilets around town won't flush so they just know that you ring up council and get a 'port-a-loo.' Resilience is quite something here.

Martin Butler mentioned that residents are used to high likelihood events and therefore have systems in place to deal with them such as moving livestock from flood prone areas.

Mayor Forbes mentioned experience with previous natural hazards three times:

Practice is the best thing that you can have. We're not saying we're having disasters all the time, but [if there was] another tsunami [in Japan] now and you'll find it is quite a different [situation]; another one 5 years after that and [they'll] be even better again. You don't wish it on people, it's the rare events that happen very infrequently that have the biggest dislocation because you're not used to them. We've got a few malfunctions that go on around town with heavy surface flooding and our sewerage system malfunctions; people know how to deal with that. If it happened once in a blue moon they'd be [upset] but they know now.

The Mayor's comments are backed up in the ODC DP "The district community is aware of the natural hazard risk from river flooding, ponding of waters, coastal erosion, coastal inundation, land erosion, and storm surge events which have occurred within the last five years." (ODC DP, 2005, p81). Mike Bryant from MSD suggests the 'silver lining' in hazard events is that they give civil defence the impetus to plan and the opportunity to test their systems. Rosalie Crawford mentioned the awareness of hazards by Canterbury evacuees who

have moved to Tauranga. One saying: “[We’re] more conscious now of natural disasters [it] helped with my decision making about where I would live.” Long memories and local knowledge of previous disasters is useful to keep out of harm’s way. Terri Eggleton says: “I know of people who have built houses in places where older people in the community have additionally shaken their heads because they’ve said – ‘30 years ago the tide used to come in there, why did you do that?’”

6.3.3.2 Social ties

Aileen Lawrie, Mike Bryant and Mayor Crosby identify strong social ties within the Maori community as a contributing factor to the resilience of the whole community. Aileen says “The marae, they open up for any catastrophe... they are used to kind of managing. We’ve just got that resilience in the community and also we’ve got a connected community; whanau, hapu and so on.” When asked if non-Maori feel comfortable going to a marae she responded: “Yes, when you look at the Kutarere marae... when the road is closed... The marae there gets inundated with people because they can’t go any further; they just open the doors. The challenge for us is making sure they get reimbursed by MCDEM after the event.” When asked whether Maori would be more resilient than non-Maori due to strong social ties Mike Bryant said: “I would totally agree with that. It’s interesting in a civil defence situation that marae would often be available for anybody to access or use [although] there’d be a degree of reluctance from some parts of the population to take that offer up.”

Mayor Crosby suggests that Maori communities and people belonging to community organisations have greater social capital and resilience. Rosalie Crawford illustrated the value and strength of social ties and helping Canterbury evacuees to cope:

We have put structures in place like [the] the BOP ‘Cantabs’ Facebook group where there are about 50 people in there now it’s when those people find others with a similar story; they can journey

together, it actually builds their capacity to cope. People who form those links, who have had the same traumatic experience are able to link together and journey through it together. It builds a sense of group capacity to cope so I know that some of them are having barbeques in Papamoa... I've seen amongst all of them as soon as I set up that group they were able to talk to each other, they were all having conversations with each other and their whole capacity to cope was increased. They're helping one another move house, I don't have to organise things because they do it. Those events and social connections are helping.

6.3.3.3 Wealth

Campbell Larkin suggests that access to money is the greatest determinant of resilience:

Money is probably the greatest factor... to be resilient, or as an example... One family lives well, has a couple of kids, couple of cars, [a] good income but at the end of the week they know they're in tough times because they have to pay the mortgage and the fact is that if they lose all, where are they going to go? If you don't have access to that resource, that money... They can't have power, they can't go anywhere they can't afford to move, they may have lost their own vehicle; they are vulnerable.

Martin Butler also suggests that those with wealth are more self-reliant and Mike Bryant asserts: "Clearly the better position somebody is in economically, the more likely they are to respond; the more likely they are to have insurances and have protections in place that will enable them to respond." Terri Eggleton says "Certainly the wealthy would have greater capacity to cope because probably all their assets aren't tied up in the one property that has been hit. They've got money in the bank, other properties... [or] a campervan which they can jump in and [go] off for two years."

Rosalie Crawford said that evacuees from Canterbury with financial

resources were more resilient:

People who own a profitable business and their own home, and are pretty much mortgage free... They don't have family here around Tauranga but they are looking around at how [they] can help someone else. They didn't have to leave Christchurch straight away because they had resources and capacity down there. They had a long-term plan: 'where should we go?' They can fly up here, scope out Tauranga, go back again. They had cash flow, people who are economically well resourced have a greater capacity, but [those who] have their own businesses, they've actually learned the skills [to be resilient].

6.3.3.4 Community gardens

Although only coded once, Roku Mihinui mentioned the usefulness of community gardens and work that Te Arawa Lakes trust is doing in this regard to prepare for emergencies:

While we've talked about marae [as a place for community gardens], in some situations the marae would not be a safe place, for example at Whakarewarewa [due to volcanic activity]. So the school could be the next place or main emergency centre; we've already put gardens there. We are targeting those foods in the gardens that would be useful in an emergency as well.

Such gardens would provide food for the community when the supply chain is disrupted in an event.

6.3.3.5 Findings

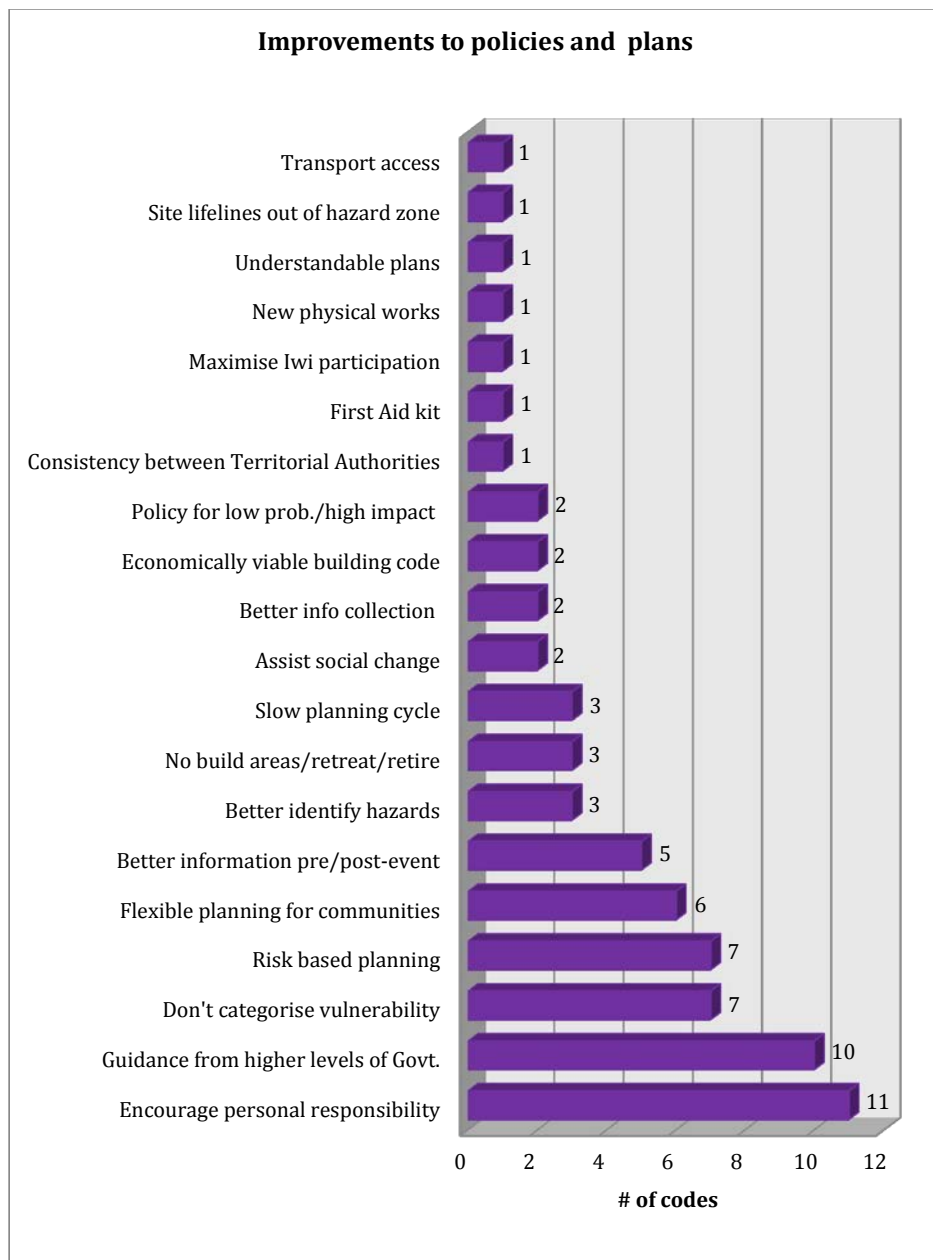
The 'silver lining' to being exposed to the more frequent natural hazards is that it gives the community the opportunity to practice their civil defence mechanisms and also reminds planners and decision makers why it is important

to locate development out of harm's way. Strong social ties among Maori and community groups increase resilience as does access to financial resources. Community gardens are a novel idea to provide access to food when supply chains are down and generate community spirit.

6.3.4 Improvements to policies and plans

Informants suggested the following improvements to policies and plans

Figure 18 Improvements to policies and plans



6.3.4.1 Encouraging personal responsibility

The number one improvement suggested by informants was that policies and plans should encourage more personal responsibility. Mayor Forbes asserts

that civil defence works best when people are encouraged to plan for an event themselves:

Civil Defence or resilience to disaster works best when an individual takes responsibility for themselves or when individuals cluster together in family groups... If people sit back and think 'no the council is going to ensure our survival and make sure we're okay' that's the big problem.

Mayor Crosby favours a more devolved civil defence process focused on individuals and the local community. TCC sought engagement from the public to devise a 'tsunami survive' plan on which the Mayor commented:

I see that as a giant leap backwards to the way civil defence used to be. It used to be community focused and then going out to the region, then national. For some reason somehow it was flipped around and taken off the community and put into national and regional initiatives but what we're saying now is when an event happens don't expect the council or the government to come and save you in the first hours.

6.3.4.2 Take a more risk-based approach to planning

Only the two planners interviewed, Campbell Larkin and Martin Butler referred to improving policies and plans by taking a risk based approach but they did so seven times. Campbell underlined the legislative imperative to look at risk:

There is an obligation on the councils to know what the risks are and to inform the community. There are two steps in the RMA, you have to avoid or you have to mitigate. In terms of planning you've got to weigh up what is the level of mitigation that brings it back to an acceptable level of risk for that community?

He highlights the importance of having a consistent approach to risk across councils. “WBOPDC... take an entirely different hazards approach methodology for managing flood hazard along the Wairoa River than TCC... on the other side. You’ve got to ask yourself, is that an integrated resilient community?” Martin Butler is unequivocal. “Where the operative RPS has singularly failed is that they have failed to address the low likelihood but high consequence natural hazards so this time around we’re taking a risk approach which we didn’t take in the first one.”

6.3.4.3 Further guidance from higher levels of government

Guidance was mentioned ten times but only in relation to helping determine risk and again only by Campbell Larkin and Martin Butler. Campbell is critical of regional council not providing a risk methodology to his territorial authority.

The regional policy... has no methodology on return [events], tolerable/intolerable [risk], how do you do it?! So there is a clear gap in my opinion in the BOP that says ‘this is how you will do it and... we’re going to set this methodology up.’

Martin Butler from BOPRC seeks further guidance from central government in determining the likelihood side of the risk equation: “We’re in a brave new world, nobody really knows what the next step is so we’re looking to central government and [Crown Research Institutes] to provide some guidance and there’s some in the pipeline, GNS in particular, with the planning side of things.”

6.3.4.4 Do not categorise vulnerability

Campbell Larkin argues how difficult it is to determine categories of vulnerability and questions why it is even necessary:

You cannot put people into vulnerability categories because every individual will respond to a hazard differently and their ability to respond to that hazard will be different as well. So say [the aged are] more vulnerable, you could say anyone greater than 80 is vulnerable; however, is that 80 year old

_____ going to be more or less vulnerable if that person was
_____ located in a retirement village on the third storey versus an
80 year old in his own house which he owns, still has
_____ transport and has good resources? In fact the second person
_____ is probably more at risk because the first person is probably
_____ protected by the building and they will be looked after, there
_____ will be care in place... I'd also say does it matter?.. The
_____ question is what is your purpose?

Mayor Crosby suggests, "post an event you could probably start putting people into categories but not before or during" and Terri Eggleton asserts that a vulnerability policy would necessarily be complex and need to be applied sensitively on an individual basis. Terry Wynyard cautions: "I think it is an area where you have to be very careful because if you create this social hierarchical system somehow, that we're going to put people into these categories, then we're creating a monster for ourselves."

6.3.4.5 More flexible planning for individual communities

Mayor Forbes is critical of the CDEMA, asserting that it allows district councils and individuals to renege on their duty to prepare:

The more that we as council say 'no, no we've planned for all of this and we've got the answers' the more people say 'well that's fine we'll let you worry about it.' What's happened under the 2002 Civil Defence Emergency Management Act is that we've taken it from a district level to a regional level. Effectively, I mean there are still some district responsibilities but that's allowing us as districts to abrogate a bit of responsibility up the chain.

Mayor Crosby is also critical, asserting that civil defence has 'evolved' upwards too far to higher levels of government and that a more local, flexible response is needed. He argues that district councils are better at communicating with their communities than higher regional or national

organisations: “authorities do a good job in cranking up their plan, they always fail in engaging with the community.” Aileen Lawrie suggests that professional emergency management and expertise sourced nationally is advantageous in an event, but that decision making pre-event is better handled locally.

I think a few years ago the emphasis was on civil defence at a local level and now the emphasis is at more of a regional level collectively. While that ticks more bureaucratic boxes and the chain of command from Wellington through to the regions has probably improved, you've got to question whether the delivery on the ground is any better or is it in fact reduced?.. I've come to the view that we need to up resource locally.

Roku Mihinui also asserts that decision-making needs to be done locally for local conditions:

Being a resident of Whakarewarewa, we're sitting over the geothermal field... some of the policies... put us pretty much in the same boat as somebody who would not ever or very rarely be susceptible to some of the environmental issues that we face in our area, particularly with a very thin earth crust over the volatile geothermal activity.

6.3.4.6 Better information before and after an event

Mayor Crosby strongly asserted a number of times in his interview that community engagement must not be overlooked when response and recovery is underway. “People will accept the good, the bad and the ugly provided that they know. What they won't tolerate is not getting information. Then they start to develop their own theories and that just creates a more dangerous situation... information is critical.”

6.3.4.7 Better identification of hazards

TCC planner Campbell Larkin advocates for greater identification of tsunami extent to aid in the calculation of risk to a standard that is able to stand up to scrutiny in the Environment Court.

6.3.4.8 No build areas, retreat, retire

Campbell Larkin also advocates curbing existing use rights in the RMA to reduce exposure. He explains that new development in harm's way can be prevented under the RMA; however, where an existing subdivision consent has been granted within existing development at risk, development on that site cannot be stopped save any mitigation measures required under the Building Act.

You have this section 106 [of the RMA], you cannot approve
a subdivision if it is at risk from a hazard; however, we have
an existing city that has large land blocks across it that were
created under [previous] subdivision rules that may be
subject to hazards; its already been subdivided. You don't
have a corresponding land-use provision that says irrespective
of that land being subdivided and is residentially zoned, 10
years later we become aware of a significant hazard risk,
when you come in for your planning consent we have the
ability to say 'you cannot build there.' We don't have that; it
doesn't exist... big flaw in my opinion.

6.3.4.9 Planning cycle too slow

Terry Wynyard laments the time it takes to implement plans and suggests that [lesson](#) learning after events such as the Canterbury earthquake needs to be included sooner.

The cycle for reviewing city plans/district plans/regional plans
under the RMA is very time consuming... it becomes very,
very cumbersome and not everybody has the will to want to

_____ go through those things... is there a better way? How do we
_____ review these plans and policies so that as we learn new stuff
_____ we can actually use it?

Terry cites flood planning in Christchurch as an example:

They started that process in 2003 and in January 2011 it was
adopted. Now you know the Environment Court, the
_____ Appeal Court the 'zillions' of dollars... to get there. It just seems
_____ to me to be a cumbersome way of bringing about change that's
_____ inevitable and change that we must have.

6.3.4.10 Assist social change

Terri Eggleton favoured an advocacy planning approach to social change by seeking out clusters of vulnerable people and specifically planning to address their particular vulnerabilities in an event: "maybe its recognition that those who live in 'that block there' are likely to be worst hit, we need to go and address them first."

6.3.4.11 Better information collection

Mayor Crosby contends that gathering the right information quickly is essential in an event and previously organisations have failed to do that effectively. When reflecting on the 2005 flooding event in Tauranga he said:

the missing component I believe was we didn't have an up
_____ and running database being prepared. In other words, what's
_____ your name, where do you live, what's your contact and what's
_____ the state of your home, what's your state, et cetera. So our
_____ call centre threw one together real quick.

6.3.4.12 Economically viable building codes

Both Terry Wynyard and Mayor Crosby question whether the level of building regulations imposed since the Canterbury earthquakes are economically viable.

Terry says: “I wouldn’t want to be a commercial building owner in the current time... I’m not saying that those buildings don’t need to be upgraded, they do. It’s a matter of reaching equilibrium.” Mayor Crosby: “its quite clear in my view that that code is going to be so restrictive that it will decimate communities financially.”

6.3.4.13 Policies for low probability/high impact events

Campbell Larkin advocates dealing with the risk of low probability, high impact events specifically in the city plan rather than relying on objectives and policies relating to subdivision matters to avoid or mitigate such events. “We’ve got this land-use gap and we don’t deal with the low probability, high impact events at all.” Martin Butler also criticises the lack of inclusion of the risk of low probability, high consequence events in the operative RPS and states that this is being redressed by the proposed RPS. “The operative RPS has singularly failed [in] that they have failed to address the low likelihood but high consequence natural hazards. So this time around we’re taking a risk approach which we didn’t take in the first one and then that enables us to get into that type of hazard.”

6.3.4.14 Consistency between territorial authorities

Campbell Larkin laments differences between councils on hazards management in the same region. “WBOPDC... take an entirely different hazards approach methodology for managing flood hazard along the Wairoa River than TCC [does] on the other side.”

6.3.4.15 Distributing a ‘first aid kit’

Rosalie Crawford advocates giving every household an emergency kit: “We should get a kit dropped off at our house; we should get a basic kit given to us. Most people don’t go and buy one because it’s too expensive and why couldn’t that come out of our rates, a kind of box suitcase, things that we can take with us?” However, Terry Wynyard would disagree strongly with such a change

Some... would say ‘thank you very much, I know I needed one

of them, I've got it now it's good.' Others would say, 'what's this all about?' 'Free food, there's a torch in there and something.' It wouldn't make a scrap of difference to. So I don't believe that by giving anybody anything tangible is necessarily the answer.

6.3.4.16 Maximise Iwi participation

Roku Mihinui holds that exclusion from the planning process contributes to vulnerability and that this needs to be rectified. "Regulations, policies and probably even the practices challenge and minimise the opportunity for iwi hapu and whanau to participate in decision making and management of various aspects of the community well-being."

6.3.4.17 New physical works

Martin Butler suggests that there are some physical works that can be done to reduce exposure such as building up higher ground in places for people to evacuate to in a tsunami.

6.3.4.18 Understandable policies and plans

Terry Wynyard advocates that guiding documents need to be clear to lay people. "You can have all the policies and plans that you like but unless you turn them into something tangible that people can understand then you could argue that they're not very effective at all."

6.3.4.19 Site lifeline infrastructure out of harm's way

Campbell Larkin asserts that more needs to be done to relocate lifelines and infrastructure out of harm's way but acknowledges that economic factors influence how viable it is to relocate.

The starting point for land-use planning [is] should core
_____ infrastructure that provides a service and... the end point of
_____ that service... be located in hazard zones? The only way that
_____ you can deal with it is to look to manage your new communities
_____ that you are building... and then you come to your existing

| _____ communities and you look to educate.

6.3.4.20 Transport Access

Roku Mihinui suggests that policies to provide reliable transport for communities affected by a hazard [are](#) a must. “You can’t get from where you are to those places of safety and support if you have to walk. If the bus system can be integrated as part of the hazard or risk resource then I’d say that would be one of the immediate ones that would make a significant impact.”

6.3.4.21 Findings

Informants see more individual and community responsibility for their own safety and survival as key to reducing vulnerability to natural hazards. The downside of better centrally planned civil defence is that it can lead to a perception by the community that they are safe and the resulting complacency. There needs to be a more risk-based approach taken by councils and government. Low probability/high impact events require more consideration. Regional council needs to support territorial authorities by providing a robust methodology to calculate risk and central government needs to provide the scientific [advice](#) to enable regional councils to help territorial authorities. Categorising individuals as having certain types of vulnerability can lead to inaccurate calculation of their sum vulnerability is fraught with difficulty and should be avoided.

Greater decision-making responsibility needs to be devolved to the district and city level. The rationale being that communication with communities is better done on locally and decisions made with local knowledge. By all means professional expertise is welcomed from higher levels of government but decisions need to be made locally. The existing use provisions in the RMA provide a challenge for effective land-use planning for natural hazards as it stymies the retirement of at risk areas. This needs to be addressed, as does the time it takes to initiate plan changes and incorporate the latest learning from hazard events.

6.4 Conclusion

All informants have a good understanding of exposure sources in the Bay of Plenty. Regarding determinants of vulnerability, 'financial' was the top code as expected but the interviews also raised some assertions that were not found in the literature review. Rural and poor communities can be less vulnerable than their urban and wealthier counterparts who may be more dependent on supply chains and live in more exposed places. Maori maybe less vulnerable than their European counterparts as their culture mitigates vulnerability through strong social ties. Elderly people can be less vulnerable than the young and fit if they have good facilities, care and financial resources. Access to transport is a determining factor as is the time of day. A disturbing finding was the exploitation of already vulnerable people by unscrupulous members of society following the Canterbury earthquakes.

The more experienced a community is in dealing with natural hazards the more resilient they become. Strong social ties among Maori and community groups increase resilience as does access to financial resources. Further work towards individual and community responsibility for their safety and survival is an important factor to reduce vulnerability. Better centrally planned civil defence can lead to complacency. There needs to be a more risk-based approach taken by councils and government and low probability/high impact events require more consideration. Government and regional council need to support territorial authorities by providing a robust methodology to calculate risk. The next chapter is a concluding section; bringing together the findings of the literature review, plan analysis and interviews.

Chapter Seven

Summary of findings and conclusion

When communities are exposed to hazards, targeting the root causes of vulnerability rather than trying to control the hazard is the best mitigation. Vulnerability is determined not by its individual factors such as wealth, health and social ties acting in isolation but rather through the combination and interaction of these together with exposure to a hazard. Land-use planning offers the opportunity to reduce this vulnerability through the advocacy, locational and design approaches. Planners need to advocate change, build resilience within the community and work to mitigate the socio-economic-political factors that generate vulnerability. Planning needs to be risk-based and undertaken not just for frequent events but also for those that are of low probability and high impact. New Zealand has robust pieces of legislation in the RMA, LGA, CDEMA BA, and LGOIMA, that provide planners, decision-makers and individuals with the foundation and tools to avoid or mitigate hazard risk.

However the lack of use of the term vulnerability is a glaring omission that needs addressing to help focus local authorities on the task of reducing it. In addition, the 'existing use' rights conundrum presented by the RMA requires serious thought if we are going to make meaningful locational decisions to reduce exposure.

Within the BOP the CDEM Group plan identifies hazards well but needs to include outcomes that are measureable beyond being simply achieved or not achieved. The RPSs, DPs and proposed CP all identify hazards and have clear objectives and policies but once again no measures of the outcomes. Including measures could improve compliance. BOP policies and plans coded building/lifeline infrastructure strength and education determinants of vulnerability the most. There was some confusion in plans regarding terminology which needs to be cleared up. The BOPCDEM Group plan used vulnerability to describe the exposure of infrastructure and exposure is referred to as vulnerability in both the operative RPS and the ODC DP. Financial codes were only mentioned in the BOPCDEM Group plan which is surprising given the weight that finances plays in determining vulnerability as found by the literature review. There is a potential inconsistency between both the operative and proposed RPS and the TCC proposed CP. The RPSs instruct territorial authorities to identify hazards and provide information about affected properties in LIM. All operative district plans mention this but the proposed CP does not. This needs to be addressed before the CP becomes operative. Resilience is only used in connection with the BOPCDEM Group plan and the BOPRC LTP and AP. Resilience is absent from the operative RPS, which may be a reason why it is absent in territorial authority plans.

Further study needs to be undertaken to see if succeeding plans address vulnerability more than the predecessors. The proposed RPS has only 'education/preparation' and 'exposure' codes and in a smaller number than the operative RPS, which includes the 'building/lifeline' code. Likewise the TCC proposed CP only codes 'building/lifeline' and 'exposure' whereas the operative DP mentions four codes. The financial, gender, health, political and social ties determinants of vulnerability need to be acknowledged and addressed better.

Including a broad range of determinants requiring mitigation in a NPS on natural hazards, the National CDEM strategy, BOPCDEM Group plan and the RPS will direct needed measures to the community. District plans and the city plan need to include an acknowledgement of vulnerability and specific locational and design measures to address them. Advocacy planning measures to reduce vulnerability need to be explicitly adopted in long term and annual plans.

There are no advocacy planning codes in the BOPRC AP, ODC LTP, ODC AP, TCC AP, and the TCC proposed CP. The omission from the CP is particularly worrisome. There should be more public participation and protection of social/ecological systems in newer plans, not less. The only social change code is mentioned in the BOPCDEM Group plan regarding the regeneration of communities affected by a hazard. If there is to be a reduction in vulnerability to natural hazards in the BOP then local authority policies and plans need to encourage positive social change. The 'retreat/retire' code is absent from RPSs and while policies for the retirement or relocation of buildings and other assets policies are mentioned in DPs and the CP it is questionable how effectively these policies can be implemented considering the RMAs existing use rights provisions. The operative RPS and the BOPRC LTP have a major focus on the maintenance and construction of physical works in an attempt to control flooding. The practicality of continuing to upgrade existing works in the face of future climate change needs to be seriously looked at; particularly as a desire to 'control the hazard' can lead to the 'safe development paradox.' The TCC operative DP and proposed CP are to be congratulated for having a strong emphasis on protecting coastal ecological infrastructure; this is something ODC may wish to emulate further.

The interviews showed that all the informants have a good understanding of their exposure to natural hazards and all had strong concern for reducing the vulnerability of the population to natural hazards. As could be expected they mentioned finances more than any other determinant of vulnerability. However other findings suggest the complexity of vulnerability and

the care needed when seeking to address it. Urban and wealthy [communities that may be more dependent on supply chains](#) can be more vulnerable than their rural, poorer counterparts. [Those of European ethnicity](#) may be more vulnerable than their Maori counterparts. The young and fit can even be more vulnerable than the elderly in certain circumstances. It reinforces the fact that vulnerability is not determined by individual factors but rather the interplay between all determinants. The BOP region has great beauty and amenity. The natural attraction [we have to these](#) exposed places increases [exposure and](#) vulnerability. A lack of access to transport coupled with a lack of financial resources complicates evacuation and resettlement. [There](#) needs to be acknowledgement that vulnerability changes according to time of day and [there must be acknowledgement and actions](#) to disrupt the exploitation of already vulnerable people by unscrupulous members of society. Strong social ties and access to financial resources are [key](#) determinants of resilience and our capacity to cope is increased through experiencing natural hazards but only if lessons are learned and implemented quickly into new policies and plans. Community gardens are a novel idea to provide access to food when supply chains are down and generate social ties.

Informants suggested a number of improvements to policies and plans including building individual and community responsibility rather than relying on councils and government. A stronger centrally planned civil defence system has worked against this and to an extent led to a perception by some that they are safe. This is why decision-making responsibility needs to be devolved back to the district and city level. There needs to be a more risk-based approach taken by councils and government, not neglecting low probability/high impact events. [Government and](#) regional council need to support territorial authorities in the development of risk calculation methodology and [the provision of](#) scientific expertise and advice. ['Boxing in'](#) individuals as having certain types of specific vulnerability should be avoided as it could be argued it is insensitive as well as fraught with difficulty.

The obvious implication of this research is that vulnerability is a complex and diverse problem that is not mitigated by placing people into broad categories divorced from the sum of their circumstances. There are so many issues that need to be resolved to reduce the vulnerability of the Bay of Plenty to natural hazards but the very fact that community leaders, planners and decision makers are aware of this gives hope that we will be a less vulnerable community in the future.

References

American Planning Association (APA) (2009). AICP Code of Ethics and Professional Conduct. Retrieved July 27, 2013 from <http://www.planning.org/ethics/ethicscode.htm>

American Planning Association (APA) (2012). What is Planning? Retrieved April 4, 2012 from <http://www.planning.org/aboutplanning/whatisplanning.htm>

Aysan, Y. F. (1993). Keynote Paper: Vulnerability Assessment. In: Merriman, P & Browitt, C. (Eds.), *Natural Disasters: Protecting Vulnerable Communities*, p. 1- 14.

Bay of Plenty Civil Defence Emergency Management Group (BOPCDEMG) (2005) Bay of Plenty Civil Defence Emergency Management Group Plan 2005. Retrieved 31 May 2013 from <http://www.boprc.govt.nz/media/30806/CivilDefence-200804-CDEMGPlan2008.pdf>

Bay of Plenty Civil Defence Emergency Management Group (BOPCDEMG) (2012). Bay of Plenty Civil Defence Emergency Management Group Plan 2012-2017. Retrieved 31 May 2013 from: http://www.boprc.govt.nz/media/225203/bay_of_plenty_civil_defence_emergency_management_group_plan_2012-2017_-_version_for_final_formatting_pdf.pdf

Bay of Plenty Regional Council (2010). Bay of Plenty Regional Policy Statement (BOPRC RPS). Retrieved May 9, 2012 from <http://www.boprc.govt.nz/media/31390/Policy-100318-Operative-RPS-incorporatingChangeNo3-revised.pdf>

- Bay of Plenty Regional Council (2011). Bay of Plenty Regional Council Annual Plan 2011-2012 (BOPRC AP). Retrieved July 19, 2013 from <http://www.boprc.govt.nz/media/98290/annualplan2011.pdf>
- Bay of Plenty Regional Council (2012). Long Term Plan 2012 – 2022 (BOPRC LTP). Retrieved 31 May 2013 from <http://www.boprc.govt.nz/knowledge-centre/plans/ten-year-plan/>
- Bay of Plenty Regional Council (2012). Proposed Regional Policy Statement (BOPRC Proposed RPS). Retrieved 31 May 2013 from <http://www.boprc.govt.nz/knowledge-centre/policies/the-next-regional-policy-statement/proposed-regional-policy-statement/>
- Bell, R.G., Goff, J., Downes, G., Berryman, K., Walters, R.A., Chaque-Goff, C., Barnes, P. & Wright, I. (2004). Tsunami hazard for the Bay of Plenty and eastern Coromandel Peninsula: stage 2. Technical report for Environment Bay of Plenty. Retrieved 19 July 2013 from <http://www.boprc.govt.nz/media/33562/Report-200406-TsunamiReportYear2.pdf>
- Becker, J., Saunders, W., Hopkins, L., Wright, K., & Kerr, J. (2008). Pre-event Recovery Planning for Land-use in New Zealand: An Updated Methodology (No. 2008/11). Institute of Geological and Nuclear Sciences Limited.
- Berke, P.R., Roenigk, D.J., Kaiser, E.J., & Burby, R. (1996). Enhancing plan quality: evaluating the role of state planning mandates for natural hazard mitigation. *Journal of environmental planning and management*, 39(1), 79-96.
- Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: lessons from resilience thinking. *Natural Hazards*, 41(2), 283-295.
- Brody, S. D. (2003). Are we learning to make better plans? A longitudinal analysis of plan quality associated with natural hazards. *Journal of Planning Education and Research*, 23(2), 191-201.
- Buckle, P., Mars, G., & Smale, S. (2000). New approaches to assessing vulnerability and resilience. *Australian Journal of Emergency Management, The*, 15(2), 8.
- Building Act (2004). Retrieved April 4, 2012 from http://www.legislation.govt.nz/act/public/2004/0072/latest/whole.html?search=ts_act_building+act_resel&p=1#d1m306036
- Burby, R.J. (1998). Natural hazards and land use: An introduction In R.J. Burby (Ed.), *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities* (pp. 1-26). Washington D.C:

Joseph Henry Press.

Burby, R. J. (2006). Hurricane Katrina and the paradoxes of government disaster policy: Bringing about wise governmental decisions for hazardous areas. *The Annals of the American Academy of Political and Social Science*, 604(1), 171-191.

Cannon, T. (1994). Vulnerability Analysis and the explanation of 'Natural Disasters,' in A. Varley (Ed.) *Disasters, Development and Environment*, London: John Wiley and Sons, pp13-30.

Cardona, O.D., van Aalst, M.K., Birkmann, J., Fordham, M., McGregor, G., Perez, R., ... Sinh, B.T. (2012). Determinants of risk: exposure and vulnerability. In C.B. Field, V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, ... & P.M. Midgley (Eds.) *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge, UK, and New York, NY, USA: Cambridge University Press, pp. 65-108.

Civil Defence Emergency Management Act (2002). Retrieved April 4, 2012 from <http://www.legislation.govt.nz/act/public/2002/0033/latest/whole.html#d1m149789>

Checkoway, B. (1994). Paul Davidoff and advocacy planning in retrospect. *Journal of the American Planning Association*, 60(2), 139-143.

Creswell, J. W. (2009). *Research Design: Qualitative, quantitative and mixed methods approaches* (3rd ed.). Thousand Oaks, California: Sage.

Cutter, S. L. (1996). Vulnerability to environmental hazards. *Progress in human geography*, 20, 529-539.

Cutter, S. L., Mitchell, J. T., & Scott, M. S. (2000). Revealing the vulnerability of people and places: a case study of Georgetown County, South Carolina. *Annals of the Association of American Geographers*, 90(4), 713-737.

Davidoff, P. (1965). Advocacy and pluralism in planning. *Journal of the American Institute of Planners*, 31(4), 331-338.

Department of Conservation (DOC) (2010) New Zealand Coastal Policy Statement (NZCPS). Retrieved June 1, 2012 from <http://www.doc.govt.nz/publications/conservation/marine-and-coastal/new-zealand-coastal-policy-statement/new-zealand-coastal-policy-statement-2010/>

- Department of Internal Affairs (DIA) (2008). National Civil Defence Emergency Management Strategy. Retrieved June 6, 2012 from http://www.civildefence.govt.nz/memwebsite.nsf/wpg_url/for-the-cdem-sector-national-cdem-strategy-index?opendocument
- Department of Internal Affairs (DIA) (2011a) Opotiki District Council retrieved 17 January 2013 from http://www.localcouncils.govt.nz/lqip.nsf/wpg_URL/Profiles-Councils-Opotiki-District-Council-Main
- Department of Internal Affairs (DIA) (2011b) Tauranga City Council retrieved 16 January 2013 from http://www.localcouncils.govt.nz/lqip.nsf/wpg_URL/Profiles-Councils-Tauranga-City-Council-Main?OpenDocument
- Dunham, D. (2007, January 18). Flood zone still a wasteland 20 months on, *Bay of Plenty Times*. Retrieved May 31, 2011 from <http://www.bayofplentytimes.co.nz/local/news/flood-zone-still-a-wasteland-20-months-on/3718086/>
- England, P. (2006). *Climate Change: What are Local Governments Liable for?* (pp. i-14). Brisbane: Griffith University.
- Folke, C., Colding, J. & Berkes., F. (2003). Synthesis: building resilience and adaptive capacity in social-ecological systems. In F. Berkes, J. Colding and C. Folke (Eds.), *Navigating social-ecological systems: building resilience for complexity and change* (pp. 352–387) Cambridge, UK: Cambridge University Press.
- Freudenburg, W. R., Gramling, R., Laska, S., & Erikson, K. T. (2008). Organizing hazards, engineering disasters? Improving the recognition of political-economic factors in the creation of disasters. *Social Forces*, 87(2), 1015-1038.
- Gaddis, E. B., Miles, B., Morse, S., & Lewis, D. (2007). Full-cost accounting of coastal disasters in the United States: implications for planning and preparedness. *Ecological Economics*, 63(2), 307-318.
- Gallopín, G. C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change*, 16(3), 293-303.
- Gamper, C. D., & Turcanu, C. (2009). Can public participation help managing risks from natural hazards? *Safety Science*, 47(4), 522-528.
- Glavovic, B. C. (2008). Sustainable coastal communities in the age of coastal storms: Reconceptualising coastal planning as 'new'naval architecture. *Journal of coastal conservation*, 12(3), 125-134.
- Glavovic, B.C. (2010). The Role Of Land-Use Planning In Disaster Risk Reduction: An Introduction To Perspectives From Australasia. *The*

- Australasian Journal of Disaster and Trauma Studies*, 2010-1.
- Glavovic, B. C., Saunders, W. S. A., & Becker, J. S. (2010). Land-use planning for natural hazards in New Zealand: the setting, barriers, 'burning issues' and priority actions. *Natural Hazards*, 54(3), 679-706.
- Godschalk, D. R., Beatley, T., Berke, P., Brower, D. J., & Kaiser, E. J. (1999). *Natural Hazard Mitigation: recasting disaster policy and planning*, Washington D.C.: Island Press.
- Gordon, E., Schirra, S., & Hollander, J. (2011). Immersive planning: a conceptual model for designing public participation with new technologies. *Environment and Planning-Part B*, 38(3), 505
- Gray, D. E. (2009). *Doing Research in the Real World* (2nd ed.). London: Sage.
- Hallegatte, S., & Corfee-Morlot, J. (2011). Understanding climate change impacts, vulnerability and adaptation at city scale: an introduction. *Climatic Change*, 104(1), 1-12.
- Handmer, J. (2008). Risk creation, bearing and sharing on Australian floodplains. *International Journal of Water Resources Development*, 24(4), 527-540.
- Hague, C. E., & Etkin, D. (2007). People and community as constituent parts of hazards: the significance of societal dimensions in hazards analysis. *Natural Hazards*, 41(2), 271-282.
- Hennessy, K., Fitzharris, B., Bates, B.C., Harvey, N., Howden, S.M., Hughes, L., Salinger, J., & Warrick, R. (2007): Australia and New Zealand. In M.L. Parry, Canziani, O.F., Palutikof, J.P., van der Linden, P.J., & Hanson, C.E., (Eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, 507-540.
- Heskin, A. D. (1980). Crisis and response: a historical perspective on advocacy planning. *Journal of the American Planning Association*, 46(1), 50-63.
- Hoch, C. J. (2002). Evaluating plans pragmatically. *Planning Theory*, 1(1), 53-75.
- Hunter, P., Burkitt, Z., & Trangmar, B. (2010). Local government adapting to climate change: Managing infrastructure, protecting resources, & supporting communities In R. Nottage, Wratt, D., Bornman, J., & Jones, K. (Eds.), *Climate change adaption in New Zealand: Future scenarios*

- and some sectoral perspectives. (pp. 1-136). Wellington, New Zealand: Climate Change Centre.
- Insurance Council of New Zealand (ICNZ) (2012). The Cost of Disaster events. Retrieved April 3, 2012 from <http://www.icnz.org.nz/current/weather/index.php>
- Klein, R. J., Nicholls, R. J., & Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept?. *Global Environmental Change Part B: Environmental Hazards*, 5(1), 35-45.
- Laukkonen, J., Blanco, P. K., Lenhart, J., Keiner, M., Cavric, B., & Kinuthia-Njenga, C. (2009). Combining climate change adaptation and mitigation measures at the local level. *Habitat International*, 33(3), 287-292.
- Laurian, L., Crawford, J., Day, M., Kouwenhoven, P., Mason, G., Ericksen, N., & Beattie, L. (2010). Evaluating the outcomes of plans: theory, practice, and methodology. *Environment and planning. B, Planning & design*, 37(4), 740.
- Lee, B-Y. (2010). Working together, building capacity - A case study of Civil Defence Emergency Management in New Zealand, *Journal of Disaster Research*, 5(5): 565-576.
- Local Government Act (2002). Retrieved April 4, 2012 from <http://www.legislation.govt.nz/act/public/2002/0084/latest/whole.html#dml170873>
- Local Government Official Information and Meetings Act (1987). Retrieved 5 April, 2013 from <http://www.legislation.govt.nz/act/public/1987/0174/latest/whole.html#DLM123065>
- Macbrayne, R., & Rowan, J. (2005, July 15) Matata desperate for compo news, *New Zealand Herald*, Retrieved July 3, 2012 from http://www.nzherald.co.nz/rosaleen-macbrayne/news/article.cfm?a_id=132&objectid=10335926
- Massey University (2010) Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants. Retrieved July 6, 2012 from <http://www.massey.ac.nz/massey/research/research-ethics/human-ethics/code/code.cfm>
- McFadgen, B. G. (2008). *Hostile Shores: Catastrophic Events In Prehistoric New Zealand And Their Impact On Maori Coastal Communities*. Auckland, New Zealand: Auckland University Press.

- McSaveney, M. J., Beetham, R. D., & Leonard, G. S. (2005). The 18 May 2005 debris flow disaster at Matata: Causes and mitigation suggestions. GNS Client Report, 2005/71.
- McSaveney, E., Stewart, C., & Leonard, G. (2009). Historic volcanic activity – Tarawera, Te Ara - the Encyclopedia of New Zealand, updated 2-Mar-09. Retrieved July 27, 2012 from <http://www.TeAra.govt.nz/en/historic-volcanic-activity/2>
- McSaveney, E. (2010) Historic earthquakes - The 1987 Edgecumbe earthquake, Te Ara - the Encyclopedia of New Zealand, updated 13-Jul-12. Retrieved July 19, 2013 from <http://www.TeAra.govt.nz/en/historic-earthquakes/11>
- Mileti, D.S. (1999). *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington D.C.: Joseph Henry Press.
- Miller, F., Osbahr, H., Boyd, E., Thomalla, F., Bharwani, S., Ziervogel, G., ... & Nelson, D. (2010). Resilience and vulnerability: complementary or conflicting concepts. *Ecology and Society*, 15(3), 11.
- Ministry for the Environment (MfE). (2008). Climate Change Effects and Impacts Assessment: A Guidance Manual for Local Government in New Zealand. Wellington: Ministry for the Environment. Retrieved July 3, 2012 from <http://www.mfe.govt.nz/publications/climate/climate-change-effect-impacts-assessments-may08/>
- Ministry of Civil Defence and Emergency Management (MCDEM) (2005). Recovery Management – Directors Guidelines for CDEM Groups. DGL4/05. Wellington. Retrieved June 26, 2012 from [http://www.civildefence.govt.nz/memwebsite.nsf/Files/RecoveryManagementDirectorsGuideline05/\\$file/RecoveryManagementDirectorsGuideline05.pdf](http://www.civildefence.govt.nz/memwebsite.nsf/Files/RecoveryManagementDirectorsGuideline05/$file/RecoveryManagementDirectorsGuideline05.pdf)
- Ministry of Health (MoH) (2008). DHB Maps and Background Information from the Atlas of Socioeconomic Deprivation in New Zealand NZDep2006 – Bay of Plenty, Lakes. <http://www.health.govt.nz/publication/dhb-maps-and-background-information-atlas-socioeconomic-deprivation-new-zealand-nzdep2006>
- Moore, T.S., Lapan, S. D., & Quartaroli, M. T. (2011). Case Study Research. In S. D. Lapan, M. T. Quartaroli, & F. J. Riemer (Eds.). *Qualitative Research: An Introduction to Methods and Designs* (Vol. 37). Jossey-Bass.
- Moorfield, J.C., (2013). Te Aka Māori-English, English-Māori Dictionary.

Retrieved 31 May 2013 from <http://www.maoridictionary.co.nz>

Murphy, B. (2007). Understanding uncertainty and reducing vulnerability: Lessons from resilience thinking. *Natural Hazards*, 41(2), 297-315.

National Police Agency of Japan (2012). Damage Situation and Police Countermeasures associated with 2011 Tohoku district - off the Pacific Ocean Earthquake December 26, 2012. Retrieved 3/1/13 from http://www.npa.go.jp/archive/keibi/biki/higaijokyo_e.pdf

Nelson, M., Ehrenfeucht, R., & Laska, S. (2007). Planning, plans, and people: Professional expertise, local knowledge, and governmental action in post-Hurricane Katrina New Orleans. *Cityscape*, 9(3), 23-52.

New Zealand Planning Institute (NZPI) (2012). Vision, Goals and Objectives. Retrieved March 26, 2012 from http://www.planning.org.nz/Category?Action=View&Category_id=446

O'Brian, G., O'Keefe, P., Rose, J., Wisner, B., (2006). Climate change and disaster management, *Disasters* 30(1), 64-80.

Opotiki District Council (2005). Opotiki District Plan (ODC DP). Retrieved 31 May 2013 from <http://www.odc.govt.nz/publications/district-plan.aspx>

Opotiki District Council (2011). Opotiki District Annual Plan 2011/12 (ODC AP). Retrieved May 31, 2013 from <http://www.odc.govt.nz/media/81089/annual%20plan%202011%20to%202012%20-%201.95mb.pdf>

Opotiki District Council (2012a) About Opotiki. Retrieved May 31, 2013 from <http://odc.govt.nz/visiting/about-opotiki.aspx>

Opotiki District Council. (2012b). About the Opotiki District. Retrieved August 7, 2012 from <http://www.odc.govt.nz/publications/district-plan/part-i-introduction/10-about-the-opotiki-district.aspx>

Opotiki District Council (2012c) *Harbour Project Factsheet*, Retrieved May 31 2013 from <http://www.odc.govt.nz/harbour-project/fact-sheet.aspx>

Ozawa, H. (2011) Japan's ancient tsunami warnings carved in stone, *Agence France-Presse (AFP)*, retrieved July 3, 2012 from <http://www.google.com/hostednews/afp/article/ALeqM5hjZl3ysxLbDfoZ4VD7krN9g0RQqw?docId=CNG.42018502043ba9252f3fa2fe6c31dce7.1091>

Park, J. (1911). Tarawera Eruption and after, *The Geographical Journal* 37(1), 42-49.

- Paton, D. & Johnston, D. (2001). Disasters and communities: vulnerability, resilience and preparedness. *Disaster Prevention and Management*. 10(4), 270-277.
- Planning Institute of Australia (PIA) (2012). Urban design. Retrieved December 4, 2012 from <http://www.planning.org.au/aboutpia/urban-design>
- Port of Tauranga (2012). Commodities. Retrieved May 31, 2013 from <http://www.port-tauranga.co.nz/About-Us/Commodities/>
- Puszkun-Chevlin, A., Hernandez, D., & Murley, J. (2006/7). Land use planning and its potential to reduce hazard vulnerability: Current practices and future possibilities. *Marine technology society journal*, 40(4), 7-15.
- Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy sciences*, 4(2), 155-169.
- Resource Management Act (1991). Retrieved April 4, 2012 from <http://www.legislation.govt.nz/act/public/1991/0069/latest/whole.html#d1m230265>
- Saunders, W. S. A., & Beban, J. G. (2011). Risk-based approach to natural hazards. *Planning Quarterly*, 183, 18-21.
- Saunders, W.S.A., Prasetya, G. & Leonard, G.S. (2011). New Zealand's Next Top Model: Integrating tsunami inundation modeling into land use planning, *GNS Science Miscellaneous Series* 34, 42 p
- Saunders, W. S. A. (2012). *Innovative land-use planning for natural hazard risk reduction in New Zealand* (Doctoral dissertation, Massey University, Palmerston North, New Zealand). Retrieved July 20, 2013 from <http://muir.massey.ac.nz/handle/10179/3270>
- Shaw, R., Colley, M., & Connell, R. (2007). Climate Change adaption by design: a guide for sustainable communities. Retrieved July 19, 2013 from http://www.tcpa.org.uk/data/files/bd_cca.pdf
- Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor M., & Miller, H.L. (Eds.) (2007). *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK and New York, NY, USA.
- Standards Australia/Standards New Zealand (2005). Risk Management Guidelines: Companion to AS/NZS 4360:2004. Retrieved 4 April, 2013 from <http://bch.cbd.int/database/attachment/?id=12285>

- Statistics New Zealand (2006). Quick Stats About a Place. Retrieved August 7, 2012 from <http://www.stats.govt.nz/Census/2006CensusHomePage/QuickStats/AboutAPlace.aspx?expand=1000004&ParentID=&type=region&ss=y%20title=&scrollLeft=0&scrollTop=93>
- Statistics New Zealand (2011). Subnational Population Estimates. Retrieved October 26, 2011 from http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationEstimates_HOTPJun11.aspx
- Stegman, M. A. (1985). Paul Davidoff: Symbol and Substance. *Journal of the American Planning Association*, 51(3), 375-377.
- Tauranga City Council (2006). Operative District Plan. Retrieved July 3, 2012, from <http://www.tauranga.govt.nz/council-documents-reports/councils-regulatory-documents/city-and-district-plans/district-plan/operative-district-plan.aspx>
- Tauranga City Council (TCC CP) (2011). Proposed City Plan. Retrieved August 3, 2012 from: <http://www.tauranga.govt.nz/council-documents-reports/councils-regulatory-documents/city-and-district-plans/city-plan.aspx>
- Tauranga City Council (TCC AP) (2011). Tauranga City Council Annual Plan 2011/12. Retrieved 31 May 2013 from <http://www.tauranga.govt.nz/council-documents-reports/councils-lead-documents/annual-plans/annual-plan-2011-2012.aspx>
- Tauranga City Council (2012). About Tauranga City. Retrieved August 7, 2012 from <http://www.tauranga.govt.nz/about-tauranga-city.aspx>
- Tauranga City Council (TCC LTP) (2012). Tauranga City Long Term Plan 2012-22. Retrieved May 31 2013 from <http://www.tauranga.govt.nz/council-documents-reports/councils-lead-documents/ten-year-plans.aspx>
- Tonkin & Taylor (2006). Natural Hazard Management Research Report. Retrieved 4 April, 2012 from <http://www.qualityplanning.org.nz/qp-research/natural-hazards-aug06/index.php>
- Turner, B. L., Kasperson, R. E., Matson, P. A., McCarthy, J. J., Corell, R. W., Christensen, L., ... & Schiller, A. (2003). A framework for vulnerability analysis in sustainability science. *Proceedings of the national academy of sciences*, 100(14), 8074-8079.
- Turner, B. L. (2010). Vulnerability and resilience: coalescing or paralleling

- approaches for sustainability science?. *Global Environmental Change*, 20(4), 570-576.
- United Nations International Strategy for Disaster Reduction (UNISDR) (2004). UNISDR Terminology on Disaster Risk Reduction. UNISDR: Geneva.
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social-ecological systems. *Ecology and society*, 9(2), 5.
- Weichselgartner, J. & Bertens, J. (2000), Natural disasters: acts of God, nature or society? - On the social relation to natural hazards', in M.A. Andretta (Ed.), *Risk Analysis II*, WIT Press, Southampton, pp. 3-12.
- Weichselgartner, J. (2001). Disaster mitigation: the concept of vulnerability revisited. *Disaster Prevention and Management*, 10(2), 85-95.
- Western Bay of Plenty District Council (WBOPDC) (2002) *Operative Western Bay of Plenty District Plan*. Retrieved June 25, 2012 from <http://www.westernbay.govt.nz/Publications/DistrictPlan/Operative-PlanA/>
- Wisner, B. (2004). Assessment of capability and vulnerability, in G. Bankoff., Frerks, G. & Hilhorst, D. (Eds.) *Mapping Vulnerability: Disasters, Development and People*, London: Earthscan, pp183-193.
- Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). *At risk: natural hazards, people's vulnerability and disasters*. London: Routledge.

Appendices

Appendix 1: interview questions

The following questions were asked of informants:

- 1) What are the main *natural hazards* that have the potential to affect your community?
- 2) Which people in your area are *exposed* to those hazards?
- 3) Do you think those exposed to hazards are aware of the *risk* they face?
- 4) Which people are *vulnerable* to those hazards and why?
- 5) Which people would have a greater *capacity to cope* and higher level of *resilience* in a hazard event?
- 6) What are the main policies and plans relevant for reducing *exposure* and *vulnerability*? How effective are they? (Please be specific)
- 7) What should be done to improve the effectiveness of these policies and plans? (Please be specific)

Appendix 2: informant consent form



**The role of Land-Use Planning in reducing the vulnerability of the
Bay of Plenty region to Natural Hazards**

Steve Morris
MRP Student

2 The Glade, Papamoa Beach,
Papamoa, 3118.

Mobile: 021 519 941
T: 07-542 1602
E-mail: info@stevemorris.co.nz

PARTICIPANT CONSENT FORM

I have read the Information Sheet and have had the details of the study 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/do not agree to the interview being sound recorded.

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

I wish/do not wish to have data placed in an official archive.

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

Signature: _____ **Date:** _____

Full Name - printed _____

Supervisor: **Dr. Bruce Glavovic**
Resource & Environmental Planning Programme

Massey University
Private Bag 11 222
Palmerston North 4442

Mobile: 021 856 339 T: 06-356 9099 Ext 2036 F: 06-350 5689 E-mail: b.glavovic@massey.ac.nz