# Sink or Swim: The implementation of flood hazard reduction in the Lower North Island, New Zealand.

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Now the thick'n'd Sky Like a dark Ceiling stood;
down rush'd the Rain, Impetuous, and continu'd till the Earth
No more was seen.

Milton, 1663.

# Abstract

This thesis examines how flood hazard reduction is currently being implemented by local government in the Lower North Island of New Zealand. Recent reforms of environmental and local government legislation have placed responsibility for flood hazard management firmly onto local government.

Under the previous regime flood hazard management was primarily the responsibility of government bodies such as the National Water and Soil Conservation Organisation and implemented at the local level through catchment and water boards and territorial local authorities. Flood hazard management under this regime was incremental, and resulted in a bias towards the use of structural protection for flood hazard control. Territorial local authorities were variable in their attempts to use land use planning as a means of controlling development on floodplains.

This research aimed to determine how local councils were implementing their flood hazard responsibilities under the Resource Management Act 1991. A case study of six district councils, and two regional councils in the Lower North Island was undertaken. Several methods were used in conducting this research. District plans and regional policy statements were analysed by a plan coding method, which enabled the assessment of the ways in which councils were implementing flood hazard reduction. Interviews with the relevant staff were also carried out to ascertain the institutional and organisational environment within which planning staff were implementing flood hazard reduction.

The research findings suggest that Territorial Local Authorities continue to be variable in their approaches in implementing flood hazard reduction. District and city councils are continuing to rely on the use of structural protection as the main method of flood hazard reduction. This was often at the expense of investigating the use of other methods of flood hazard control. The councils in this study cited a lack of information as the main reason for their inaction in relation to proactive flood hazard reduction. Despite this, the two regional councils were both taking an active role in assisting Territorial Local Authorities in flood hazard reduction. Although the regional councils appeared to be fulfilling their responsibilities satisfactorily, it became evident that there were communication difficulties between regional councils and the district and city councils. The plans also revealed that some basic Resource Management Act requirements, for example monitoring were not being fulfilled. Overall, it was found that the district and city councils were continuing to rely on structural protection for flood hazard reduction and, in some instances, are struggling to fulfil the basic requirements of the Resource Management Act.

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# Chapter One: Introduction

Floods are probably the most universal of all natural hazards, and tend to have the greatest spatial impact. As well as causing losses, floods have more beneficial aspects than any other natural hazard. People are drawn to areas prone to flooding by the very characteristics- easily obtainable water supply and fertile, flat terrain- which contribute to their potential for damage. Floods are a natural process which have contributed to the shape of our landscape and maintained a range of wetland habitats. Floods also assist in maintaining soil fertility through the deposition of silt and the flushing of salts from surface layers (Smith, 1992). It is these positive aspects of rivers and flooding that lead people to reside in potentially hazardous areas. The impact that human uses of floodplains have on increasing flood losses, has not always been readily recognised. Many people prefer to perceive the problem as one resulting from extremes of nature, and in doing so, can ignore the sometimes difficult, steps that can be taken to minimise susceptibility to flood losses through land use planning.

New Zealand is particularly susceptible to flooding. The most serious flooding can be expected in the north and east of the North Island and the west of the South Island. New Zealand is a geologically young country with steep hills and high mountains, as well as abundant and heavy rainfall feeding streams and rivers which fall quickly to the sea. In addition to this, the native vegetation has been largely removed and replaced with pasture. All these factors coincide to make New Zealanders susceptible to a volatile flood hazard with the possibility of high damage potential. The damage potential of floods is dependent on a variety of factors, but is closely related to the nature of flood plain occupance, and stage of economic development which have as much influence on losses as the physical characteristics of a flood. If the flood hazard was better managed and planned for, then flood losses could be dramatically minimised.

This thesis examines flood hazard reduction in the context of recent environmental and local government reforms. In particular, it addresses the extent to which local government is moving towards sustainable management of the flood hazard. This chapter briefly outlines the changes in institutional context for natural hazard management, the main theoretical approaches to natural hazard management and the research objectives and questions.

## Theoretical Approaches to Natural Hazards Research

In order to understand fully the process of flood hazard reduction the theoretical philosophies which underlie natural hazard adjustments must first be discussed. These

theoretical approaches provide an important overall context through which planning for flood hazard reduction may be viewed. The approaches outline the main philosophies and concepts which effect the implementation of natural hazard reduction. They discuss the role people play in natural hazards and natural hazard reduction, and the arguments for and against a collective response (i.e., government intervention) to natural hazard management. The following section describes the theoretical approaches that have developed in approaching hazard management. These approaches have been developed by geographers in an attempt to find a suitable response to the problem of human adjustment to hazards.

Two main approaches to the study of natural hazards have evolved over the last 40 or so years, which, although slightly different in conceptual basis, share some of the same themes. A third approach has recently developed and is partly based on a combination of the first two approaches. The two main approaches are the Human Ecological Approach and the Structural Approach. The third is known as the Contextual Approach.

## The Human Ecological Approach

This approach originates from the University of Chicago hazards school and the work of Gilbert. F. White. Before the advent of this approach there were generally only two types of response to the flood hazard, loss bearing and engineering works (White, 1964).

White noted that "the rate of increase in damage potential through urban encroachment on unprotected floodplains, was greater or equal to the rate of decrease through engineering protection" (White, 1964, 3) and that although expenditure on flood control was rising, so too were losses [1](White et al., 1958 in White [ed.]1974a). He also appreciated that these increases in losses may be influenced by factors such as population growth and made more apparent through improved communications such as television. In 1974 White stated that

> Every parameter of the biosphere subject to seasonal, annual, or secular fluctuation constitutes a hazard to man [sic] to the extent that his adjustments to the frequency, magnitude, or timing of it's extremes are based on imperfect knowledge. Were there perfectly accurate predictions of what would occur and when it would occur ... there would be no hazard (1974a, 3).

In this approach hazards are seen as "an aspect of the interaction of man and nature arising from the common process in which men [sic] seek in nature that what is useful,

[1]It is interesting to note that this situation does not exist in Britain, where factors such as low post-war population growth and housing stock growth have resulted in less encroachment onto floodplains (Handmer, 1987c).

and attempt to buffer that which is harmful to man [sic]" (Kates, 1971, 439). Human Ecologists realise that there is a fine line between a resource and a hazard, and that the difference is merely one of extremes. They recognise that the benefits of inhabiting hazardous areas are often strong enough to outweigh the potential threat posed by living in these areas. A hazard is seen as a function of both the natural event and human use system and any change in either can, theoretically, have an impact on losses (Burton, Kates and White, 1978), as can be seen in Figure 1.1.

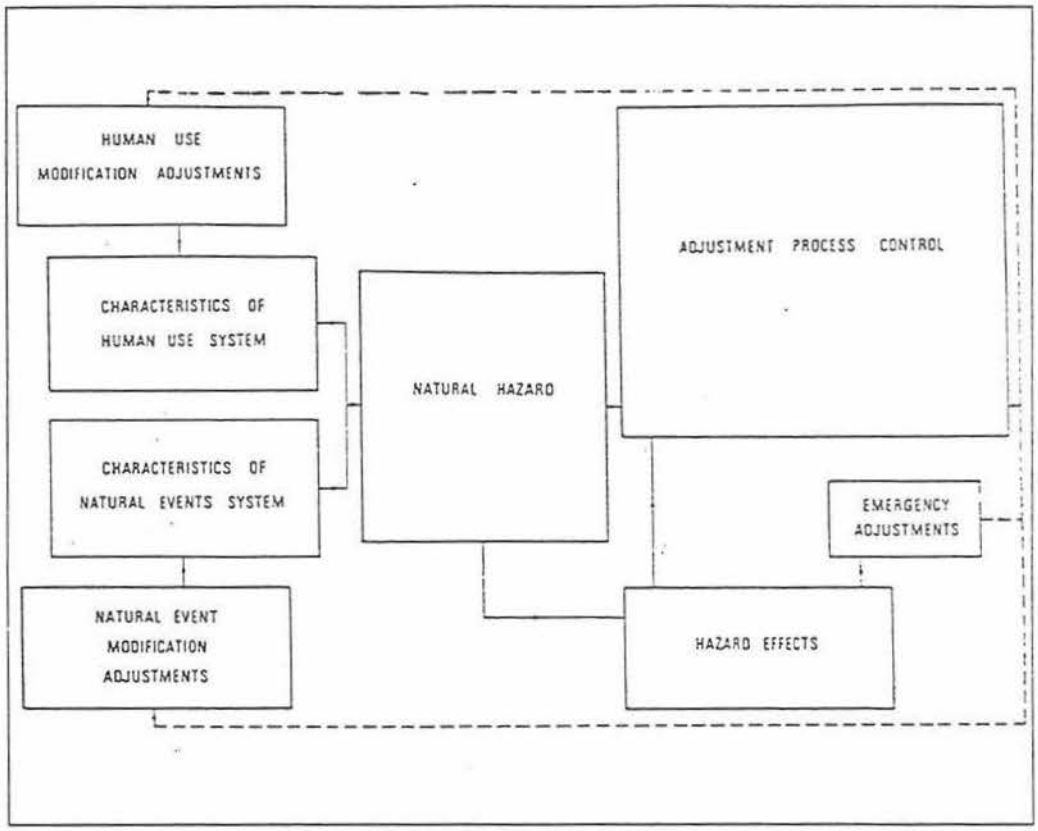


Figure 1.1. Human adjustment to natural hazards: outlines of a general systems model. Source: Kates, 1971, 443.

The Human Ecological Approach offers explanations and practical solutions to the flood hazard problem, which is seen as the apparently irrational behaviour which causes people to occupy places of risk. Factors such as perception and experience (knowledge) of decision-makers, along with the influence of vested interests at the community level are seen to be the main influences which determine how people choose to adjust[2] to the flood

[2]as opposed to adapt which is a long term adjustment on a societal level (Keen, 1994)

hazard. The most notable aspect of this approach is the classification of adjustments based on the part of the hazard that is being addressed. These are, in the case of flooding, modifying the flood event, modifying flood loss susceptibility and modifying the flood loss burden (Beyer, 1974; Ericksen, 1986a).
The Human Ecological Approach has contributed most to these choices of adjustment through its emphasis on land use planning and the control of human behaviours (the human use system). Human Ecologists search for an understandable, workable model of human decision-making in adjusting to the flood hazard and explores the role of hazard perception, seeing this as possibly the most important influence on the choice of adjusting to hazards.

**Hazard Perception**

The way in which people perceive natural hazards is dependent on a variety of factors, all influencing the outcomes of natural hazards adjustments. Human Ecologists propose that experience of flooding is an important influence on flood hazard perception. This approach proposes that the more floods a person has experienced, the more they are aware of the possibility of further floods.

Human Ecologists analyse the characteristics of hazard perception through integrating ideas such as the notion of 'bounded rationality', which they see as having an important influence on the choice people make of whether or not to take action to reduce the possibility of flood hazard damage. The idea of 'gambler's fallacy', 'anchoring' and 'locus of control' are also thought to play a role in influencing peoples choice of adjustment to flooding.

Bounded rationality "asserts that the cognitive limitations of the decision-maker force him[sic] to construct a simplified model of the world to deal with" (Slovic, Kunreuther and White, 1974, 189). The key principle of this theory is that of 'satisficing' where the goal to be achieved is satisfactory to the person rather than the optimum achievable (ibid.). The gambler's fallacy is an example of bounded rationality. The gambler's fallacy effect (ibid.) asserts that if an event, such as a flood, has happened one year it is unlikely to happen the next. An example of this is the idea of the return period, i.e., 'The flood had a return period of 1 in 100 years' implying that if a flood occurred in a certain area last year it will not occur in that area for another 99 years.

Anchoring is a process whereby people take what they have experienced and attempt to relate it to a wider body of knowledge to help them make judgements and decisions about a threat. Ericksen (1986a) gives the example of Opotiki residents who had seen water running up the street and stopping before their property in past floods and who subsequently believed themselves flood-free, until a larger event struck.

The concept of locus of control refers to whether people feel that an event is within or beyond their control i.e., whether they can influence the end result. If the event is perceived as beyond their control the locus of control is seen as being in the hands of fate, god or government (Ericksen, 1986a; Sims and Saarinen, 1969). Erroneous perception of the causes of flooding may be the main reason for shifting the locus of control. Residents of the community Rock River, Illinois, objected strongly to attempts at better floodplain management through planning, as they wrongly perceived the main cause of the flood hazard was the build up of silt in the river (Moline, 1974).

Related to experience of flooding is the importance placed by Human Ecologists on the concept of thresholds. They propose that a certain threshold must be reached in order to begin the adjustment process, and that the process of choice does not begin until after the first threshold, 'the threshold of awareness' has been exceeded. This threshold may be of actual or anticipated loss and must be passed to induce a person to recognise the existence of the hazard and ways of dealing with it. Once the second, 'action threshold' has been reached, the need for purposeful action to modify and remedy losses is acted upon. In this stage the individual searches for a number of alternatives involving changes in resource use or technology. The third threshold is the 'intolerance threshold'. Once this threshold has been crossed the reasons for migrating become sufficiently compelling and the individual finds a new location (Burton, Kates and White, 1978).

Burby et al. (1988, 90) give an example of an everyday application of the Human Ecological Approach to flood hazard reduction. They cited the choice of house location as being comprised of a two-stage decision process consisting of the decision to move from the previous location and the choice of the new house site. For the first stage decision they agree with human ecologists that "consumers who are seeking a new location because they have suffered flood losses are less likely to settle in another flood-prone area". In the second stage of the decision, they found through their own research that consumers were likely to have ranked their main site-related objectives and that freedom from flooding was not highly ranked on this list.

**Criticisms of the Human Ecological Approach**

Structuralists (see below) criticise this approach as being essentially technocratic and environmentally deterministic. They are quick to point out that the initiative in a disaster is seen to be with nature which determines where and what social conditions and responses will become significant. The Human Ecological Approach is criticised for viewing disaster as occurring because of chance occurrences of natural extremes, modified in detail only by human circumstances (Hewitt, 1983a).

Hewitt (1983a, 10) states that "hazards are not viewed as integral parts of man-environment relations or as directly dependent on those". He gives an example of how language reinforces the sense of otherness in this approach, severing the problem from the rest of human-environment relations and life, i.e., the use of the word 'event' reinforces the idea of a discrete unit in space and time.

## The Structural Approach

This emerged during the late 1970s and early 1980s out of research being carried out on hazards in underdeveloped countries. It is a Marxist response to the inadequacies perceived in the Human Ecological Approach. This approach defines disasters as "the interface between an extreme physical event and a vulnerable human population" (Susman, O'Keefe and Wisner, 1983, 264).

Disasters are seen to be more strongly influenced by factors such as capitalism and marginalisation increasing the vulnerability of certain groups in society than the characteristics of the extreme natural events themselves (Smith, 1992). Structuralists assert that "the severity of a natural hazard depends upon who you are, and to what society you belong to at the time of disaster" (Bryant, 1991,7).

The Structural Approach emphasises the constraints that are placed on individual action by more powerful and broader institutional forces, the 'political economy' (Waddell, 1983). According to the advocates of this approach, disasters and the damages caused by them are characteristic, rather than accidental, features of the places in which they occur. The risks, pressures and uncertainties that bear upon the awareness of, and preparedness for, natural fluctuations stem mainly from ordinary life rather than from the rareness and scale of those fluctuations.

The role of geophysical processes in a disaster is not entirely rejected, merely sidelined as the primary disaster-inducing mechanism. In contrast to the Human Ecological Approach which treats everyday life and disaster as opposites, the Structural Approach is concerned with the degree to which natural hazards are not explained by geophysical processes which initiate damage; the degree to which human awareness of and responses to natural hazards are not dependent on geophysical conditions (mechanisms, frequency or past experiences of them); and the extent to which the natural disaster, its causes, features and consequences are not explained by conditions or behaviour peculiar to hazardous events. White and others did make this distinction in their work, but nevertheless interpreted crises as being the function of the imperfect knowledge of the victims which could probably be resolved through the transmission of knowledge. Developing opposition to the former approach " urges that disasters cease to be automatically qualified as 'natural' " (Waddell, 1983a, 39).

Hewitt (1983a) questions the basis of the Human Ecological Approach by challenging some basic assumptions. He questions whether people are poorly prepared for disasters due to the unpredictability of natural extremes or whether they are preoccupied with present gratifications and therefore discount the possibility of flooding. He challenges the basis of the Human Ecological Approach within western society, by asserting that most people simply do not have the time, or means, to prepare for natural disasters, as all their risk-avoiding and risk-taking energies have been used up in coping with other aspects of survival such as saving for retirement.

## The Contextual Approach

This approach, as outlined by Mitchell, Devine and Jagger (1989) focuses on the contextual character of natural hazards. It combines some elements of both the structural and the human ecological approaches outlined above. The context of hazards is seen as multi-layered. It includes not only factors of space and time that bestow uniqueness on specific events, but also independent processes that affect exposure to the hazard and vulnerability, and the prominence of hazards on public and private agendas (Mitchell, Devine and Jagger, 1989). Essentially, the Contextual Approach comprises elements of the previous two approaches and in addition, takes into account political influences on hazard management.

The Contextual Approach is so-called because of the importance of the contexts in which hazard adjustments lie. These contexts may be spatial, temporal, organisational, environmental, sociocultural, economic, political or of some other form. As "contexts are largely independent of natural-hazard systems and are subject to a host of exogenous factors, they are highly changeable. This characteristic poses a dilemma for the hazards analyst. It is very difficult to derive broadly applicable conclusions from studies of specific natural disasters, because contexts are likely to vary " (ibid., 406).

The example used by Mitchell, Devine and Jagger in applying this approach was a cyclonic storm which hit Southern England in 1987, four days before the stock market crash. The main policy issues that arose after the storm were the ineffective late warning issued and the inadequate sources of information. These were seen as the main causes of the event and were attributed to government cutbacks in weather ships in the area[3]. Officials saw the storm as a rare event, which did not warrant major expenditures on protection systems (ibid., 399). The circumstances surrounding the storm (the stockmarket crash) meant that there was no focus on improvements in hazard management after the disaster, and little criticism of storm response failures by the media.

[3] A classic example of a shift in locus of control.

Britain was an appropriate setting for the initial application of the contextual approach, as the nature of its institutional framework meant that structural forces have a strong influence on policy-making and decision-making systems. Penning-Rowsell rejects the complete domination of these forces and states that local mediating factors, such as the quality of staff involved and the hierarchical structures within which these individuals operate also influence "the evolution of events " (Penning-Rowsell, 1987, 61).

## Overview of theoretical approaches to natural hazards research

All of the three approaches have strengths and weaknesses. The Human Ecological Approach offers practical suggestions to hazard problems. It may overemphasise the importance of the earth and atmospheric system as the cause of natural disasters, at the expense of examining socio-cultural causative factors (Morren Jnr, 1983). The Human Ecological Approach places some blame with the victim whereas the structural approach takes a broader view, recognising that the response of the individual may be beyond his or her immediate control (ibid.). Structuralists would argue that everyday realities such as saving for old age, providing for children's education, and paying off the mortgage, means it has become increasingly difficult for people to set aside time and resources for the possibility of events with potentially disastrous effects.

The Structural Approach fails to provide for the fact that populations do not always have the resources to barrier themselves from disaster, and that some people will always be poor and have uneven access to knowledge. All individuals are constrained to some extent by the institutional, economic and social circumstances in which they find themselves. Most institutions, whether they are local councils, real estate agencies or government departments, have influence which transcends an individual's free choice. In turn, the institutions themselves are moulded by macro-scale economic and political processes. The Structural Approach offers no viable practical solutions (Smith, 1992).

The Contextual Approach attempts to integrate the above two approaches, while also explicitly incorporating the role of risk in responses to hazards and costs involved. It recognises, and partly provides for, the political influences on the hazard response system. This approach is quite broad and requires extensive familiarisation with the processes involved to be fully comprehensible. Refinement over time may resolve these anomalies. It is also theoretical in nature, offering few useful practical solutions.

Overall, it appears that the Human Ecological Approach, which has dominated research into New Zealand flood hazard management, generally assesses the hazard system on a different scale to that used by Structuralists. The Human Ecological Approach

concentrates on personal influences on the hazard system as opposed to Structuralists, who deal with the vulnerability of an individual to hazards within the bigger picture.[4] This bigger picture is also of primary importance to those advocating the Contextual Approach.

An integrated framework combining aspects of each approach is used in this thesis. More emphasis will be focused on Human Ecological type adjustments as the research for this thesis is mainly concentrated on the local level. This approach contains the relevant level of detail and the general nature of solutions required for the problem to be explored. Other aspects of the research will have a structural emphasis, for example in identifying the constraints on institutions in managing the flood hazard. The contextual nature of the New Zealand flood hazard will also be explored.

This thesis aims to examine flood hazard reduction within the New Zealand planning context. Specifically, it aims to examine how councils are implementing flood hazard reduction within the legislative context of the RMA and in an environment of devolved responsibility for the flood hazard. It has been five years since the enactment of the RMA and although it is still relatively early to predict the ability of councils to effectively manage this hazard, some indications of capability in this regard should be beginning to be revealed.

# Thesis Aims, Objectives and Research Questions

The main objective of this thesis is to answer the following question:

*How is local government implementing flood hazard reduction measures in the current legislative regime?*

The objectives that this thesis will achieve in answering the main research question are:

## Objective one

*To describe theoretical approaches to flood hazard management*

What makes flooding hazardous?

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[4] It should be noted that Structuralists express a desire to study specific hazard situations in greater detail (Wisner and Henry 1993). If they carried these studies out, they may come to some of the same conclusions as Human Ecologists (who have undertaken studies at this level of detail) as to what influences impact most on hazard systems.

Should the onus be on collective action (i.e., councils) at all?
What responses are available for those responsible for flood hazard reduction?
What factors influence effective flood hazard management planning?

### Objective two

*To describe the past and present institutional contexts for flood hazard management in New Zealand*

How has flood hazard management developed in New Zealand?
Who was previously responsible for managing the flood hazard?
Who is currently responsible for managing the flood hazard?
How does the Building Act 1991 influence the responses of councils to the flood hazard?

### Objective three

*To identify the approaches councils are adopting in fulfilling their flood hazard responsibilities*

In what ways are councils responding to their flood hazard responsibilities?
How are these flood hazard reduction measures being implemented into the newly prepared district plans?

### Objective four

*To identify the constraints on planners responsible for flood hazard reduction*

What are the factors determining councils responses to floods?
What opposition exists to flood hazard management under RMA?
How does the institutional context affect councils ability to achieve flood hazard reduction?
In what ways could councils improve their flood hazard responses?

# A New Context for Natural Hazard Management

New Zealanders have always attempted to deal with the problem of managing the flood hazard. Historically, the adjustments to flooding in this country were of a structural nature and mainly relied on the use of stopbanks to control flooding. In many ways this legacy is still with us. However, both in New Zealand and overseas, there has been a move towards the adoption of non-structural measures such as land use planning to

mitigate the flood hazard. This has occurred primarily because of the realisation that structural protection has a limited ability to mitigate the flood hazard.

Over the last 100 years a raft of policies for natural hazard management, and flooding in particular, has been developed by central government, in its various forms. These attempts at natural hazard management and flood hazard control were developed on an incremental basis and administered by an increasingly complicated bureaucratic system i.e., the changing structure and functions of catchment boards. This ad hoc approach resulted in a fragmentary, complicated and often confusing, natural hazard management structure which appeared to be making little progress in the implementation of natural hazard reduction.

One obstacle to the effective implementation of natural hazards management and flood hazard reduction is the commitment of councils to achieve this goal, which has often been questionable. From the early 1970s onwards, attempts by central government to ensure that councils fulfilled their flood hazard responsibilities in controlling hazardous development met strong resistance from parochial local government. This resistance was based on three main concerns. Councils perceived flood hazard reduction through land use planning would; limit their rating base through controlling development on floodplains, make existing properties in potentially floodable areas harder to sell; and possibly make them liable for existing properties in floodable areas which they had previously permitted development (Ericksen, 1986a).

In New Zealand, as a consequence of the reforms of central government and natural hazards, responsibility for natural hazard management was placed more firmly with local government. In addition, policy changes at the national level confirmed central government's intention that local communities were to take responsibility for local problems. Central government would no longer take responsibility for ongoing funding of structural works, such as stopbanks, and economic relief following a disaster would be limited. This reduction in central government intervention, was generally consistent with the economic philosophy of the 1984 Fourth Labour Government.

The Resource Management Act 1991 (hereafter referred to as the RMA) meant that local government in the form of regional councils, territorial local authorities and unitary authorities now have primary responsibility for natural hazard management to be implemented within the purpose of sustainable management. This piece of legislation marked the end of a transition in environmental policy development in New Zealand. A semi-coercive and prescriptive style of mandate characterised both the Town and Country Planning Act 1977 and Water and Soil Conservation Act 1967, in which central government was heavily involved. The RMA is a more co-operatively based and

devolved mandate which assumes the willingness of local government to fulfil the goal of sustainable management.

However, the move to a more co-operative style of resource management did not include either significant financial incentives or technical assistance which a co-operatively based mandate requires to be fully effective (May et al., 1996, forthcoming). How councils will manage their natural hazard responsibilities will be dependent on the commitment of their councils to the problem of natural hazards and the capacity they have for implementing flood hazard reduction policies.

## Thesis Structure and Chapter Outline

Chapters two and three comprise the literature review. Chapter two provides information on what comprises a flood hazard, the flood hazard reduction measures available to those with responsibility for mitigating the hazard and planning and organisational influences on flood hazard management. Chapter three discusses flood hazard management in New Zealand, both historically and in the present day, and outlines the current institutional.

Chapter four outlines the research design and methods used to address the research objective and questions. This includes the selection of case study areas, and explanation of the two main methods used to obtain the information. Two areas were chosen for the case-study, the Manawatu-Wanganui region and the Wellington region. A method of plan analysis known as plan coding, was applied to the district plans, using criteria adapted for the purposes of this thesis. Regional Policy Statements were also coded and assessed for the purpose of determining the influence of regional councils on local level flood hazard implementation. Interviews with selected participants were also undertaken to supplement and inform the results obtained in the plan analysis.

Chapter five presents the results of the plan coding and interviews. The plan coding results are presented first, followed by the interview findings which are summarised in the form of tables. Chapter six identifies and analyses the key issues which emerged from the research results, in the light of insights gained from the literature review. The issue of sustainable floodplain management is examined. This chapter also includes some suggestions to remedy the problems identified in the research. Finally, chapter seven evaluates the research design, assesses the research findings in light of the stated aims of the research objectives and offers some further suggestions of ways in which flood hazard reduction can be improved in practice.

# Chapter Two: Flood hazard reduction

This chapter comprises three parts. The first part of this chapter deals with the nature of the flood hazard. The causes and characteristics of floods will be examined in this section. The second part of the chapter assesses the theoretical range of adjustments proposed by those who have previously researched this topic. The range of practical choices for New Zealand conditions is also assessed within this context. The third part looks at the relevant aspects of planning theory as this thesis aims to explore the question of how councils are managing their flood hazard responsibilities. The application of planning theory contributes useful insights into how councils are implementing their flood hazard responsibilities in practice, through examining structures of power within organisations, the role of information, the influence of vested interests, and factors affecting the implementation of policy by local government.

## The Flood Hazard

The nature of a flood, for example spatial extent and silt load can have an important influence on the type of damages sustained by those on the floodplain. Additionally, the type and amount of flooding experienced can be aggravated by several factors, related to the way in which humans use the environment. The flood hazard is predominantly a physical event consisting of an excedance in the capability of a catchment to accommodate the rainfall received. This can result in some serious property damage and occasional loss of life. There are two main factors which affect the damage potential of floods and the effectiveness of flood mitigation measures. These two factors are the causes of the floods and the physical characteristics of floods.

### Causes of Floods

Flood causes are divided into two categories, primary causes, which result from external climatological forces and secondary causes, essentially flood intensifying conditions which are often human-induced (Smith, 1992).

#### Primary

The main cause of riverine flooding is rainfall. A flood is an excess of rainfall in a given area over a given time period. High intensity rainfall often occurs with localised convectional storms. Areas of unstable air with high humidity tend to occur near warm oceans, areas of frequent thunderstorm activity or mountains in the path of moisture laden winds (Bryant, 1991), such as the New Zealand axial range.

Currently, uncertainty clouds our climate, making accurate prediction of weather patterns, especially long term, even harder than usual. Campbell states that with a potentially changing climate "the intervals between extreme events may be reduced" and that any impending climate change could mean "heavy rainfall extremes may occur more frequently in most parts of New Zealand, and with greater magnitude than today" (Campbell, 1991, 29-30). When intense rainfall cells combine with small drainage basins a flash flood may occur. Melting snow may also cause flooding, which may become especially dangerous when combined with rainfall (Smith, 1992).

**Secondary**

Natural flood intensifying conditions

These conditions exacerbate the drainage basin response to primary causes. Drainage basin topography is one natural flood intensifying condition. The condition of a catchment has an important influence on the nature of flood flows. Factors such as the size and shape of the catchment, and surface conditions such as frozen soils reducing infiltration, will have a major effect on the speed at which rainwater moves through the stream system. The smaller and steeper the catchment, the greater the effect of a rainfall event. New Zealand has many small, steep catchments that have been relatively recently and extensively, altered in land use and vegetation. This can have a catastrophic impact on flooding as was seen with Cyclone Bola in 1988. "New Zealand's rivers tend to have very large flows (high specific discharges) for the size of their catchments" (Waugh, 1992,7).

Floodplain topography also has a major effect on the nature of a flood. Channel morphology and floodplain topography directly determine aspects of a flood such as magnitude and areal extent. New Zealand has a continuum of river types reflecting channel morphology from tortuous meandering to braided (Mosley, 1992b). A flood with a large areal extent but shallow depth, will usually be the result of factors such as a small channel and wide floodplain and vice versa.

Human-Induced Flood Intensifying Conditions

These conditions generally consist of human actions which have, or are about to, change the land use. They may be deliberate in nature such as the improvement in the drainage capacity of agricultural land (Smith, 1992) by mole tunnelling, which increases drainage, thereby speeding the rate of runoff from pasture. Deforestation is another example of a human-induced flood intensifying condition. It increases runoff through the reduced

interception capacity of the vegetation, and increases sediment deposition (which in turn reduces channel carrying capacity).

Another example of an human-induced flood intensifying condition is urbanisation, which has a major effect on flooding in several ways. The first of these is through the creation of highly impermeable surfaces such as roofs, paving and roads. This has the effect of increasing runoff quantity and rate though inhibiting infiltration. Waugh (n.d., in Ericksen, 1986a, 16) states that "the 100 year flood may be doubled in size by complete urbanisation of a catchment in which 30 percent is paved". Urbanisation of a catchment may also change the nature of a flood resulting in floods of shorter duration but greater magnitude as shown in Figure 2.1.

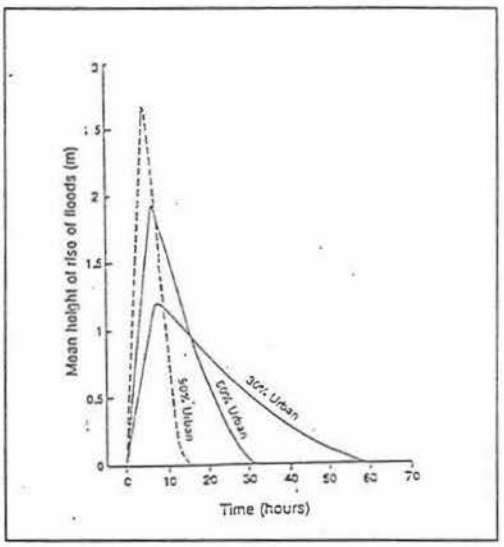


Figure 2.1 The Effect of urbanisation on a catchment.
Source: Williams, 1976 in McConchie in Mosley (ed.) 1992a, 338.

Second, urban surfaces are serviced with a dense network of infrastructure (drains and sewers) which deliver excess water more rapidly to the stream channel. This also has the effect of increasing the speed of flood onset. Stormwater drains and sewers are constructed to required design levels which can also be exceeded, further exacerbating a flood. This is especially likely when the infrastructure is old and subsequently has a limited flood water carrying capacity. The constriction of the natural river channel through bridges and other structures also reduces the carrying capacity of the channel (Smith, 1992).

## Physical characteristics of floods

The physical characteristics of floods greatly affect the hazardous extent of flooding. The damages caused by a flood can often be directly related to the characteristics of the flood. Seasonality and flood frequency relate to the chances of a flood occurring at any one time. The duration of a flood, magnitude and speed of onset in combination with the velocity and load of floodwaters have a major influence on the extent of flood damages. The most important rainfall indices for flood analyses are the duration (hours) and intensity of rainfall (centimetres/hour) and areal extent (Ericksen, 1986a).

### Seasonality

New Zealand's climate and rainfall are influenced by three main variables; our position in the zone of westerly winds, location within a large area of ocean (ensuring the westerlies are moisture-laden when they arrive) and our orography (Tomlinson, 1992). New Zealand suffers from dry summers in its eastern areas but Ericksen (1986a) asserts that, despite this, there is no marked seasonality of flood events, although rainfall does show seasonal influences.

### Flood Frequency

Frequency (also referred to as the return period) is the prediction of the chance of recurrence of a particular flood size, over a certain time horizon. The accuracy of this prediction depends on the availability of stream flow data over a long time period. Frequency assessment is a very important tool for the planning and design of long term adjustments to floods such as engineering works and comprehensive flood loss reduction programmes.

Two approaches are generally taken to flood frequency assessment. In the first, the analyst has a flood of a given magnitude and wishes to know how frequently this can be expected in the future (i.e., one in every twenty years). Use of the second approach requires the analyst to know the magnitude of a flood with a frequency of a certain period, i.e., how deep is the 100 year flood. (Ericksen, 1986a). The probability of this flood being exceeded once in any 100 year period (the annual excedence probability - AEP) is only 63% but the probability of two or more events which will exceed the 100 year return period within a 20 year period is 1.7% (Pearson, 1992).

Inadequate data poses significant problems for those assessing flood frequency. Pearson (1992) gives an example of this in the assessment of the 50 year flood for the Waimakariri River. In 1951 the size of the 50 year flood was calculated at 3950 cusecs, in 1971 this was recalculated at 3900 cusecs using the additional data gathered in the

subsequent 20 years and in 1991 this was further scaled down to 3700 cusecs. These types of difficulties place the accuracy of design levels of many types of flood protection in doubt.

**Duration**

Duration of the flood is the time the river is above bankfull stage and can vary from minutes to months[5]. The period of time to the next rainfall and the amount of water stored in the catchment as groundwater, soil moisture, snow and lakes all influence the duration of a flood (Pearson, 1992). The duration of a flood may also be prolonged due to natural and artificial barriers and depressions, which may cause drainage to be impeded well after the initial flood has passed (Ericksen, 1986a).

**Magnitude and areal extent**

Flood magnitude (depth) can be expressed in physical (discharge in cumecs or cusecs) or probabilistic (5-year flood) terms. Magnitude in turn depends on contributing factors such as type, duration, intensity and spatial distribution of rainfall, drainage basin size and shape, and land use (Beyer, 1974). The state of wetness of a catchment before a flood also has an important influence on flood magnitude (Pearson, 1992). The greater the magnitude the higher flood losses are likely to be. Areal extent is a function of flood magnitude, floodplain topography and channel morphology. The larger the areal extent, the greater the damage potential.

**Speed of Onset**

Speed of onset defines the forecasting ability of the flood and the amount of time available for issuing warnings. Smaller catchments may have flash floods which have effectively no warning time, and larger catchments may have days before flood waves will reach vulnerable areas. New Zealand is almost entirely made up of relatively small catchments meaning that speed of onset is often in the vicinity of hours. Thunderstorms are the primary cause of most of New Zealand's flash floods (Tomlinson, 1992). The cumulative effect of tributary flows can be important in effective forecasting and warning systems (Ericksen, 1986a) and the speed of onset of a flood affects the viability of emergency actions and contingency floodproofing measures.

**Velocity and Load**

The velocity (speed) at which a flood flows and the load (sediment) that it carries, can greatly affect the amount and type of damages incurred by the flood. Ponding can serve

[5] The 1993 Mid-west floods of the United States lasted for several months.

to reduce the velocity at which flood flows through a community, although it can also increase the amount of sediment left after the flood, (Ericksen, 1986a). The sediment load of a flood flow will drop as the velocity of the flood decreases. The amount of sediment in any flood flow can greatly affect the amount of damages sustained in a flood. New Zealand floods often contain high levels of silt due to the nature of our catchments.

# Flood Hazard Responses

Responses to the flood hazard have evolved over the last few decades with the emphasis generally moving away from structural methods of flood control towards non-structural methods of flood control. This shift is occurring in New Zealand, albeit later than in countries such as the United States. This shift has not come about through the altruistic desires of people to internalise their externalities. It has occurred for one of three reasons. First, the level of structural protection is as high as it can possibly be in terms of economic justification (i.e., cost-benefit analysis). Second, changes in government policy during the mid-1980s and the third is that the structural protection in place has still resulted in damaging floods. This evolution from structural to non-structural methods[6] is being accompanied by a change in philosophy. The emphasis is moving away from the physical control of the flood through flood abatement and diversion measures, to the control of the use of the floodplain by people.

Human Ecologists classify adjustments to hazards in three ways, modifying the event, modifying the loss susceptibility and modifying the loss burden. Figure 2.2 demonstrates the extent of adoption, of each adjustment in New Zealand for flooding in 1985-6.

## Modify the Event (adjust the flood to people)

The adjustments used in this category are known as structural measures and can be divided into flood abatement and flood diversion measures.

### Flood Abatement Measures

Flood abatement measures attempt to reduce the size of the flood by decreasing the amount of run-off entering the system. This is generally done through catchment treatment which requires the practices used to be adopted over a majority area of the basin to be effective (Smith, 1992).

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[6] This has generally not occurred in Britain (Handmer, 1987c).

Catchment Treatment

Catchment treatment involves strategies such as reforestation, grazing strategies to protect vegetation and minimise forest fires, and the treatment of slopes such as terracing. The preservation and creation of wetland areas to hold water in an extreme event is also a form of catchment treatment.

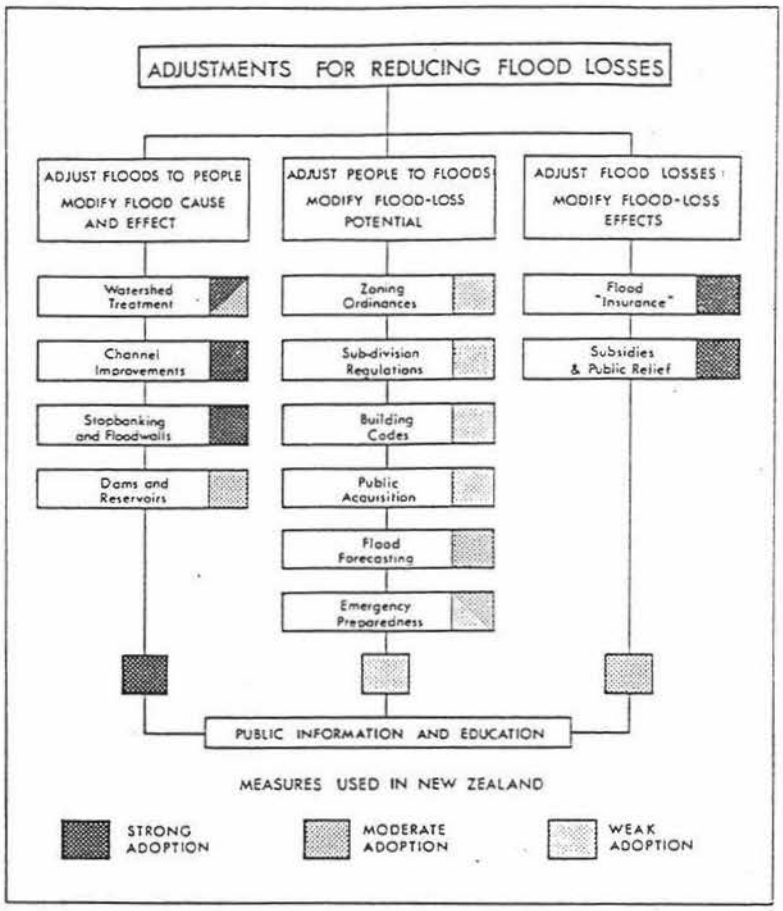


Figure 2.2 Chart of Flood Adjustments and the extent to which they are adopted in New Zealand. Source: Ericksen, 1986a, 240.

Development practices are continuing to destroy wetland areas which can intensify flooding problems in many areas (Office of the Parliamentary Commissioner for the Environment, 1988). Wetlands areas could be extremely useful for multi-objective planning through their ability to integrate control of both water quantity and quality. For flood control, wetland areas can reduce peak flows in streams and waterways by storing flood waters and gradually releasing them to rivers while also treating water runoff (Fahey and Rowe 1992; Fulton, 1993). In urban areas, catchment treatment uses spaces such as parking lots for on-site storage of run-off. Doubts have been thrown on the

effectiveness of some forms of catchment treatment due to the expense involved and the large amount of land required to make any real impact on the flood event.

In some parts of New Zealand various forms of this adjustment may be impractical because of numerous small sized catchments and any catchment treatment undertaken would involve vast sums of money. Some catchment treatment has been carried out in New Zealand, particularly in regions of unstable hill country such as the East Coast/Hawkes Bay. This was undertaken less for flood control purposes (although this would have undoubtedly been a consideration) and more for erosion control purposes (Office of the Parliamentary Commissioner for the Environment, 1988). This work was carried out by the now defunct catchment boards and financial resources are no longer available from central government for this type of work, as discussed in chapter three.

Weather Modification

This involves attempts to modify precipitation patterns through methods such as cloud seeding. This adjustment is rarely used as it has not been proven effective and issues such as the redistribution of precipitation to other areas can have adverse effects on the result.

**Flood Diversion measures**

Flood diversion measures attempt to regulate flood waters after formation. These structural measures consist of stopbanks, channel improvements and dams. Adjustments of this kind are by far the most commonly adopted means of flood control in New Zealand and a common sight in many lower catchment areas. These types of adjustment are becoming more unpopular in New Zealand as the public become more environmentally aware. As Burby et al., (1988, 2) note "Each of the engineering approaches to flood damage prevention entails some environmental disruption or damage".

Stopbanks

Stopbanks are a community adjustment which effectively raise the banks of the river channel, allowing for the discharge of higher levels of water. They divert flood-flows further downstream or out to sea, where they are less of a hazard. Stopbanks protect only to design level. The design level includes a measure of 'freeboard' in which the stopbank has an extra area of height included over and above the design level in an attempt to ensure maximum protection.

Stopbanks can fail in several ways. The first of these is overtopping which occurs if the flood waters exceed the design level. Overtopping can also cause stopbanks to collapse

as, while water is pouring over it, the stopbank may be rapidly eroding. Burch (1987, 87) expresses the concern that planning authorities rarely quantify the risk of overtopping or let this risk be fully appraised by their planning departments. Moreover, the design levels of stopbanks can be reduced by the infilling of the channel by sediment. Stopbanks can also be undermined by the lateral movement of the river which erodes the stopbank resulting in a breach or collapse in a flood. Similarly, failure of the foundations of a stopbank through the build up of water pressure in the foundations of the stopbank can also cause the stopbank to be undermined by 'ground heave' (Worley Consultants, 1994).

Additionally, stopbanks can be damaged by hazards such as earthquakes, trampling by grazing stock and modification by people such as those who choose to build steps and bar-be-ques into them (Miller, pers. comm., 1995). They are capable of causing catastrophic results when they do fail, as was demonstrated in the 1993 Mid-West floods of the United States.

Previously, structural measures have been the most popular option in New Zealand for those seeking to control the flood hazard. As has been repeatedly shown the use of stopbanks has some drawbacks for flood hazard control. The 'levee effect' occurs when structural protection works exist in combination with increasing flood plain development. The greater the amount of floodplain development and the greater the amount of existing investment, then the greater will also be the economic benefits to be obtained from the flood control structures. Under these circumstances a cost-benefit analysis will probably have a positive result and protection will be provided for the area of the floodplain due to the high levels of assets lying there unprotected. The floodplain is then perceived by floodplain dwellers and developers as free from the flood hazard, land values rise and further development takes place. This type of protection makes it perfectly rational for an individual to locate in a potentially floodable area as their assets are protected at minimal cost to themselves.

Stopbanks also require continuous maintenance to keep them at design level, which makes them expensive even once they have been constructed. In New Zealand, three reports reviewing flood protection schemes found that many previous works were over-capitalised and have caused problems for maintenance of existing systems without subsidies from central government (May et al., 1996, forthcoming).

Options for councils choosing this method of flood protection include strengthening or altering existing banks or building new ones. Strengthening can involve sheetpiling or constructing a concrete core to alter the design levels of the stopbank. Unfortunately, to strengthen existing systems and even build new ones requires substantial funding.

Channel Improvements

These works consist of the removal of flow impeding vegetation and sediment through dredging and gravel extraction which may enlarge or realign the channel, or provide floodways. Rock works and groynes are also frequently used to strengthen channel banks by reducing the erosional ability of water. Channel works can have major adverse effects on the habitat of channel inhabitants and amenity values. Channel improvements are commonly used by regional councils to control floodflows and erosion.

Gravel extraction for commercial purposes is an effective way of removing the excess sediment which has built up in the channel by maintaining the carrying capacity of the channel and controlling the bed level of the river. The planting of riparian vegetation can also improve the channels carrying capacity through the reduction of erosion of berms and stopbanks, thereby reducing the amount of sediment supplied to the river from its banks. However, riparian vegetation can also compromise flood protection works by reducing the area available to hold flood waters.

Detention Dams

Flood detention dams are commonly used in New Zealand for minor flood alleviation. The most recently completed flood control dam in New Zealand is the Onepuni dam located upstream of Invercargill (Smart, 1995). Dams keep flood flows at a level that the channel can manage by damming the water and releasing small amounts of water through design-sized pipes. The water coming out of the pipe will fit in the channel downstream. Spillways (normally grass) cope with over design flows. These are generally not on the dam face but around the edge on natural ground, so a small amount of damage to the spillway will not cause the dam to collapse.

New Zealand hydro-electric dams are of little use as flood regulatory measures as there has been no legislative basis for flood control to be built into their design. They may even exacerbate flood flows when their capacity to hold water is exceeded and excess water must be released. Dams used for flood control purposes must be empty for the majority of the time which means that the use of hydro-electric dams for flood control has limited applicability in New Zealand because of their single-purpose design.

As with other forms of structural protection, detention dams are subject to limitations in controlling flooding. Dams can fail and must be designed to minimise this. A dam can be made unsafe in three ways: it may not be designed to pass large enough flood without overtopping; it may not be properly maintained (leading to failure at well below design levels) and it may fail to operate properly in a flood situation for example failure of the spillway gates to open at the appropriate moment (Roden, 1984).

## Modifying Flood Loss Susceptibility (Adjust People to Floods).

This category is also known as non-structural measures and there has been a move towards increasing use of this type of adjustment. There are several methods used, but the most promising is the regulation of human uses of the floodplain. The idea behind regulating human use of the floodplain is that the use of the floodplain by people will become more compatible with the flood risk (Ericksen, 1986a).

### Flood Forecasting and Warning

The focus of this adjustment is to alert people to the possibility of impending danger by evaluation of a single event. Warning systems consist of three stages, the evaluation (forecast), dissemination and response. The efficiency of many emergency actions depends on the accuracy and detail of the flood forecast and warning. Forecasting capabilities have vastly improved however "despite the progressive improvement in forecasting capability flood warning 'failures' continue largely because of weaknesses in the dissemination phase" (Parker, 1987b, 169). Generally, people are alerted through conventional communication media such as the radio and television, which may fail to reach those affected. It is the dissemination phase of the warning process which is the most prone to failure, although forecasts can also be wrong[7]. Parker (1987b, 173-74) stresses that warning is a process which requires feedback from the warned to the warners to ensure that the warned have in fact received the warning and are responding in the appropriate way.

The responses taken to a warning are often ineffective due to a lack of knowledge about what should be done in the circumstances. Gruntfest (1987, 196) emphasised that "taking no action in response to a threat constitutes an action in itself", and that there was quite a high likelihood of this occurring. She emphasises the importance of signs as a relatively cheap and effective way of ensuring the appropriate response is taken (ibid., 197).

Warning systems are a vital element of flood loss reductions in New Zealand, and in many areas constitutes the practical choice for reduction of flood losses. This is particularly true of areas with little other flood protection and high susceptibility to floods with fast onset periods. Warning processes are generally expensive and to keep them effective and efficient requires both integration and commitment from, and between civil defence and local government, as well as money for exercises and training. A lack of resources has meant that some areas such as the West Coast of the South Island (Dixon, pers. comm., 1995) are facing the possibility of having to downgrade their warning systems.

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[7] This can be a danger in itself due to the cry wolf syndrome (Ericksen, 1986a).

### Emergency Actions

In response to a warning of an on-coming flood, most individuals will take some form of emergency action. In some circumstances this is all they can do to reduce flood damages. The speed of onset of the flood has an important influence on the viability of this adjustment. Areas prone to flash flooding are less suited to this adjustment due to their lack of warning time.

Emergency actions are in some areas the most practical choice for reducing flood losses in New Zealand. This is because of the inevitability of flood losses when faced with an oncoming flood. Flood fighting along riverbanks is probably the most common adjustment to floods in New Zealand. The removal of furniture and household items to higher parts of the house is another emergency action, as is the evacuation of people and goods. Almost everyone is capable of some type of emergency action and often there is no specialist or prior knowledge required. Evacuations are a community adjustment and require the rapid co-ordination of people under stressful conditions.

### Floodproofing

This adjustment is actually misnamed as the house is not 'proofed' merely protected up to a certain design level. Once this design level has been breached the building is effectively unprotected. It is an individual adjustment, although it may require initiation in practice through building codes and the provision of information to the public. Floodproofing can be further divided into permanent floodproofing, contingency floodproofing (measures installed immediately before a flood) and emergency floodproofing (measures put into place on short notice) (Canterbury Regional Council, 1991).

Permanent floodproofing consists of measures such as minimum floor levels, and the installation of watertight windows and doors. These measures can be expensive and are most strongly recommended for commercial and industrial buildings (ibid., 67). Contingency floodproofing includes the use of flood shields as in Figure 2.3. These are watertight barriers which prevent water entering thorough windows and doors and which can be quickly and easily installed. Emergency floodproofing uses sandbag dykes, temporary walls made of timber and covered in plastic, and emergency operations of electricity and water services on receipt of flood warning.

### Land Use Management

Ericksen wrote in 1971 that "this form of adjustment to flooding is, in the New Zealand context, the least developed, yet if correctly percieved and practised, appears to possess considerable potential for reducing the nation's flood loss burden" (1971, 125). Here lies

the focus of planning for the flood hazard. Through the use of this adjustment, land use and development within the floodplain are controlled to minimise losses and maximise benefits.

However,

> ." because the initiative behind decisions which move property through the land conversion process[8] lies in the private sector, the influence of public policy is most often indirect. Land use management programs ... seek to achieve desired private sector actions by changing the values of key variables that are considered by target groups in making decisions about floodplain property" (Burby et al., 1988, 92).

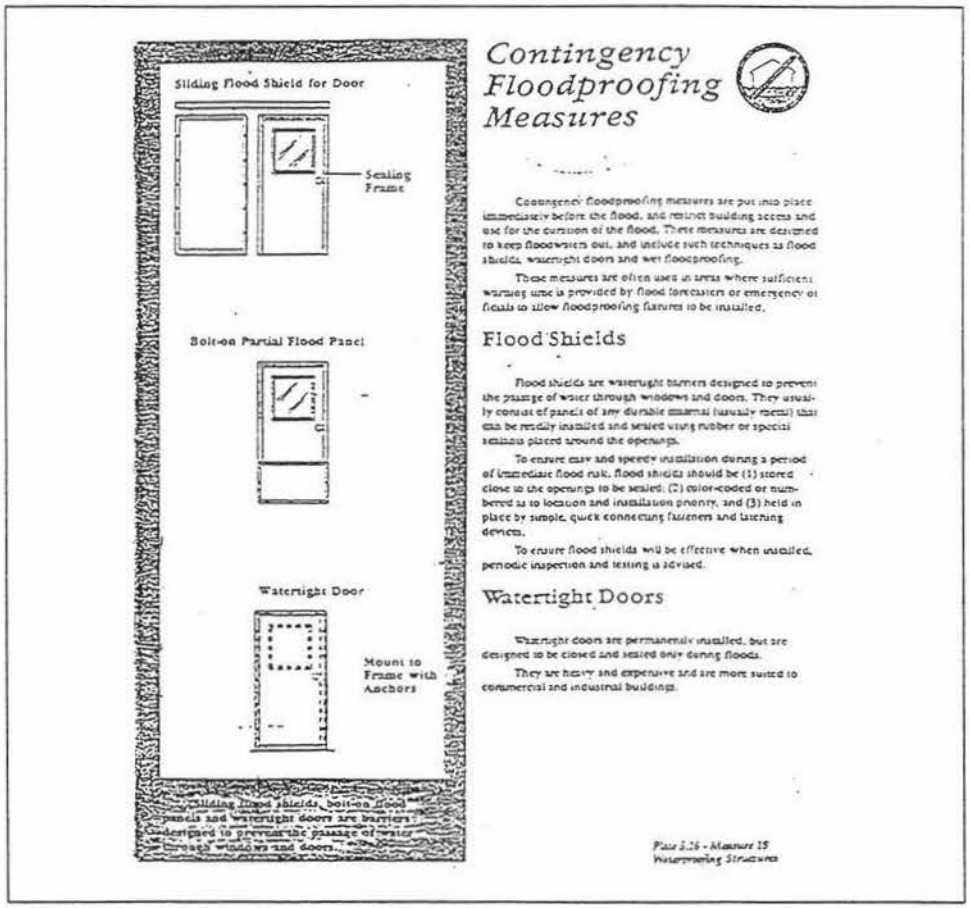


Figure 2.3 Contingency Floodproofing Measures (water proofing structures). Source: Canterbury Regional Council, 1991, 67.

[8] i.e., conversion of flood plain land from low intensity use to residential land

These researchers found that three sets of variables were helpful in explaining the decisions of various target groups in the land conversion process. These variables were community contextual factors, floodplain property characteristics and decision maker characteristics (ibid.).

Community contextual factors include the city growth rate, the median house value and the amount of flood free land available for development within the city area. Floodplain property characteristics describe the land itself and can be divided into two main groups. The first are physical characteristics such as the degree of flood hazard which are inherent in the land and can only be changed by physical site modification such as filling a site, thereby increasing development costs. The second group are locational characteristics, such as accessibility to employment, which are derived solely from the location of the property within the city or region. Locational characteristics also affect land price and the attractiveness of land for urban uses.

Decision maker characteristics include the level of income and education, the awareness and perceptions the decision-maker holds of the flood hazard, and attitudes towards government intervention. The impact of floodplain management policies can be directly influenced by decision-maker characteristics through the influences these characteristics have on the relationships between community contextual factors, property characteristics and decision outcomes (ibid.).

Land use management is a long term adjustment and often controversial in nature. It has two main purposes; the maintenance of floodways through development restrictions adjacent to the river channel and the regulation of development through the use of zoning, the control of subdivision and building codes.

## Land Use Management Measures

There are various methods available for planning for flood hazard reduction through land use management measures. Zoning ordinances, transferable development rights, subdivision regulations, building codes and public land acquisition can all reduce the susceptibility of a population to a flood by controlling land uses in hazardous areas.

### Zoning Ordinances

Zoning is the "division of a municipality or other jurisdiction into districts in which use and densities are controlled" (Bernstein, 1994, 48). Zones indicate the desired land use for an area and exclude specific uses. The strength of zoning ordinances is that the public is familiar with them and they provide certainty for the public about what can be done in certain areas. Zones can be very useful for restricting development in hazardous areas.

Zoning ordinances are a little out of fashion in New Zealand since the enactment of the effects based Resource Management Act 1991, although they are still used. Zoning as a hazard management tool is vulnerable to political and market opposition because of the association of hazard zones with decreases in property prices.

For flooding, zoning policies tend to restrict urbanisation in areas of potential hazard to ensure that development in the zone is compatible with the vulnerability of the area to a flood. Zoning ordinances can also control the use of dangerous goods in hazard zones restricting these when necessary. Burch (1987, 88) stresses the need for a balanced approach to floodplain planning and emphasises that it is "...neither feasible nor desirable to consider floodplains as sacrosanct and development kept at bay."

An important aspect of the effectiveness of zoning on flood hazard management is the delineation of the floodplain.

> "Efforts at the federal, state, or local level to better address high risk areas must begin with an identification of communities subject to such risks and the actual areas. Once identified, regulations and other management measures can be adopted. Maps are essential if high risk areas are to be zoned ...Maps are also needed to inform local government officials and private landowners of the locations of high risk areas. In general, the issue is not whether maps are needed if regulations are to be adopted for high risk areas but which map scales, degrees of accuracy, and other features are needed" (Kusler and Bloomgren, 1984,13).

There can be considerable opposition to the classification of areas into flood hazard zones. This stems from the perception that the delineation of an area as subject to the flood hazard will lower property values and make property harder to sell (Burby et al., 1988; Ericksen, 1986a; 1986b; Office of the Parliamentary Commissioner for the Environment, 1988). Research into the effects of zoning on property values has produced varying results "Regulations on land development, most notably zoning, have a significant effect on the uses to which land can be put and hence on land value and development potential" (Burby et al., 1988, 155) but recent studies on housing markets (Montz, 1987; Montz 1992; Tobin and Montz, 1988) suggest that disclosure of the hazardousness of a location through maps and land use policies has no depreciating effect on property values. There is "no significant difference in assessed values between non-floodplain and floodplain lots (which) suggests a demand for 'desirable residential properties' despite a hazard potential" (Montz, 1987, 59). Burby et al., (1988, 140) found that the "attractiveness of flood hazards areas in terms of natural amenities appears to be an important and unique factor in a floodplain location decision" which could effectively override the effect of a floodplain designation.

Burby et al., (1988) in their study of 10 floodprone cities, found that the most effective way of reducing flood losses was to influence development and building decisions by reducing the profitability of a site for development. They found that reducing the allowable density of a site reduced the resulting return to the developer. They also noted that "because reducing density is associated with lower property values (and landowners recognise that fact), efforts to downzone floodplain property may be met with stiff political opposition" (1988, 181). They concluded that the best way to neutralise this opposition was either to limit density by public purchase of property for open space or use transferable development rights.

Transferable development rights.

Related to floodplain zoning is the concept of transferable development rights (TDR). Transferable Development Rights are an economic instrument which "treat development potential as a good that can be sold or traded by allowing transfers of density between tracts of land that may be under different ownership" (Bernstein, 1994, 64). Development is limited in one area, the 'sending area' and increased through either height or density in another, the 'receiving area'. Within a receiving area a certain density is allowed which may be increased by purchase of development rights from a sending area. This mechanism can compensate for a loss of income or investment through the designation of an area as subject to hazard which allows no development or low density development. The disadvantage of TDR's is that they can become very complicated and, to date, the use of TDR's in New Zealand has been limited.

Subdivision Regulations

Subdivision regulations aim to assess the suitability of a site for development at the initial conversion from agricultural or low intensity use land to land for other, higher intensity uses. Subdivision regulations control the physical layout of new development through the use of subdivision standards and controls. Although subdivision is essentially no more than a legal process, once land has been subdivided there is often a perception that the land is both available and suitable for further development. Controls at this stage can ensure that land unsuitable for residential development, such as land subject to flooding, can have restrictions placed on it at the appropriate, pre-sale stage.

Subdivision regulations can be used to create or maintain flow paths for floods through the use of density restrictions or setback requirements. According to Burch (1987,89) this requires detailed delineation of the two parts of the floodplain refers to as the flowplain and the washlands[9]. He defines the flowplain as the "part of the floodplain over which water may flow" and the washland as the "areas of the floodplain where floodwater may

[9] In New Zealand we would refer to these as ponding areas.

be stored and apart from floodwater flowing into and out of washlands- water would not flow into them" as is illustrated in Figure 2.4.

Burch regards development on the flowplain to be the most critical as development would impede the flow of floodwaters thereby causing an afflux (increase in water level). He feels that flowplains should ideally be left as greenfield sites in the country or urban fringe.area or as conveyance areas in towns where floodwaters can be conveyed over the ground surface down roads and between buildings. Burch goes on to assert that washland areas should be preserved but failing this, some development can be accommodated, as long as the property levels are raised above possible flood levels (ibid., 90).

Subdivision regulations are an important option available to territorial authorities under the RMA which can effectively restrict the amount of flood prone development. Subdivision regulations control the division of land before development begins. The most common requirement for flood hazard areas is the provision of a flood free building site, and examples of this can be seen in some district plans. Some district plans also restrict the amount of impervious surfaces in new development sites. However, in the past local government has been reluctant to impose measures upon themselves which they believe will limit growth, rateable income and adversely affect land values (Ericksen, 1971; 1986b).

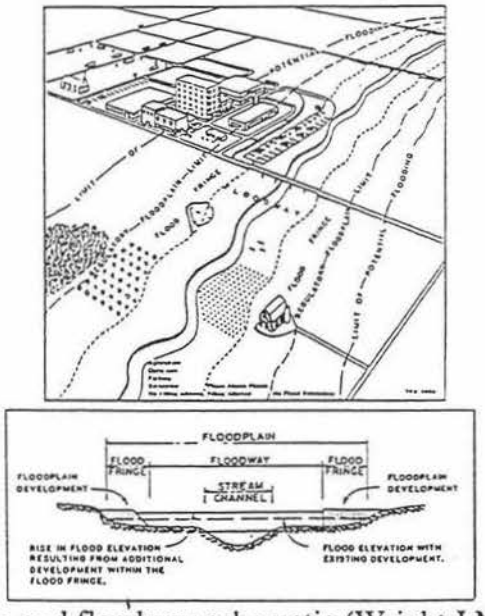


Figure 2.4 Floodplain and floodway schematic (Wright J.M. and Porter D.L., 1993, 147 in Ruess M (ed.),1993)

Building Codes and Restrictions

Building codes specify the type and level of construction of buildings on the flood plains. These are administered by Territorial Local Authorities (district and city councils) under the Building Act 1991. The most common requirement of building codes for flood hazard areas in New Zealand, is the use of minimum floor levels which protect property in certain areas up to a specified design level. Minimum floor levels can be obtained by filling on-site or by the elevation of foundations. Burby et al., (1988, 173) found that elevation requirements "....can have a negative effect on the likelihood of development but no effect on land values, although they did seem to deter development." Unfortunately they are often expensive to implement, especially if retro-fitting is needed, and are therefore more applicable to new buildings. Materials can also be adapted and foundation and structures designed to withstand certain flooding conditions.

Building line restrictions and encroachment lines can also be used to set buildings back from hazardous areas such as areas of potential stopbank breach and outflow areas of the floodplain. These are especially applicable to new development and tend to run in a parallel direction to structural measures such as stopbanks.

Public Land Acquisition

This adjustment has been strongly advocated as an ideal option for floodplain management, especially the public acquisition of floodplain land in urban areas, for development as permanent open space. The public acquisition of land can create conflict with societal objectives such as economic development (land acquisition is seen to 'sterilise' land as it no longer contributes to the rating base) and historic preservation when the area acquired necessitates the purchase and demolition of historic buildings (Mitchell, 1987, 99). To be effective the public acquisition of land must recognise these two concerns. The main disadvantage of public land acquisition is that it is very expensive.

## **Modify the Flood Losses** (Adjust flood losses to people)

These types of adjustments are also non-structural. Within this category there are two main choices of adjustment, insurance and public relief. Both of these adjustments aim to redistribute the impact of the loss among those not immediately affected by the flood hazard. They can both be counter-productive in adapting to the flood hazard over the long term and are not seen as an answer to reducing the flood hazard in a proactive way.

This adjustment is known in planning as the 'do nothing' option which gives rise to one of the ethical issues of dealing with natural hazards. This is paternalism, in which

governments assume a moral right to interfere with the wishes of some people to live and work in environments deemed to be hazardous (Beatley, 1988, 2).

### Risk-taking

Some people feel that risk taking is natural and desirable and if such behaviour does not affect others, then government has no right to interfere. The more secure a person is economically, the more likely they are to assume risks (Burton, Kates and White, 1978). The opposing argument to this, is that risk-takers rarely fully understand the dangers involved (Human Ecological Approach) and may have little real choice in location (Structural Approach). Realistically, the actions of risk-takers do impinge adversely on the well-being of society as a whole through the use of government funds for relief when the risk-takers require assistance in recovery.

The reliance on information-based mitigation strategies by organisations as a means of overcoming their liability is becoming increasingly politically unfeasible as the costs of these actions are not solely borne by the individuals who choose to expose themselves to the risk (Cigler, 1988). For these reasons, the consensus view is usually that government has an ethical responsibility for reducing risks to a level which is socially acceptable, whatever that level may be (Smith, 1992).

### Education

The use of education as a means of informing the public about flood hazard reduction is often touted by government. Education has ideological appeal to those who advocate minimal government regulation. 'Educate don't regulate' is a frequently heard catch cry in government circles. However, research (Ericksen 1980; 1986a) has found that, while informing people of the risks they are taking has its place, merely informing people of the nature of flooding does not generally change their behaviour. The provision of information about a certain issue such as flooding has to compete with a variety of previously held beliefs and ingrained attitudes which may negate the effect of the new information. Additionally, people may be unable to act in a way consistent with the new information through various constraints or simply a lack of knowledge on how to change their behaviour (Dixon, Ericksen and Michaels, 1995; Ericksen, 1986a). Experience of flooding appears to be the most effective way of changing perception of the hazard.

### Insurance

"Insurance is one of the great social inventions" (Reiss Jnr, 1992, 306). The purpose of insurance from flooding is to assist in recovery from flood loss. It is based on the philosophy that the loss will be spread in time and place by the insured through the

payment of an annual premium. The advantages of insurance are that it guarantees compensation after a loss and can work towards the reduction of the impact by appropriately targeted premiums which reflect risk. Unfortunately, this is not easy to do, requiring a large amount of data and human resources to process.

Insurance has limitations when used as a means of addressing the flood hazard. First, generally only those most under threat from floods will choose to insure against them, leaving the insurance company with a portfolio of bad risks. The second problem is the setting of actuarially based premiums which is time consuming and expensive for the insurance company. The advantage of this form of premium setting is that it provides an indication of the risk associated with the property. Another problem is that of moral hazard (Arnell, 1987; Ministry of Agriculture and Fisheries, 1992) . This means that the person insured may choose not to take an emergency action to prevent losses as he/she knows that he/she will be reimbursed to a certain pre-determined level for this loss.

The United States has the National Flood Insurance Program which uses subsidised insurance cover as an incentive to encourage communities to undertake mapping, adopt floodplain regulations and building codes, and qualify for relief in the event of a flood. In this respect it is as much a programme to control land use as it is an insurance programme (Arnell, 1987, 118-121). It is the main non-structural federal tool for the reduction of flood-loss susceptibility in local communities, although it has had limited results (May et al., 1996, forthcoming). In Britain, the opposite occurred with the private insurance companies agreeing to sell cover to those at risk from flood in order to prevent government involvement (Handmer, 1987c).

**Post-Flood Relief**

The aim of relief is to restore the community back to pre-event levels. It includes such financial measures as government grants, subsidies, low-interest loans and tax concessions. Public appeals are often the source of money, clothing and food. Service groups and community organisations play an important role in distributing and providing relief.

Relief is a double-edged sword. While it is often necessary to provide some form of assistance to the victims of a flood it is often counter productive in the long term as it merely reinstates pre-existing conditions to the same level of vulnerability. Relief results in the externalisation of the costs of floodplain development and therefore has a negative effect on adjustment to the flood hazard.

# Factors affecting planning for flood hazard reduction

An important point to note about flood hazard reduction is that in any approach institutional inertia and vested interests, at both national and local levels must be recognised. "Whichever type of non-structural adjustment is identified, it should be appreciated that decision-makers often view them as infringing upon personal rights, adversely affecting property values and restricting local tax bases" (Mitchell, 1987, 102). Political control and funding arrangements are important aspects of these obstacles to better flood hazard management. These frequently ensure the selection of one type of hazard adjustment rather than another (Smith, 1992). The importance of professional bias (Ericksen, 1986a) in flood hazard control must not be underestimated.

There are several main influences on the effective planning for flood hazard management. These are the amount of information available, agenda setting and the role of the media, the organisational aspects of flood hazard management, and the implementation of flood hazard policy.

## Information availability

Uncertainty can be reduced through the search for information and the generation of alternatives on which to act (Comfort, 1988b). Recognition of the existence and nature of a problem is largely dependent on the flow of information within and between participating organisations, which in turn, is critical in eliciting the attention and co-operation of participant organisations (Comfort and Cahill, 1988). The provision of information on the location and nature of individual hazards can alert communities to the costs of building in hazardous areas (Burby and Dalton, 1994). The delineation of hazard zones and subdivision regulations must be based on sound information if they are to withstand legal challenges.

"In organisations operating under conditions of uncertainty and complexity, the management of information is critical to their capacity to act effectively" (Comfort, 1988b, 18). Organisations are consumers and managers of information and rules for gathering, storing and using this information are essential elements of organisational procedures. Feldman and March (1988) note that the gathering and use of information provides assurance that the appropriate attitudes to decision-making exist within the organisation, enhances perceived competence and inspires confidence. The use of information, the request for more information and the justification of decisions in terms of the information available " have all come to be significant ways in which we

symbolise that the process is legitimate, that we are good decision-makers, and that our organisations are well managed " (Feldman and March, 1988, 419).

However inefficiencies in information collection and use abound. Feldman and March (1988) claim that complaints that an organisation does not have enough information will occur while available information is ignored. Existing sources of information on the flood hazard in New Zealand are very important. These sources of information have been originally collected for other purposes such as structural works. Once available information has been assessed then organisation can determine what further information is required. This existing information will have to be included in flood hazard reduction strategies in any case as no floodplain management plan will start from a zero-base, having to take into account existing land uses and structural works (Office of the Parliamentary Commissioner for the Environment, 1988).

Feldman and March (1988) also note that much information that is gathered and communicated within organisations has little relevance to the final decision and additionally much information gathered is used to justify a decision after it has been made. They also assert that much information is gathered in response to a request for more information by decision-makers that is not considered in the subsequent decision and that regardless of the amount of information available for the consideration of a decision, more information will be requested.

Another anomaly reported by Feldman and March (1988) in the use of information by organisations, is that most organisations collect more information than they can use in decision making. This means that many organisations cannot process the information they have and subsequently experience an information shortage. Finally, they note that the information available to the organisation for decision-making is systematically the wrong kind of information and limitations in processing abilities of staff mean that information which cannot be processed is used. Ender et al.(1988) concur with this assertion by stating that weaknesses in information are often used by organisations as an excuse to ignore policy implementation and existing information is often not used adequately. When this information is available, staff weaknesses such as inexperience, often mean that they are unable to turn this information into administrative recommendations and policies.

The Parliamentary Commissioner for the Environment (1988) notes that membership of elected councils changes completely on average every nine years. In addition to other information problems, this poses the problem of the loss of knowledge of past disasters and the reasons for restricting land use in certain areas.

Hazard information must be easily accessible to the public so the public can make informed decisions on their choice of land. Norwood and Norwood (1989) note that people living in a newly constructed subdivision in Palmerston North should have known they were living in a hazard prone area that was subject to raised floor levels in the district scheme, by checking with the council. "But human nature being what it is, this was not done" (Norwood and Norwood, 1989, 19).

The argument against the use of providing information to the public by councils is twofold. First, is that if the information proves to be faulty or certain areas are not identified as hazardous, it may result in the council being liable for damages. The knowledge of the magnitude and probable frequency have of floods are vital elements in practical flood hazard reduction. Historical records for flooding in New Zealand are relatively short. Sampling error in estimating flood frequency results in large margins of error when the magnitude and probability of 100 years flood are determined from records of 30 years duration. This is further exacerbated by the fact that floods occur randomly rather than on a regular basis. Moreover, the possibility of environmental change is also ignored as the assessment is based on the assumption that there will be no change in the factors causing floods (Smith, 1992).

The argument against the provision of information has been repeatedly rebutted on the premise that, if normal levels of professional responsibility are based on the best advice available at the time a decision was made, a council will not be liable (Ministry for the Environment, 1988). As well as the problems with obtaining accurate flood hazard information, the areas identified as hazardous through methods such as zoning may face a decrease in property value, and therefore result in public opposition[10]. The argument against the use of information is common to planning problems. Pavlak (1988) notes that the 'facts' of a given situation may be subject to dispute, varying interpretations or simply unknown. Information is also gathered and communicated within a context of conflict of interest and with consciousness of the potential consequences from the provision of this information (Feldman and March, 1988).

## Agenda setting and the role of the media

The amount of attention paid to the flood hazard issue is largely influenced by political and perception factors. As the level of government is lowered the chances of a particular local government having experienced a flood lessens, resulting in a perception that the flood hazard is not an issue locally (Cigler, 1988). The 100-year flood is not generally a source of excitement for planning activities until it occurs (Waugh, 1988).

[10] see the earlier section on zoning.

Another factor in planning for flood hazard reduction is the issue of agenda-setting. "The matters to which participants in the political process pay serious attention at any given time constitutes the political agenda". They note that "...institutional agendas favour old and recurring items because of their familiarity and that the alternatives to dealing with them may be patterned" (Buhrs and Bartlett, 1993, 20-21). Downs (1972, in Buhrs and Bartlett, 1993) offers the issue-attention cycle as a means of explaining the agenda setting process. He states that a problem leaps into prominence, where it remains for a short time. The problem then fades from the centre of public attention (still largely unresolved) and enters the 'post-problem' stage.

The media can influence on the workings of the issue-attention cycle, although this influence is less in New Zealand than overseas due to the restricted amount of media channels in this country (Buhrs and Bartlett, 1993). Floods provide dramatic news coverage with pictures of houses being washed away and cars drowned in water. Floods are rapid onset disasters and therefore make good media fodder for a day or two. "Television is probably the most powerful information source shaping hazard perception, ... considerable in-built bias exists in television news reporting, which does not accurately reflect the degree of risk" (Smith, 1992, 60). Smith also asserts that the amount of time given to items is mainly related to journalistic criteria for news. This criteria is based on the timeliness of an item, the amount of human interest in the event and the visual impact of film reports.

## Organisational Aspects of Planning for Floods

Organisational structures and processes are an inherent aspect of policy implementation. Pressman and Wildavsky (1973) assert that a policy is seldom executed by a single autonomous organisation, or in a static environment, and that policies are implemented by multiple actors in a constantly changing system. They assert that the complexity of implementation depends on the degree of joint action in a dynamic context, and that this in turn, requires an understanding of the relations between organisations and of policy networks.

Organisational fragmentation plays a crucial role in influencing policy implementation. Responsibility for one policy area may be dispersed among several departments or organisations, diffusing power and responsibility for the policy area. This diffusion complicates policy co-ordination though inhibiting changes in policy, wasting resources, duplicating actions and causing conflict through the spread of responsibility and conflicting priorities of each department or organisation. All this leads to vague or conflicting policies and responsibilities that fall through the cracks of departmental and organisational boundaries (Ender et al., 1988). "In general the more co-ordination required to implement a policy the less its chance of success" (ibid., 69).

Organisations within which planners work are not "problem-solving machines with simple inputs and outputs. They are structures of power and thus of distorted communication - they selectively channel information and attention, systematically shape participation, services, and (often problematic) promises" (Forester, 1989, 20). Forester also asserts that "whether in the public or private sector, organisations are not egalitarian utopias; differences of status, power and authority, information and expertise, information and desires abound" (1989,8).

Another factor constraining effective flood hazard management is the slow process of innovation adoption within organisations. Creativity can be enhanced within an organisational environment through rational procedures such as the search for information, consultation and feedback from participating organisations (Comfort, 1988b). However, innovation may also be constrained by staff factors. Staff may not be sufficiently trained and senior staff may feel threatened from juniors showing innovation (Penning-Rowsell, 1987). Moreover, individuals within the organisations responsible for the flood problem "probably fail to understand the forces affecting these decisions or the opportunities they have as individuals to influence events" (Penning-Rowsell, 1987, 63).

Staff composition is an important aspect of planning for flood hazard reduction. Waugh (1988, 124) states that the "largest impediment to effective state and local efforts seem to be the lack of fiscal resources and technical expertise". The commodity of the planner is an ability to visualise and think for the future (Dyckman, 1973). This is a vital aspect of flood hazard reduction as unless all the basic future goals for the community and questions concerning long term development are settled, it is hard to determine the most effective way to implement any council responsibility. Planners in council organisations are also placed in a difficult position in that "when a planner can clearly see that the consequences of development will violate the goals of a community, it is his [sic] professional responsibility to point out this divergence" (Dyckman, 1973, 249).

## Implementation of policy

Effective flood hazard management requires serious examination of various methods to reduce the flood hazard and of implementation processes to make the adjustments chosen fully effective. Numerous constraints exist to the effective implementation of flood hazard policies. In addition to the usual difficulties of implementing public policies, natural hazard mitigation presents different implementation problems as the threat from disasters is largely invisible, of low probability, although of large potential consequence (Ender et al., 1988). Uncertainty is inherent in planning for flood hazard reduction and this serves to further complicate moves towards implementation due to human cognitive limits (Comfort, 1988b).

In an ideal situation, the nature of the problem is well defined, goals are clear and we are told what the 'error signal' is (Forester, 1989). Unfortunately, this is not typical of planning problems.

> "Problems, outcomes, and even programs and outputs are usually not well defined; goals and outcomes are ambiguous and conflicting; participants are often in conflict and may withhold co-operation; and 'error' or 'success' is not so obvious-what to settle for is half the problem" (ibid., 15).

Problems do not exist in an institutional or political vacuum and that vested interests in 'old' problems will influence the definition of 'new' problems (Buhrs and Bartlett, 1993). In addition to the difficulties of problem definition "institutions and their constituent organisations routinise responses to problems" (Short Jnr, 1992, 19). It then follows that, planners resolve problems by "creating them anew, reformulating them so action and strategy are possible, sensible and agreeable in the case at hand."(Forester, 1989, 16). Change to policies are often the result of external forces such as an event of crisis proportions resulting in a public inquiry (Penning-Rowsell, 1987).

The most important factor to remember when considering the effectiveness of policy implementation is that policy is still being both made and changed, as it is being implemented. Friedmann (1987,164) notes that "Policy implementation, ... is not like building a physical structure such as a bridge- a process that has a clear beginning and an end. Rather it is a continuously evolving set of problems that arise at different levels of decision-making." It should not be forgotten that the positive aspects of mitigation lead to minimal political visibility and therefore low political salience (Cigler, 1988), offering no political reward for the government who imposed the strategy.

Planners often feel that the failure to implement sound, rational planning is the fault of politics and the politicians who run our local governments (Beckman, 1973). Buhrs and Bartlett (1993, 13) reinforce this sentiment by stating that "making sense out of environmental policy depends firstly on the acknowledgement that policy is political". Politicians often have different philosophies and agendas to those of policy-makers. A politician's survival depends on the success with which the politician can reconcile the competing demands placed on him or her by the constituency (Beckman, 1973). Politicians and citizens are more responsive to mitigation efforts that require only passive participation and do not have obvious immediate economic costs. Low political priority results in minimal to non-existent funding, and without the commitment of resources, a low chance of program success (Waugh, 1988).

Another reason for the failure in effective implementation of flood hazard reduction policy is that private decision-makers (and politicians) focus on the immediate benefits of

an action, usually in the form of profits, and in doing this ignore the long term costs that may result from the action. For example, developers construct buildings and sell land as quickly as possible and therefore have no long term interest in the land (Ruchelmen, 1988). Burby et al., (1988) found that the most effective way to alleviate this problem is to reduce the profit of those who develop the floodplain by imposing costs on them directly. "The decision maker's choice among those alternatives depends upon the interaction of land use management program with other factors entering into the decision" (Burby et al., 1988, 92).

However, as Sabatier and Mazmanian (1979) have observed, a major problem with implementation of policies is that target groups may not behave as policy makers expect or intend. In the case of floodplain building codes, for example, private sector decision makers must weigh a number of alternatives, only one of which is compliance with the regulations. First, of all they can avoid compliance by not developing or building at all. Second, they can avoid compliance by developing or building in an area not covered by the regulations. Third, they can avoid compliance by ignoring the regulations, seeking a variance from the regulations and/or seeking a change in the regulations. Fourth, they can comply by developing and building in the manner prescribed by the regulations.

Monitoring is a integral aspect of policy implementation. Smith (1992, 50) demonstrates the necessity of monitoring for natural hazards by asserting that the "general lack of feedback from post-audits is one of the most serious deficiencies in the understanding and reduction of environmental hazards at the present time". Comfort (1988b, 13) states that "designing procedures for action in a changing environment requires a continual monitoring of the discrepancy between intent and outcome of the action." Buhrs and Bartlett (1993) reiterate this by making the point that the chances of a problem being 'discovered' is increased if some form of systematic monitoring of development's is undertaken. Organisations will only change their behaviour when the revealed discrepancy forces them to reconsider the basic premises underlying their actions (Comfort, 1988b). In order to effectively evaluate flood hazard reduction, the objectives of flood hazard policy must be well defined in order to be able to measure successes and failures (Parker, 1987).

As well as the monitoring of the effectiveness of policy outcomes, monitoring of the process of formulating and implementing the policy is also important in achieving the required environmental outcomes. This can allow for examination of the process of implementation if this is seen to be less than optimal. "By assessing the processes of policy implementation, evaluation can lead to greater effectiveness in relating knowledge about the implications of alternatives to the political powers and administrative structures required for implementing them" (Hill, 1985, 180).

Generally it can be seen that the way in which humans use floodplains is as much responsible for the flood hazard as are the physical causes of flooding. Most of the theoretical approaches recognise this to some degree but it is the human ecologists which offer us practical solutions for addressing this problem. Land use planning is the most promising method for redressing this problem but is subject to numerous constraints on effective implementation. The next chapter looks at the influences on politicians and local government officials to ignore the aspects of land use planning that can rectify the flood hazard within the New Zealand context. Flood hazard management in the New Zealand institutional context will be outlined, including the development of local government flood hazard responsibilities under the Resource Management Act 1991 and the Building Act 1991.

# Chapter Three: Flood hazard management in New Zealand

This chapter describes the institutional context of flood hazard management in New Zealand. It outlines the approaches used for flood hazard management in New Zealand and investigates how and why these approaches have evolved. The chapter then examines the impact of the reforms which led to the Resource Management Act 1991 (RMA) and the Building Act 1991, implemented by the current national government. Current responsibilities for flood hazard management are outlined and the processes through which councils can achieve sustainable flood hazard management are examined.

## The history of adjustment to flooding in New Zealand

### Early Adjustments

The earliest recorded adjustments to the flood problem in New Zealand occurred in the Canterbury region where private stopbanking had been undertaken since the 1850s to protect land and property. The 1860s provided the impetus for investigations into the flood problem due to early bouts of flooding in some settled areas. These investigations were typically of an engineering nature. Consulting engineer W.T Doyne wrote two technical reports in 1864 and 1865 on the nature of the flood problem in the Canterbury region. In a prophetic moment he counselled provincial government against "undertaking the responsibility of executing and maintaining works for the protection of property from the ravages of the river because it was impossible to see where the responsibility and expenditure would end" (Doyne, 1864, in Roche, 1994, 23).

The 1868 'Great Flood' reactivated political interest in flooding prompting William Rolleston to introduce the Canterbury Rivers Bill into the House of Representatives which stated that Christchurch was under serious threat of inundation from the Waimakariri. The Canterbury Rivers Act 1868 provided a model for other provinces, some of which soon followed suit.

The 1884 River Boards Act was the first piece of national legislation to deal with the flood problem. It established sixteen river boards throughout the country. Extensive flood protection efforts began in a somewhat uncoordinated fashion. River boards could be responsible for different sections of one river channel and even different banks of the

same stretch of river. An all-out "stop-bank war" erupted (Strom, n.d. in Roche, 1994, 23).

Legislation to consolidate river board efforts was passed in 1908 but the period from 1901-1926 was most notable for the series of commissions of inquiry into the control of various rivers throughout New Zealand (Roche, 1994, 23). This was supposedly an attempt to solve the problem of flood control in perpetuity. In 1928 the head of the Public Works Department (later the Ministry of Works and Development), engineer Frederick Furkert published a review paper which reinforced the necessity for soundly considered engineering works, which he regarded as crucial for safeguarding the increasing population of New Zealand from floods (Furkert 1928, in Roche, 1994, 24).

The 1930s resulted in a change in focus in dealing with flooding for two main reasons. First, the Labour Government which had been elected in 1935, was searching for large scale public works both to utilise the Public Works Department, which had been increasingly downgraded, and to employ considerable elements of the labour force. Flood control was one element of this strategy. The second reason was the Esk Valley Floods of 1938 which had caused widespread damage in the Hawkes Bay Region. In reality, damaging although these floods were, they were symptomatic of the increasing flood and soil erosion problem. These floods had a catalytic effect and once again, institutional attention turned to the escalating problem of rivers control.

## The Soil Conservation and Rivers Control Act 1941

The response by government this time, was of a more comprehensive and integrative nature and culminated in the Soil Conservation and Rivers Control Act 1941. This was, effectively, the first major step that Central Government had taken towards remedying the flood problem and the first systematic attempt at controlling the actions of private landowners.

The Act set up the Soil Conservation and Rivers Control Council (SCRCC) which had as one of its primary functions the "investigation of flood prevention measures." The Council was responsible to the Minister of Works and initially comprised Public Works Officials, local representatives and farmers. Catchment boards were also established under this Act, and these, together with the SCRCC, initiated the integrated management of catchments in New Zealand. Catchment boards were given grants from central government through the SCRCC and were also able to raise revenue through rating property within their Districts. This became the first major teething problem in the Boards' operations.

During the 1940s works were carried out by the catchment boards with flood control works dominating expenditure. These works included stopbank construction, channel clearance, river bank protection, river diversions and other miscellaneous structures. The varied nature of the river control problems meant that different engineering solutions were used in different areas (Roche, 1994). By-laws and land use controls were also tools used by catchment boards in fulfilling their functions, although these were unpopular with Territorial Local Authorities [11]which resisted being regulated (Ericksen, 1986a).

Comprehensive region or district wide schemes, which were suppose to address the prevention or minimisation of flood damage and erosion were to be submitted to the SCRCC under the 1941 Act. These did not eventuate for several reasons. Boards were initially poorly resourced, information for planning and management was limited, soil conservators and water engineers did not work well together, and the nature of the boards functions' made them "crisis-orientated and reactive rather than forward-looking and anticipatory" (Ericksen, 1990, 55).

The period from 1941 to 1967 was a time of extensive development of engineering works in New Zealand. These works were, by necessity, a community response heavily supported by central government for two main reasons. First, the cost of the works was beyond the ability of most local communities to finance by themselves. Second, government considered that by supporting the projects they were preventing the possibility of worse, more costly, problems in the future (Ericksen, 1986a). The works brought about a marked change in land use in regions now protected from design size floods with some areas now becoming more intensively developed.

## The Water and Soil Conservation Act 1967

The 1967 Water and Soil Conservation Act [12]was a response to new challenges in water management. In some respects it built on the framework set up by the 1941 Act. This Act was not repealed because the need for rivers control and soil conservation was still very necessary, although many of the 1967 Acts' objectives overlapped with those of the 1941 Act.

The new Act imposed some important changes on the previous system, with the most significant of these for dealing with the flood hazard being the creation of the National

[11] Territorial Local Authorities consisted of numerous local boroughs and councils until the late 1980s. After local government reform, the term Territoial Local Authorities refers to district and city councils. Local authorities and local government also includes regional councils

[12] The long title of the act was " An act to promote a national policy in respect of natural water and to make better provision for the conservation, allocation, use and quality of natural water and for promoting soil conservation and preventing damage by flood and erosion and for promoting and controlling multiple uses of natural water." Judge Treadwell once remarked that "never in the history of legislation in New Zealand has the long title to an act been used so frequently in an attempt to find guidelines." (Otago Daily Times, 17 December, 1980, in Roche, 1994, 141).

Water and Soil Conservation Organisation (NWASCO). This was an umbrella organisation which included the National Water and Soil Conservation Authority (NWASCA), chaired by the Minister of Works and Development. The SCRCC was retained and a Water Allocation Council was established, although the latter soon became (in conjunction with the Water Pollution Council) the Water Resources Council. The Water and Soil Directorate of the Ministry of Works and Development was given the job of servicing NWASCO.

The 1967 Act enabled regional water boards to administer the Act on a district-wide basis which would supplement the catchment authorities. Effectively, this meant that most catchment authorities would change hats to reconstitute themselves as regional water boards when moving from problems of soil conservation and rivers control to water allocation issues (Roche, 1994), although in some areas they were different authorities.

Preceding and ensuing debate surrounded the Act of 1967. Cries for consolidation of water and soil related legislation had been in place for some time and evidence suggests that all involved in this field were highly aware of the inadequacies of the institutional structures in place. The public had shown considerable confusion regarding the roles of the different organisations and anecdotal evidence indicates that this also extended to those within the organisations (ibid.).

Within the catchment authorities, the evaluation of flood control was largely conducted in an ad hoc manner until the 1970s. In 1971, NWASCA required benefit-cost analyses to be undertaken by catchment authorities in evaluating projects worth more than $100 000 (1971 dollars). This was required to ensure that all projects subsidised by central government would show an economic return to the nation and that the economic costs were outweighed by the economic benefits. Successful projects had to meet an internal rate of return of at least 10% (Ericksen, 1986a).

The emphasis on engineering works to solve the flood problem was inherent in the institutional framework of the era. Both acts emphasised the flood problem in terms of the cause and effect relationship and the institutional structure set up under the acts reflected this. Staffing within the NWASCO consisted almost entirely of water engineers and soil conservators. Staff were trained to view the flood hazard in a particular way and were constrained by the institutional structures in which they worked (ibid.). The link with the Water and Soil Directorate of the Ministry of Works and Development further reinforced the engineering approach. In addition to this, the requirements for government subsidies (see above) " meant that boards picked the most productive parts of a catchment to ensure some measure of government funds. This meant opting for short-

term river control projects rather than longer term catchment treatment and land use management." (Ericksen, 1990, 56).

### The move towards non-structural adjustments.

The 1970s brought about a change in the philosophy behind the traditional approach of adjustments to the flood hazard. Catchment authorities began to recognise the links between development and the flood hazard. In response to this, they began promoting the use of a variety of plans such as water and soil resource management plans, although these were not mandatory.

In the early 1980s NWASCA formally altered its river control policy affecting urban areas to one which encouraged TLA's to consider means other than protection works (Ericksen, 1986a) and tackle the flood problem through non-structural alternatives such as land use planning. This was no easy task. NWASCA, which after a 1983 amendment now included the SCRCC and Water Resources Council, had come to see that structural solutions such as engineering works had limited ability to solve the flood problem as flood losses were still rising. The change of policy was officially recognised in 1987 with the release of the circular 'Floodplain Management Policy' (ibid.).

## Local Government and Hazard Planning

Local government throughout this period was becoming increasingly responsible for hazard planning. The Local Government Act 1974, together with the Town and Country Planning Acts of 1953 and 1977 placed on TLA's the responsibility of flood hazard management, although the catchment authorities and their constituent boards still retained some responsibility for this up until 1991.

### The Local Government Act 1974

This Act stipulates the purposes and functions of local authorities and also details some of the requirements of councils in regard to hazard management. In approving subdivisions, TLA's had to consider the possibility of flooding, among other hazards after a 1978 amendment to the Local Government Act 1974 (section 274). This section stated that subdivision should not be permitted;

(a) where any of the land in the proposed subdivision was subject to erosion, slippage or inundation or;
(b) the subdivision would cause, accelerate or worsen the erosion, slippage or inundation of other land not in the subdivision, unless adequate

provision was made to protect the land or subdivision.

There were, however, easy ways around these requirements as the legal responsibilities of TLA's was qualified by the use of clauses such as "in councils' view", "adequate protection" was "provided or to be made". Subsequent amendments to the LGA (i.e., section 641) further enhanced the methods through which TLA's should have provided for the avoidance of the flood hazard. The 1979 Amendment Act established the 'power to refuse a building permit provision'. This section stipulated the conditions under which a local authority should refuse a building permit and was intended to reinforce other the legislative measures.

These provisions were successfully weakened after lobbying by local government. Development orientated TLAs found it far easier for them to put this in the 'too hard basket', generally ignore the remaining requirements and continue instead to rely on, and push for, structural adjustments such as stopbanks, which were not seen as impeding development but as having the opposite effect.

## The Town and Country Planning Acts 1953 and 1977

Territorial Local Authorities had had a statutory duty to plan for flood hazard reduction for many years under the 1953 Town and Country Planning Act and subsequent amendments. In particular, regulations in 1960 required TLA's to identify and map hazards in their district schemes and provide "as far as practicable, against land being used for purposes for which it [was] not suitable, having regard to ... flooding.." (Town and Country Planning Regulations 1960).

The 1977 Town and Country Planning Act made the previous statutory requirements in relation to potentially hazardous development even more specific. This Act required TLA's to identify areas subject to hazards and make provisions to avoid development in these areas, unless that development could be justified on the basis of sound technical advice. This was to be provided by catchment authorities and NWASCA, but as the advice offered was generally disregarded by TLA's, often ended up in the form of submissions objecting to development proposals. One reason for TLA's ignoring the requirement to identify areas subject to hazard was that they feared being held liable for property they disclosed as potentially hazardous, after already permitting other development on the land in question. This was despite government assurances that, if the development had been permitted on the best available advice at the time, TLA's would not be liable. Despite all this TLA's were starting to recognise their responsibilities in regard to natural hazards, albeit at "glacial speed" (Ericksen, 1990, 71).

## Territorial Local Authority Resistance to Flood hazard reduction

Pressures from developers and residents still made it easier from the viewpoint of most TLA's to push for structural adjustments to remedy the flood problem, which was to many people a vague threat - until they got hit by one. While local government often complained about the power and interventionism of central government, efforts by central government to encourage territorial local authorities to improve planning often met stiff resistance (May et al., 1996, forthcoming).

Floodplain management planning is clearly one example of this paradoxical situation. The attitudes of TLA's (especially politicians) towards land use management bordered on contemptuous as they felt it would limit development and therefore rateable income. The problem effectively lay in the legislation in that there were no penalties for TLA's which chose to ignore their legislative obligations and no incentives for floodplain management planning, unlike structural adjustments which the government still subsidised. Later, these subsidised structural works often became the carrot NWASCA would dangle before TLA's (after their change in policy beginning in 1983) stating that if they did adopt some land use regulations in relation to developing the floodplain they could get structural protection they required, as was the case with Invercargill (Ibid.).

All this changed dramatically in 1984 with the election of the Fourth Labour Government.

# Government Restructuring 1984

The Fourth Labour Government made sweeping reforms of New Zealand's institutional frameworks which included the reorganisation of national environmental administration, local government, the public service in general and environmental statutes. The catalyst for these changes had been the dire financial situation facing the country as the incoming Labour Government was about to take office. Government expenditure had become problematic, with few accountability requirements in place to keep it under control. The country was in a fiscal mess, and a switch to a market led philosophy, in which government at all levels was efficient, accountable, transparent, clearly mandated (regulation and policy were separated from operations) and outcomes and objectives driven was seen as the remedy to this situation.[13]

The Ministry of Works and Development was an example of the inefficiencies and inadequacies of the institutional system at the time. It had a dual mandate having both

[13] Buhrs and Bartlett, (1993) provide a detailed account of this.

developmental and environmental responsibilities, and conflicts between these responsibilities were resolved within the Ministry, rather than being made transparent. It was abolished in 1988, along with NWASCA enabling many environmental reforms to occur.

A Ministry for the Environment (MfE) was established by the Environment Act 1986. It was given a policy making role and a reporting function to the Minister on matters relating to the environment. The Environment Act also established an independent environmental watchdog in the form of the Parliamentary Commissioner for the Environment. In addition to this Act, the Department of Conservation was established under the Conservation Act 1987.

Local government was also reformed in the Labour Government's second term. The main consequence of this was that environmental policy implementation and regulation was devolved to local government under the Resource Management Act 1991. This Act replaced 59 statutes and 19 regulations and orders, and was primarily enabling legislation for local Government. Regional councils were established by amendments to the Local Government Act 1974 in 1989 which abolished special purpose authorities such as catchment boards and began operating within the year. Territorial Local Authorities (TLA's) were amalgamated into 73 city and district councils from over 200.

## Central Government Policy Adjustments

The reform of environmental legislation in itself, had little effect on the range of adjustments adopted by councils in relation to the flood hazard. In some respects, the new legislation was similar to the previous regime in its requirements of TLA's to flood hazard management. However, two policy directives in particular had far-reaching effects on the adoption of particular adjustments to floods.

The first of these was the announcement by central government that there would be no more money for flood control works, which were out of favour politically as research in New Zealand[14] and overseas had shown them to be limited in their effectiveness. A transitional amount of about five million dollars per year was granted by MfE to councils to finish works and finance plans already in progress, and for the purpose of assisting plan development for some councils.

Second, the release in 1991 of Government's Recovery Plan: Natural disasters and emergencies within New Zealand stated that there would be no more relief packages of the scale that had come to be expected. This policy was consistent with the Labour

[14] See for example: Ericksen N.J. 1986a. Creating Flood Disasters? New Zealand's need for a new approach to urban flood hazard.

Government's free market reforms, and expectations that local communities would bear responsibility, including the financial costs of their actions. The flood hazard is one example of the externalities the government was working to be rid of. People located in flood prone areas, only to be assisted by others through relief packages and subsidies for structural protection, if a flood occurred. This policy was also partly the result of investigations into disaster relief and its effectiveness in achieving desired objectives.

Cyclone Bola had provided a timely opportunity for a revision of government disaster policy including flooding. In its aftermath, came the 'Bola Report' (Office of the Parliamentary Commissioner for the Environment, 1988), which examined the effectiveness of various adjustments to flooding, and a study conducted by the Ministry of Agriculture and Fisheries of the social and economic impacts of the assistance scheme given to farmers after Bola (Ministry of Agriculture and Fisheries, 1991). This scheme differed from other assistance schemes as it provided compensation for uninsurable property damage as well as income loss, and compensation payments were to be used at the discretion of the farmer and not tied to farm restoration. The Ministry of Agriculture and Fisheries study evaluated whether the scheme had achieved its objectives, one of which was enabling farmers to sell up if this proved a viable option. The conclusions reached were that, although the package had achieved its short term objective of helping to maintain the social and economic fabric of the region in general, "the compensation package, by keeping some farmers on the land, probably hindered rather than accelerated the process of more rational land use and management" (ibid., iii).

The Recovery Plan: Natural disasters and emergencies within New Zealand[15] stated that local authorities were now "primarily responsible for dealing with the impact of disaster in their geographical and functional areas of responsibility" (Cabinet, 1991, 2). Future central government assistance would be minimal and only available where local resources are inadequate to achieve an adequate recovery or if there are economies of scale in having a national response (Campbell and Dixon, 1993).

As a result of this policy, the LAPP (Local Authority Protection Programme) fund was set up by the New Zealand Local Government Insurance Corporation Ltd. The fund was established in 1993 as a mutual benefit fund for participating local authorities. The fund's primary purpose is to act as an insurance scheme, particularly in assisting local governments to restore infrastructure damaged by hazardous events. The restoration of infrastructure can be one of a local authorities main post-disaster expenses, and can result in an essentially bankrupt local authority if no assistance is provided.

[15] which was also published as part of the National Civil Defence Plan.

# Hazard Responsibilities under the Resource Management Act and Building Act

The legislation that resulted from all these policy changes, places some new and challenging requirements on local authorities. The RMA imposes some new concepts onto those operating within local government, such as sustainable management. The new Act places increased emphasis on procedural requirements including public participation, accountability for, and justification of, methods chosen and the requirement for information gathering and monitoring.

Responsibilities for natural hazard management are now divided between regional councils and TLA's. Each level of government has responsibility for different aspects of natural hazards in accordance with their relative functions. However, these responsibilities do overlap, in some cases quite substantially. The Building Act also contains requirements for local authorities in regard to hazard reduction, although the conceptual basis underlying this Act is quite different from the RMA.

## The Resource Management Act 1991 (RMA)

Under this regime planning has moved from an essentially coercive style of government mandate to a more co-operative style of government mandate. Coercive government mandates assume that local government is minimally committed to state policy objectives and therefore requires sanctions to ensure that state policy objectives are achieved (May and Handmer, 1992). Coercive mandates detail the procedures for achieving policy goals, thereby reducing local government discretion in policy development. These mandates use compliance monitoring and penalties to ensure that policy goals are achieved (Dixon, Ericksen and Michaels, 1995). Co-operative government mandates assume that councils are committed to policy objectives, and therefore can be relied on to achieve state policy goals given adequate resources. There are no penalties involved in this mandate style with central government choosing instead to provide financial and technical assistance to achieve the required outcomes (May, 1993).

Co-operative mandates require substantial local government commitment and capacity to be effectively translated into practice (Dixon, Ericksen and Michaels, 1995). Their underlying assumptions are that the different levels of government are all working towards the same goals and that councils have the resources to implement the goals set by the legislation. The RMA is essentially co-operative in mandate style. While the processes to be followed by local governments in achieving the goal of sustainable management of resources are prescribed, the particular means of achieving the goals is left up to the individual local councils. The RMA still contains some coercive elements

such as penalties although these are orientated towards individuals rather than local government (Chapman, 1995).

The RMA lacks some of the required elements of a co-operative mandate which ensure that the prescribed goals are achieved. One example of this, is the inadequate financial and technical assistance provided by central government. The only financial assistance currently provided by MfE to regional councils and TLA's is the Sustainable Management Fund. One of the purposes of this fund is to assist regional councils and TLA's in plan preparation and the achievement of sustainable management. While the provision of the Sustainable Management Fund may indirectly improve hazard management, the Ministry for the Environment has indicated that natural hazards are not currently a priority. One option available to the Ministry is to produce a national policy statement and prepare regulations and standards for natural hazards. However, this option not expected to be exercised, as is the case with many other issues.

Sections 30 and 31 of the RMA (Appendix 2.3) outline the functions of regional councils and TLA's respectively. Regional councils are responsible for the integrated management of natural and physical resources of a region, the control of land which is of regional significance, soil conservation, water use and quality, discharges to air and water, the avoidance or mitigation of natural hazards, control of hazardous substances and control of the coastal marine area in conjunction with the Minister of Conservation.

Territorial Local Authorities are responsible for the integrated management of land, including the control of effects of land use for the purpose of avoiding or mitigating natural hazards and the adverse effects of hazardous substance use. As well, TLA's are responsible for the subdivision of land, the emission of noise (except for the coastal marine area), and the surface of water in rivers and lakes.

The RMA brought about a change in emphasis in hazard planning in several ways. The first major difference for natural hazards is that the primary responsibility now lies with local government rather than the central government level (Campbell and Dixon, 1993). Now that local government is without the sanctions and incentives of the previous regime, fulfilment of natural hazard responsibilities will depend largely on the capacity of local government in allocating resources (both financial and human), and the commitment that local government has to hazard management.

Second, the Act's primary purpose is the sustainable management of natural and physical resources (section 5, Appendix 2.1). The term 'sustainable management' has caused a considerable amount of debate, especially in defining the word 'sustainable'. Numerous interpretations have been put forward as to its denotation, despite the Ministry for the Environment stating that a flexible definition is necessary so that dynamic social,

economic and natural pressures can be responded to appropriately (MfE, 1988, in Spence, 1993).

Another difference from the preceding legislation is the emphasis within the Act on procedural means. It details processes for the sustainable management of floodplains in two main ways, the preparation of policy statements and plans and the granting of consents. Public participation requirements, in the form of extensive consultation, have been greatly increased in both the policy writing and consent granting processes. Section 32 (Appendix 2.4) stipulates that there must be a method of assessing the alternatives used for sustainable resource management, including a weighing up of the costs and benefits of each method. There is also a duty under section 35 (Appendix 2.4) which requires councils to gather information, monitor the environment and keep records.

Regional and district councils can reduce the effects of flooding through two means. The first of these is the preparation and writing of plans. Policy statements and plans provide objectives, policies, methods and rules for use in the planning and development of the floodplains within their jurisdiction. Regional policy statements (RPS') and regional plans provide the parameters and standards against which an application for a consent is assessed. District plans, prepared by TLA's, are mandatory under the RMA. These plans and policy statements are written in accordance with the manner set out in the first schedule and must be prepared in accordance with the functions of the relevant authority (sections 30 and 31) and part two of the Act (sections 5,6,7 and 8).[16]

The regional policy statement, prepared by regional councils provides for the integrated management of resources in the region and under section 62(1)(ha) (Appendix 2.5) may delegate responsibility for hazards in the region, or retain these responsibilities by default.[17] These responsibilities appear to overlap considerably. Under the Act, regional councils have the specific function of *controlling the use of land* for the avoidance and mitigation of natural hazards. Territorial Local Authorities are specifically required to *control the effects of the use, development, or protection of land* and the *implementation of rules* for the avoidance and mitigation of hazards (RMA, s.30(c)(iv) and 31(a)(b)). This division has resulted in confusion and conflict between levels of government. Table

[16] For a detailed description of these processes see MfE, 1991. Guide to the Act. and for an overview see May et al., 1996, forthcoming.

[17] Regional Planning Schemes were first required under the 1953 Town and Country Planning Act, but due to the precarious existence of regional government until 1989 this requirement was not well implemented. The Regional Planning Scheme was to 'prevail' over the District Scheme under the Town and Country Planning Act 1977.

3.1 details the responsibilities of each level of local government in relation to hazards under the current legislation.

| Regional Council | Territorial Authority |
|---|---|
| -Hazard threats of regional level significance. | -Hazard risks of district level significance. |
| -Planning control provisions in regional plans. | -Controlling development and activities in flood prone areas through their district plans and resource consents. |
| -Maintaining monitoring and warning systems. | -Preparation of hazard management plans and contingency plans. |
| -Research into natural hazard threats. | -Controlling stormwater discharges (because of involvement in land use planning and control of building development). |
| -Education and information. | -Works and services at the district level (e.g. hazard mitigation works). |
| -Works and services at the regional level (e.g. stopbank repair). | -Maintaining a district natural hazards register. |
| -Maintaining a regional natural hazards register. | -Information on site specific and localised natural hazards. |
| -Preparing and updating regional civil defence plans. | -Preparing and updating district civil defence plans. |

Table 3.1. Natural Hazard Responsibilities. Source: Chapman, 1995, 83.

Important among regional council functions in hazard management are the preparation of objectives and policies relating to the effects of the use of land which are of regional significance and the control of the use of land for the purpose of the avoidance or mitigation of natural hazards. Regional plans are not mandatory under the act but the council "shall consider the desirability of preparing one when ...any threat from natural hazards... may be avoided or mitigated" (RMA 1991, s.65(3)(c), Appendix 2.5). The Canterbury Regional Council is one council that exercised this option during the transition period from the previous regime to the RMA regime, producing the Waimakariri River Flood Plain Management Plan, which deals with the potential hazard from this river. This plan seeks to control erection of new buildings on certain parts of

the floodplain by classifying them as non-complying or prohibited activities, and also to control the erection of buildings in areas it defines in the plan as 'hazard zones'.

Although it appears mandated to do this, an appeal to the Planning Tribunal by the affected district councils resulted in the following declaration. It stated that regional councils "do not have the function (which territorial authorities have) of controlling any *actual or potential effects* (my italics) of the use, development, or protection of land for the purpose of the avoidance or mitigation of natural hazards" (A 89/94, 13). This declaration was overturned by the Court of Appeal who clarified the respective responsibilities of the councils by stating that "the control of the use of land for the avoidance or mitigation of natural hazards is within the powers of both regional councils and territorial authorities. There will be no doubt be occasions where such matters need to be dealt with on a regional basis..." (The Canterbury Regional Council v Banks Peninsula District Council and Others CA 99/95, ([1995] NZRMA 452) 13).[18]

Regional councils still retain certain functions under the Soil Conservation and Rivers Control Act 1941. These are generally operational functions and powers including responsibility for the construction and maintenance of works for flood and erosion control (section 126), and maintaining and improving river channel works (section 133). Under this Act they are also required to undertake afforestation and animal control where this is likely to damage vegetation important for erosion and flood control purposes; carry out surveys and investigations and the purchase of land when necessary for fulfilling these purposes. Nothing in this Act is to derogate from the powers and functions of the councils under the RMA (Campbell and Dixon, 1993).

The consents process is the second way in which local authorities can manage the use and development of their floodplains. It is through this process that the second major piece of legislation concerned with hazard planning, the Building Act 1991 is significant. The Building Act and the RMA were drafted to interact with each other. The RMA governs whether a particular building can be erected on a site and the Building Act dictates to what standards the structure is to be erected (Horsley, pers. comm., 1994).

The Building Act requires TLA's to administer and enforce building controls and supply information on controls which may affect building in their territory. This task is generally executed through the issuance of Project Information Memorandums (PIM'S) and Land Information Memorandums (LIM'S). Project Information Memorandums are

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[18] Another challenge to the authority of regional councils to control land use, occurred in the Auckland region when TLA's appealed the right of the regional council to restrict the spatial expansion of the Auckland urban area. Effectively, the regional council drew a line on a map within the regional policy statement restricting the further expansion of the Auckland urban area, which TLA's percieved as ultra-vires (CA 29/95.The Auckland Regional Council v North Shore City Council and Others ).

issued by TLAs' to owners' intending to build on a site and state everything that is known to the TLA about the land concerned that could affect the design and construction of the building. Land Information Memorandums relate to the land as it is and are also part of the process for issuing a subdivision consent. Both of these memorandums must specifically mention any known flood hazard.

When intending to subdivide and develop property, a developer must obtain a subdivision consent from the local TLA under sections 11 and 31 of the RMA (Appendices 2.2, 2.3). The RMA, under section 106(1)(a)&(b), requires that a TLA is not able to grant a subdivision consent where land or structures are "likely to be subject to" or "accelerate, worsen or result in" damage from inundation from any source (Appendix 2.6). These circumstances are qualified by the phrase "unless the consent authority is satisfied that sufficient provision has been made or will be made in accordance with subsection (2)" (the effects will be avoided, remedied or mitigated). Territorial Local Authorities can impose conditions on subdivision consents to protect against flooding, including the taking of esplanade reserves for this purpose (section 229, Appendix 2.7).

## The Building Act 1991

The Building Act 1991 replaced all previous building related legislation and follows in the spirit of government reforms in the mid 1980s. The Building Act is performance based and replaces all preceding fragmented building-related legislation. It established the Building Industry Authority which, among other functions, interprets the Building Code requirements which specify how a building must perform rather than how it is to be designed or constructed.

One of the general purposes of the Building Act is to co-ordinate building controls with the sustainable management of natural and physical resources. However the two acts originate from different perspectives. The Building Act states that people "shall" build on land subject to hazards as long as: the structure meets building performance standards; can withstand a natural event and the landowner accepts all responsibility. The RMA states that natural hazards must be avoided or mitigated for the community well-being. The Building Act prevents any regional or district plan from requiring performance criteria for buildings additional to or more restrictive than those in the Code, except for the protection of other property from the effects of surface water (RMA, 1991, s.68(2)&76(2a) Appendix 2.5). The Building Act specifies a protection standard of 50 years for minimum floor levels. This standard is inconsistent with that already in use by many councils who have had for some time a 100 year protection standard for floor levels.

The most significant aspect of the Building Act for flood hazard reduction is section 36 (Appendix 2.8), which essentially carries over the previous legislation and deals with building on hazard prone land (Fyson, 1992). This section provides the regime for issuing building consents for work that does not comply with Building Code performance criteria in respect to hazards. It states that when building on land subject to hazards if the building work is likely to increase the risk for that land or any other property the TLA must refuse the consent unless it is satisfied that there is adequate provision for the protection or restoration of property. Where the TLA is satisfied that the building work to be undertaken will not actually add to the hazard risk, it may grant the consent but the fact that the land is subject to hazard must be entered on the title to the land. This absolves the TLA from liability if the building is later damaged by this hazard. Through this last clause the owner of the building is made aware of, and effectively shoulders the risk of, building on the hazard prone land.

Recent research suggests that some TLA's are using the Building Act as an alternative to RMA requirements regarding the development of hazard prone areas (Chapman, 1995). This research indicated that the councils that are relying on this section of the Building Act to fulfil their flood hazard responsibilities are not acting in the public interest and are not fulfilling their RMA requirements for sustainable hazard management. Councils appeared to be taking either path, proactive flood hazard management or section 36(2) of the Building Act. As explained in chapter two, people do not rank flooding as a priority objective in choosing a house site "unless flooding is manifestly severe or frequent, a major flood has recently occurred, or he[sic] has past experience at some other location to make him[sic] wary of the problem" (James, Laurent and Hill, 1971, 8).

Local government also has natural hazards responsibilities under the Civil Defence Act 1983 which requires regional councils to prepare a regional civil defence plan in order to prepare for and mitigate the effects of a natural hazard. Regional councils also have other responsibilities under this act such as: maintaining a civil defence organisation (including advisory committees and supporting services); promoting civil defence awareness through public education programmes and training; and the approval of District Civil Defence Plans. Territorial Local Authorities must also prepare civil defence plans for their jurisdictions.

In conclusion, probably the most significant impact on flood hazard adjustments has been the withdrawal of funding from central government for structural flood protection and to a lesser extent, non-structural measures. The practicalities of flood hazard protection means that this will probably have a far greater impact in the long run than any legislative change. The legislative requirements for the development and management of land which may be subject to flooding are now little stronger than those that existed previously. The new Acts have certainly brought about some changes. Under the RMA,

the management of natural and physical resources must be undertaken on a sustainable basis. The achievement of this goal is reinforced by the processes inherent in plan writing, section 32, which requires that alternatives of any proposal to be assessed and section 35 which requires the gathering of information and the monitoring of the effects of the activity. Natural hazard reduction is now the primary responsibility of local government with each level having certain responsibilities in undertaking this task. However, the division of these responsibilities is not always clear and the style of mandate provided by the RMA does little to facilitate the co-operation and co-ordination of each level of government. Additionally, the use by some councils of section 36(2) of the Building Act tends to negate any positive changes provided by the RMA in respect to the sustainable management of land prone to the flood hazard.

In the absence of a highly prescriptive mandate, how well councils implement flood hazard reduction will depend on their capacity and commitment to this problem. Learning from their mistakes could have significant adverse effects on those populations residing in flood hazard areas. The RMA brings a flexible and co-operatively based approach to hazard management but preliminary findings show that significant differences in plan quality, the main tool for flood hazard management, are occurring throughout New Zealand. How well natural hazards are managed will now be directly determined by regional and district councils. This will depend on levels of institutional experience within councils and the willingness of councils to achieve the goal of sustainable flood hazard management, resulting in variations in policy and practice throughout the country (Campbell and Dixon, 1993). It may be that a more coercive approach is needed to ensure that hazards are managed sustainably.

This chapter has discussed flood hazard management from last century to the present day. The next chapter presents the research design used in this thesis and outlines the methods used to assess how councils are fulfilling their flood hazard management responsibilities.

# Chapter Four: Methodology

The aim of this thesis is to examine the ways in which councils are fulfilling their flood hazard reduction responsibilities and to identify any constraints on effective flood hazard management under RMA. This chapter will discuss the methodology used in achieving this objective. Two methods were used to investigate the ways in which councils are implementing their flood hazard responsibilities. A method of plan coding and semi-structured interviews were used within the case study area. This chapter sets out the research methodology and the particular methods used in undertaking this research.

A mixture of qualitative and quantitative approaches were used in the field work for this thesis. This is known as inter-method triangulation in which two or more methods of different methodological origin are used (Sarantakos, 1993). Inter-method triangulation allowed the researcher to obtain a variety of information on the same issue and to assess the gaps between the public policies and methods of the organisations, as represented in the plans and the actual policies and methods being implemented by those organisations, as revealed in the interviews. As district plans were used as a mechanism for measuring the implementation of flood hazard reduction measures by TLA's, a plan coding method was applied to assess the plans. This allowed a more objectively based assessment of the plans and comparison between them. The two methods complement each other, covering aspects which may have been missed if only one of the methods had been used.

The first phase consisted of choosing case study areas which would be the basis of the plan coding and interviews. The second phase of the research was to conduct interviews with council staff to ascertain how they implemented flood hazard reduction and any difficulties or constraints in implementing flood hazard reduction policy. The third phase consisted of coding the plans to determine the methods councils were using for flood hazard reduction, the identification of the differences between council approaches and how well each council was fulfilling its flood hazard responsibilities. The plan coding phase was carried out before the interview phase as the interviews were used to gain information on the institutional environments in which the plans were written.

## Phase one: case study

A sample of six district councils and two regional councils were chosen. Given that there are over 73 district councils and 11 regional councils the representativeness of councils chosen for the case study was not a concern as the constraints of this thesis meant it was not possible to gain a representative sample. Therefore, purposive sampling, a form of

non-probability sampling, was used to choose the councils to be studied. This form of sampling involves the researcher choosing subjects which are relevant to the research topic, in the opinion of the researcher (Sarantakos, 1993).

The councils chosen through purposive sampling were identified through three main criteria: they had a significant or potential flood problem; district plans had been released in at least draft form under the RMA; and the councils were relatively accessible for the conduct of this research. As the capacity and commitment of councils in implementing flood hazard reduction was also under scrutiny, Lower North Island councils were chosen to identify any problems that councils lacking the resources of larger metropolitan areas may be experiencing. Four rurally-based district councils and two larger urban-based district councils were chosen, with two of the former and one of the latter selected in each region.

Three of these councils were in the jurisdiction of the Manawatu-Wanganui Regional Council and three were within the jurisdiction of the Wellington Regional Council. The more rurally-based councils would be comparable on their population and funding basis and the same applied to the two larger-urban based councils. The inclusion of the two urban based councils was considered to be important because the differences between councils with larger rating bases could be compared with those with smaller rating bases.

The variability in the topography and populations of the case study councils chosen was largely eliminated, in that there were no major differences between the topography, climate and populations of the case study councils. Figure 4.1 illustrates the territorial authority boundaries of the case study councils. All of the councils chosen have a flood hazard, although the damage potential of this hazard varies between districts.

The councils selected within the Manawatu-Wanganui region were Palmerston North City Council, Ruapehu District Council and Tararua District Council. The combination of intensive development on the large floodplain of the Manawatu River has resulted in Palmerston North City and its surrounding areas being susceptible to flooding with a high damage potential. The last major flood occurred in the city 1992. Flood threats also exist from the Mangaone and Kawau Streams and the Oroua River.

The Ruapehu District is prone to flooding from a number of rivers and smaller streams in the area. The main flood threats are posed by the Wanganui and Ohura Rivers. Taumaranui, the main township in the Ruapehu District Council area experienced its last major flood in the 1960s. The Tararua district drains both the Ruahine and Tararua ranges. It is an area prone to heavy rainfalls and flood threats exist from several rivers and smaller streams. The district has repeated flood problems in its Alfredton-Eketahuna corner. Figure 4.2 shows the areas in the case study districts prone to flooding.

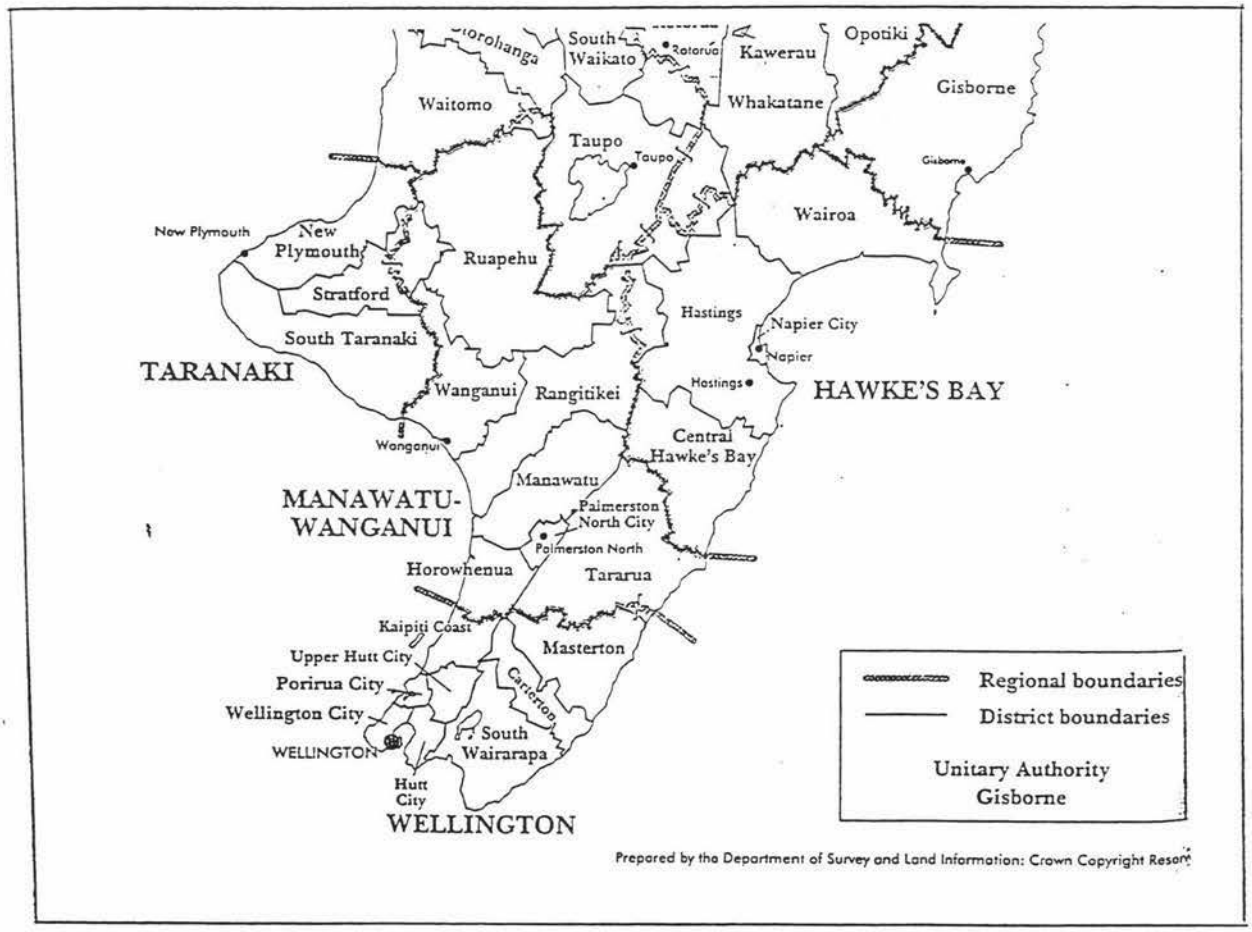


Figure 4.1 The territorial boundaries of case study councils chosen.

Source: Local Government Directory, 1995, 60.

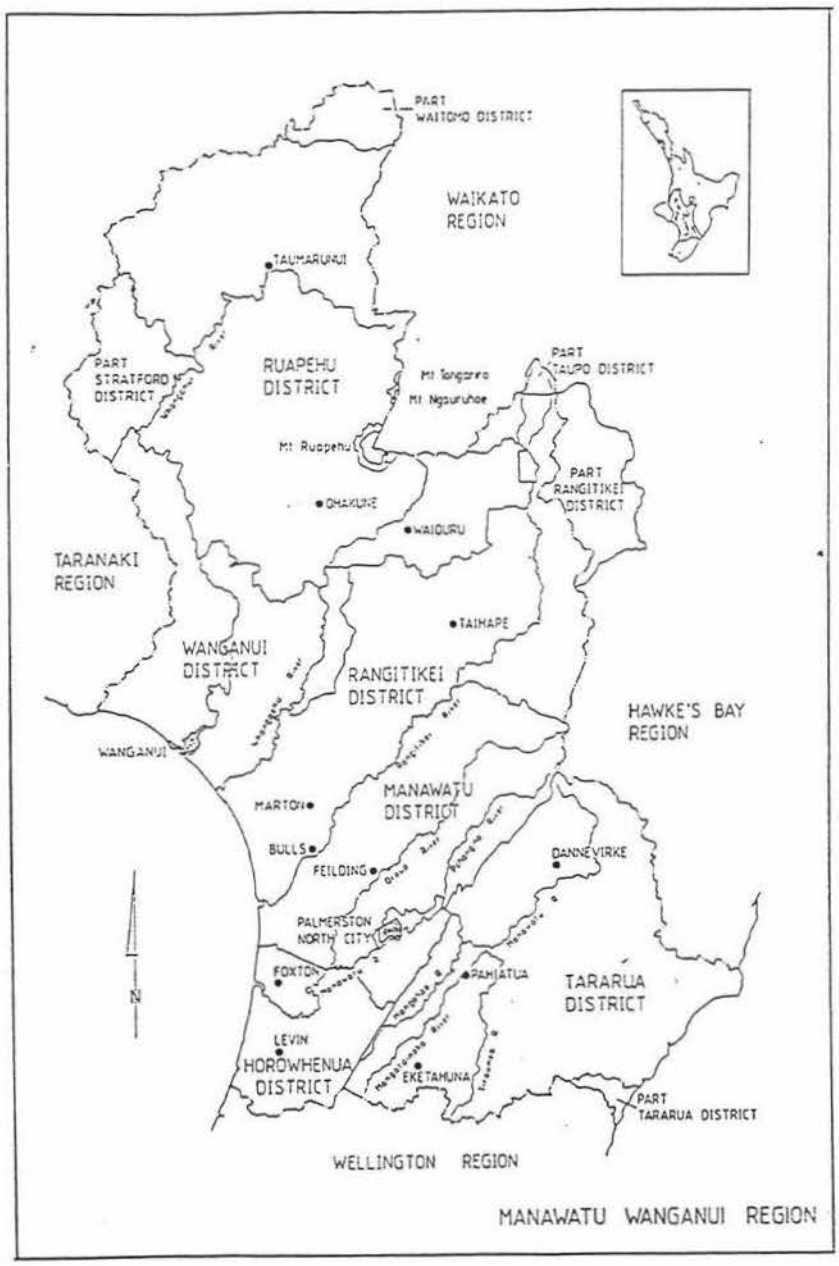


Figure 4.2 Areas in the Manawatu-Wanganui region prone to flooding
Source: Manawatu-Wanganui Regional Council, 1995, 12.

Within the Wellington Region the councils chosen were Kapiti Coast District Council, Masterton District Council, and South Wairarapa District. Intensive floodplain development in on the Kapiti Coast makes the area particularly prone to flood damages, especially the Otaihanga area which experiences flooding every two to three years. The South Wairarapa District is geographically large with a small population base. Flood

threats originate from three major rivers in the area, the Waiohine, the Ruamahanga and the Huangarua, generally after rainfall in the Tararua Ranges. The townships of Greytown and Martinborough both regularly experience severe flooding.

In addition to conventional flood damages, flooding in this district is known to isolate the area due to the closure of access routes in and out of the towns, particularly Martinborough. Masterton District lies on the floodplains of the Waingawa, Ruamahanga and Tauweru Rivers and faces a significant potential flood threat. The main areas of concern in this district are the Waingawa River which has the potential to take a shortcut and flow through the township and the Tinui area. Figure 4.3 illustrates the areas most prone to flooding in the Wellington region.

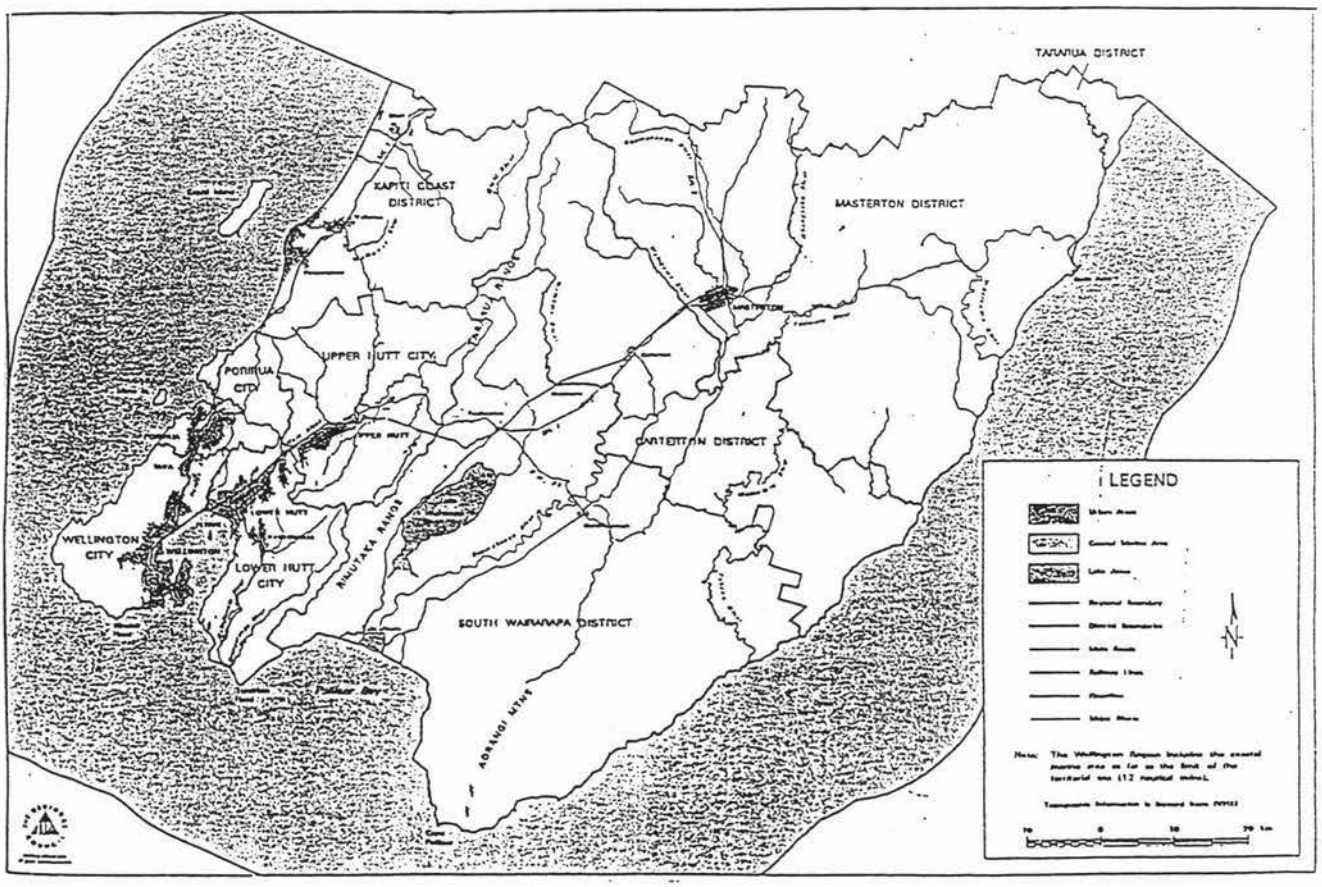


Figure 4.3 Areas prone to flooding in the case study areas of the Wellington region.

Source: Wellington Regional Council, 1995.

# Phase two: plan analysis

Analysing district plans was a necessary component of this fieldwork. The district plan in particular, through its control over land use which can have a major effect on flood hazard reduction. Future floodplain development can be controlled and existing development in flood prone areas could also be made less vulnerable to flood damages through provisions in district plans. The intent of the plan analysis through plan coding was to ascertain what methods were contained within the district plans to implement flood hazard reduction.

## Plan Coding

Plan coding involves the numerical scoring of land use plans. Plan coding was used as it was a systematic method of assessing the quality of the plans that were being produced, the range of measures being used to reduce the flood hazard, and allowed comparison between plans. This method was adapted by Berke (1994) and has been used recently in research on natural hazard policies within coercive and co-operative mandates[19].

Plan coding was initially developed for application in the United States, thus some aspects of this method were unsuitable for inclusion in this research. Plans in the United States which deal with natural hazards, include aspects such as pre-disaster planning and post-disaster recovery within the same plan. These components of the method were therefore irrelevant to this research, which was focusing on how councils are implementing flood hazard reduction i.e., proactive planning rather than emergency response. [20] The inclusion of them would have necessitated the coding of civil defence plans so these parts of the method were excluded from the coding schedule.

The quality of plans appears to be hard to define and very little attention has been paid by planners to this issue to date. Berke (1994) believes that the key characteristics which define plan quality are "facts", "goals", and "policies" and that these three factors are suitable for use as criteria in evaluating the quality of a plan.

In addressing the flood hazard the fact basis of the plans is crucial, as indeed it is for all natural hazards. The fact basis of a plan should "specif[y] local conditions and indentif[y] needs related to community physical development" (Kaiser et al., in Berke, 1994, 156). In the process of adjusting to the flood hazard the fact basis allows for the assessment of practical choices for the area. A plan that effectively reduces the flood hazard would

[19]Chapman S, 1995 and May et al., 1996, forthcoming.

[20]The Civil Defence organisation is responsible for emergency and post-disaster planning not local government, although the latter does play a significant role in implementing civil defence procedures.

outline the threat of possible flooding in the locality, the local aggravating conditions in relation to the flood hazard, the areal extent of possible flooding in the area and provide maps of the most vulnerable areas. As discussed in chapter two, floodplain mapping was found by researchers to be a crucial aspect of optimal flood hazard management.

Plan objectives represent the "general aspirations, problem alleviation's and needs that are premised on shared local values" (ibid.). A plan which aimed to effectively reduce the flood hazard would have explicitly stated objectives to reduce the effects of flooding. Objectives for flood hazard management should: relate to a specific issue; state what the council requires from the resolution of the issue; explain the state of the resource or the environmental value which is sought; and be applicable to the assessment of resource consents (Ministry for the Environment, 1994).

Policies within a plan "serve as a general guide to decisions about the location, density, type and timing of public and private development to ensure that plan goals are achieved" (Kaiser et al., in Berke, 1994, 156.) Policies should: relate to a stated objective; be capable of assisting in resource consent decision-making; assist in leading to a decision based on the environmental effects of an issue and state how the effect is going to be addressed (Ministry for the Environment, 1994).

For this research the 'goals' (as defined by Berke 1994) were reclassified as 'objectives/policies' as objectives are the New Zealand equivalent of goals. In addition many of the goals detailed in this method are policies in this country. The distinction between the 'goals' section and the 'policies' section was slightly different to that of the original method. For this reason the 'policies' section in the original version was expanded to 'policies/methods' as many of the policies that were classified in the policy section are used as methods in this country.

The way in which the plans were scored is adapted from Berke (1994, 157) and is as follows. The 'fact basis', 'objectives/policies' and 'policies/methods' items' used in the coding are presented in Table 4.1.

The 40 individual items were combined into 11 indices and these were used as indicators of the overall results. Berke (1994), used 53 individual items with 13 indices but many of these were irrelevant due to the separation of activities in New Zealand into civil defence activities and planning and resource management activities. The individual items were coded using the scale presented in Table 4.2. Half measures were used if it was perceived that a plan had scored in between the items on the scale, for example if a plan had maps which were more than mentioned but not of enough detail to score a 2, the plan could receive 1.5 for this.

Table 4.1 List of items for plan coding. Adapted from Berke (1994, 158).

*Fact Basis*

*Maps of hazards*

1.Delineation of the location of the hazard.

2.Delineation of the magnitude of the hazard.

*Exposure*

3.Number of the current population exposed.

4.Loss estimations to private structures.

5.Loss estimations to public structures.

*Objectives/Policies*

*Hazard*

6Any goal to reduce property loss.

7.Any goal to protect the safety of the population.

8.Any goal to reduce damage to public property.

9.Any goal to minimise fiscal impacts of disasters.

10.Any goal to distribute hazards management costs equitably.

11.Any goal that promotes a hazards awareness program.

*Environment*

12.Any goal to reduce hazards impacts that also achieves preservation of natural areas.

13.Any goal to reduce hazards that also achieves preservation of open space and recreation areas.

14.Any goal to reduce hazards impacts that also achieves maintenance of good water quality.

*Policies/Methods*

*Land use controls.*

15.Permitted uses.

16.Density of development.

17.Transfer of development rights.

18.Density bonuses.

19.Tax abatements/Rates relief.

*Site Design.*

20.Setbacks.

21.Site Review.

22.Clustering.

23.Project impact assessment.

*Building Standards.*

24.Building codes.

25.Mandatory retrofitting.

26.Retrofitting incentives.

*Hazard knowledge.*

27.Education programs.

28.Mandatory disclosure.

29.Encouragement of voluntary real estate disclosure.

30.Technical assistance to owners.

31.Encouraging insurance purchase.

32.Disaster warning.

33.Hazards signage.

*Public facilities and infrastructure.*

34.Retrofitting public facilities.

35.Critical facilities standards.

*Structural measures.*

36.Any type of structural protection.

37. Recognition of residual hazard in spite of structural protection.

*Monitoring*

38. Any intention to gather further information.

39. Any proposed monitoring strategy.

40.Overall assessment for plan.

Total for plan.

Computation of plan quality score by indice consisted of three steps. The first was to assign a score to each of the 40 items. The score was the value assigned by the researcher for flooding. For example, a value of 2 (detailed) is assigned to community A for the item 'delineation of location of hazard'. The second step was to derive a composite score for each dimension by summing all the item scores within each indice. Finally each composite score was divided by the number of items within an indice. For example the 'maps' indice in Table 4.1 consisted of 2 items. Thus the scores for each indice ranged from the lowest score of 0 to the highest score of 2. Standardising the scores in this last step allowed for the comparison of the score out of the total possible mark and the comparison of composite scores between all of the plans.

Table 4.2 Coding Scale for Plans (Berke, 1994, 157).

**Fact basis items:**
0= not mentioned in the plan
1= mentioned but not detailed
2= mentioned and detailed

**Goal items (Objectives):**
0= not mentioned in plan
1=mentioned in plan

**Hazard reduction policy items (including methods):**
0= not mentioned in plan
1=suggested in plan
2= mandatory in plan

Berke (1994) used the tactic of double coding to increase the reliability of the coding. Given this was independent research, I chose, instead, to code each plan twice to ensure consistency in coding. Where scores differed between the first coding and the next, the scores were averaged out. This was quite important as the methodology could be subject to considerable interpretation in its application. To assist in coding consistently, a set of criteria and examples were developed (Appendix 1) based partly on plan coding guidelines previously used i.e. (Chapman ,1995).

# Phase three: interviews

Interviews with those working within local government were undertaken to gather information on the organisational circumstances within which planners were undertaking for flood hazard reduction. Specifically, the purpose of the interviews was to obtain details on the operational environments and constraints influencing flood hazard reduction planning within local government. Nine interviews were carried out with

planners from the six district councils as well as a manager from one regional council, and a planner and an engineer from the other regional council. The interviewees were chosen of the basis of having either written the natural hazard section of the district plan or the natural hazard section of the regional policy statement.

## The interview process

Semi-structured interviews were used to assess the context of planning for flood hazard reduction in the case study areas (Sarantakos, 1993). Semi-structured interviews were carried out as it was necessary to exercise some direction over the interview. This form of interview was used to minimise the chances of the interviewees digressing from the topic and to ensure the required information was obtained. The use of semi-structured interviews also allowed for flexibility if the interviewees volunteered information which was perceived to be important, and that warranted further investigation. Often the information the interviewee volunteers is as important as the information gained through the question and answer process and semi-structured interviews provided for this. Interviews were conducted on an individual basis, as this provided the most appropriate setting for eliciting the type of information required.

Open ended questions with prompts were used to allow for information to be given freely (Appendix 4.1, 4.2). The prompts were used to further explain the questions when required, and for elucidation purposes when the interviewees appeared unsure of the question. The use of open ended questions avoided the problem of leading questions which would solicitate a certain type of response. The interviews allowed for the respondents to make any additional comments at the end.

Once the interview questionnaire was formulated, the interviewees were telephoned to request their involvement. Apart from establishing personal contact, the use of the telephone ensured I was proposing to interview the most appropriate person and allowed both parties to establish a suitable time. The responses were excellent. Everyone either agreed to be interviewed or recommended a more appropriate person. A confirmation letter was then sent to each of the interviewees briefly restating my research aims, the purpose and time of the interview, and enclosing the interview schedule (Appendix 3.1). This allowed for considered rather than spontaneous answers. Enclosing the interview schedule also enabled the respondents to ask their colleagues about anything in the interview schedule they were unsure about. The letter also requested their permission to tape the interview and advised them that they would not be named in quotations to ensure confidentiality if they so wished. It was hoped that this would instil confidence in the interviewees by enabling them to answer the questions freely. The respondents were informed that they would be sent a copy of the transcript to assess and correct any

inaccuracies. The interviews were all positive experiences which resulted in a myriad of useful and interesting information. The sending out of transcripts, with an accompanying letter (Appendix 3.2), proved to be very useful for clarifying information received in the interviews.

### Interview Analysis

Once the interview information had been gathered it was synthesised through a process known as data reduction. Sarantakos (1993, 300) refers to this as the process of "manipulating, integrating, transforming and highlighting the data" for the purpose of identifying the important themes within the information and organising the material for the purpose of the study. The removal of irrelevant information was a large task. In addition to this, the questions were grouped into themes for the analysis chapter, as not all the questions were equally informative. As the regional council interviewees were asked slightly different questions from those posed to the district council planners, these had to be edited and rearranged to extract the important points.

## Interpretation

This part of the methodology involved the identification of patterns, similarities and trends within the data obtained through the plan coding and interviews. Once both sets of data had been collated the search for explanations of the results was undertaken. The interpretation phase of the research was an important part of integrating the plan coding information with the interview material. This process involved the re-examination of the literature within the light of the research findings. Information that had been gathered during the literature review which had not appeared significant at the time often took on a new meaning after the data synthesis process. The results of the fieldwork were then presented in the form of tables and text to condense and organise the information. The most prevalent themes were identified and the most important themes examined further.

The next chapter presents the results of the plan coding and the information gained through the interview process.

# Chapter Five: Research Results

This chapter presents the results of the plan coding and the fieldwork interviews. The plan coding identifies the methods councils are using to implement flood hazard reduction measures through their plans. The interviews offer insights into why the methods used in the plans have been chosen and the how the operating environment influences the implementation of flood hazard reduction measures. More emphasis has been placed on the district plans as these are the focus for planning at the local level. Results from the plan coding and interviews are summarised through the use of text and tables, allowing a succinct assessment of the ways in which councils are planning for the flood hazard.

## Plan coding results

The plan coding results are examined to identify the methods that councils are implementing in fulfilling their flood hazard responsibilities. Each coding characteristic ('fact', 'objectives/policies' and 'policies/methods') is considered in terms of its relevant indices, (for example the objective/policy indices are hazard and environment) which are in turn made up of individual items.

### Fact Basis

The total possible score for the Hazard Maps indice is a maximum of 2 for the District Councils and 1 for the Regional Councils, as the regional policy statements are more policy orientated documents than the district plans. For the district councils, Kapiti Coast scored the highest for the Hazard Map indice. The hazard maps contained in the plan were very detailed including its text which stated five categories of flood hazard mapped within the 1 % flood extent. Palmerston North City Council also scored reasonably well, although not as well as would be expected for an area with such a salient flood hazard. This plan contained maps detailing the extent of its flood protection zone but the delineation of hazard magnitude was less detailed. Masterton District also scored the same as Palmerston North for its hazard maps as the plan contained rather sketchy maps detailing a 1-2 and 5-10 year flood extent in certain locations. The plan for South Wairarapa District contained brief descriptions of floodable areas. Both regional councils scored the same due to the presence of adequate text descriptions. Scores for the Exposure Estimate indice for all councils were nil. Table 5.1 summarises these results.

Table 5.1 Fact Basis Scores for councils.[21]

**Table 5.1 Fact Basis Scores**

| *Fact Basis ( / 2 )* | PNCC | RDC | TDC | MDC | SWDC | KCDC | MWRC *( / 1 )* | WRC *( / 1 )* |
|---|---|---|---|---|---|---|---|---|
| Maps of hazards | 1.25 | 0 | 0 | 1.25 | 0.5 | 1.75 | 0.75 | 0.75 |
| Exposure estimates | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Objectives/Policies

Objectives/Policies were scored out of a total of 1. Kapiti Coast district again scored the highest for the Hazards Objectives/Policies indice, obtaining the maximum possible score. The Wellington Regional Council also obtained the maximum score, although this is to be expected from a policy document of this kind. Manawatu-Wanganui Regional Council and Ruapehu District both scored reasonably well. Palmerston North City Council scored the lowest for this section as its hazard reduction objectives and policies were vague, particularly for a city with such a recognised flood hazard.

For the Environment Objectives/Policies indice, Palmerston North and Tararua, Masterton, South Wairarapa and Kapiti Coast Councils all scored the same for the mention of the use of esplanade reserves and strips for the management of flooding. The regional policy statements did not score well in this indice. This is particularly discouraging considering that these policy documents are intended to provide for the integrated management of resources in the respective regions. Both regional council policy statements mentioned the consideration of the protection of natural ecosystems in undertaking flood control works and the planting of riparian strips in managing the flood hazard. Objectives/Policies scores are summarised in Table 5.2.

[21] Legend for all score tables

| | | | |
|---|---|---|---|
| Palmerston North City Council | PNCC | Masterton District Council | MDC |
| Ruapehu District Council | RDC | South Wairarapa District Council | SWDC |
| Tararua District Council | TDC | Kapiti Coast District Council | KCDC |
| Manawatu-Wanganui Regional Council | MWRC | Wellington Regional Council | WRC |

Table 5.2 Objectives/policies scores for councils* .

**Table 5.2 Objectives/policies scores**

| *Objectives/policies ( / 1)* | PNCC | RDC | TDC | MDC | SWDC | KCDC | MWRC | WRC |
|---|---|---|---|---|---|---|---|---|
| Hazard objectives/policies | 0.33 | 0.66 | 0.57 | 0.5 | 0.57 | 1 | 0.66 | 1 |
| Environmental obj's/policies | 0.33 | 0 | 0.33 | 0.33 | 0.33 | 0.33 | 0.5 | 0.5 |

## Policies/Methods

Policies/Methods scores are out of a total of 2 for each indice. The regional councils have been excluded from the first three indices (Land Use Controls, Site Design and Building Standards) as well as the fifth (Public facilities and infrastructure) because of the nature of their functions under the RMA and LGA. These results are summarised in Table 5.3.

For the Land Use Controls indice, Palmerston North City Council, Kapiti Coast District and Tararua District all obtained equally low scores, although these were the highest for all the councils. These scores were obtained through the specification of permitted and prohibited activities in areas known to flood. Ruapehu and Masterton did not score at all in this characteristic. Palmerston North has a Flood Protection Zone, South Wairarapa, who only just rated on the scale, has a River Corridor Policy Area and Kapiti Coast has a River Corridor Zone in which certain activities are allowed or disallowed.

For the Site Design indice Tararua District scored the highest with a score of 1.75 with South Wairarapa District obtaining the next highest score. The Tararua District Plan has quite detailed specifications for construction standards of sites in areas prone to flooding. These two councils both have minimal structural protection and therefore have to rely on the consents process to minimise flood losses.

All the councils obtained low scores for the Building Standards indice. Masterton obtained the highest score with half marks as shown in Table 5.3. Next came Palmerston North, Ruapehu and Kapiti Coast. Interestingly, the two councils who scored the highest for the Site Design indice both scored the lowest equal on the Building Standards indice, indicating a reliance on flood hazard control at different stages of the land development process.

For Hazard Knowledge all the scores were low with Kapiti Coast District obtaining the highest. The second highest score was Tararua District which focused on "the transfer of

* see footnote 21 for table legend

this information to the community as the main method of mitigating the effects of natural hazards, thereby enabling a self-help approach" (TDC, 2-28). Both regional councils obtained the same scores for this section, which were low. Palmerston North City scored the lowest for this indice.

All the councils scored nil for the indice 'Public Facilities and Infrastructure' except for Wellington Regional Council which scored 0.5 through its preparation of contingency plans to ensure essential operations continue in a natural hazard event. This is probably more a reflection of the earthquake risk and population in the area than prudent flood hazard planning.

Table 5.3 Policies/Methods scores for councils*.

**Table 5.3 Policies/methods scores**

| *Policies/methods ( / 2 )* | PNCC | RDC | TDC | MDC | SWDC | KCDC | MWRC | WRC |
|---|---|---|---|---|---|---|---|---|
| Land Use Controls | 0.4 | 0 | 0.4 | 0 | 0.1 | 0.4 | N/A | N/A |
| Site Design | 0.5 | 0.75 | 1.75 | 1 | 1.25 | 1.12 | N/A | N/A |
| Building standards | 0.66 | 0.66 | 0.33 | 1 | 0.33 | 0.66 | N/A | N/A |
| Hazard knowledge | 0.28 | 0.42 | 0.71 | 0.42 | 0.42 | 0.85 | 0.57 | 0.57 |
| Public facilities and infrastructure | 0 | 0 | 0 | 0 | 0 | 0 | N/A | N/A |
| Structural measures | 2 | 0.5 | 0.5 | 0 | 0.5 | 1.5 | 1.5 | 1 |
| Monitoring | 0 | 1 | 1 | 2 | 0 | 0 | 1 | 1 |

Palmerston North City Council scored maximum points for the Structural Measures indice for recognising that the protection these measures offered the city was not infallible. Kapiti Coast District scored second highest for integrating structural measures with other flood reduction measures. Manawatu-Wanganui Regional Council he same as Kapiti Coast (refer Table 5.3) for its efforts through stating that it was moving away from this measure towards avoidance (1995) and mentioning protection from design floods. Wellington Regional Council scored less than Manawatu-Wanganui Regional Council de little reference to the use of structural measures in the RPS.

For the Monitoring indice Tararua and Ruapehu District Councils together with Manawatu-Wanganui and Wellington Regional Councils all scored half marks for explicitly stating the need to obtain further information. The only council to outline the procedures to be undertaken in monitoring natural hazards in the plan, as well as expressing the need for further information, was Masterton who earned the highest and maximum score. These results are depicted in Table 5.3.

* see footnote 21 for table legend

## Overall Results

Figure 5.1 summarises the overall plan coding results for the district councils[22]. It illustrates which councils achieved the highest and lowest scores for each characteristic and overall. The district council which scored consistently highest was Kapiti Coast District Council with Masterton District, second. Interestingly, there was a minimal difference between Palmerston North City and Tararua District. This is surprising considering one council has a substantial population base and a high flood loss potential. while the other does not. South Wairarapa followed with Ruapehu District last.

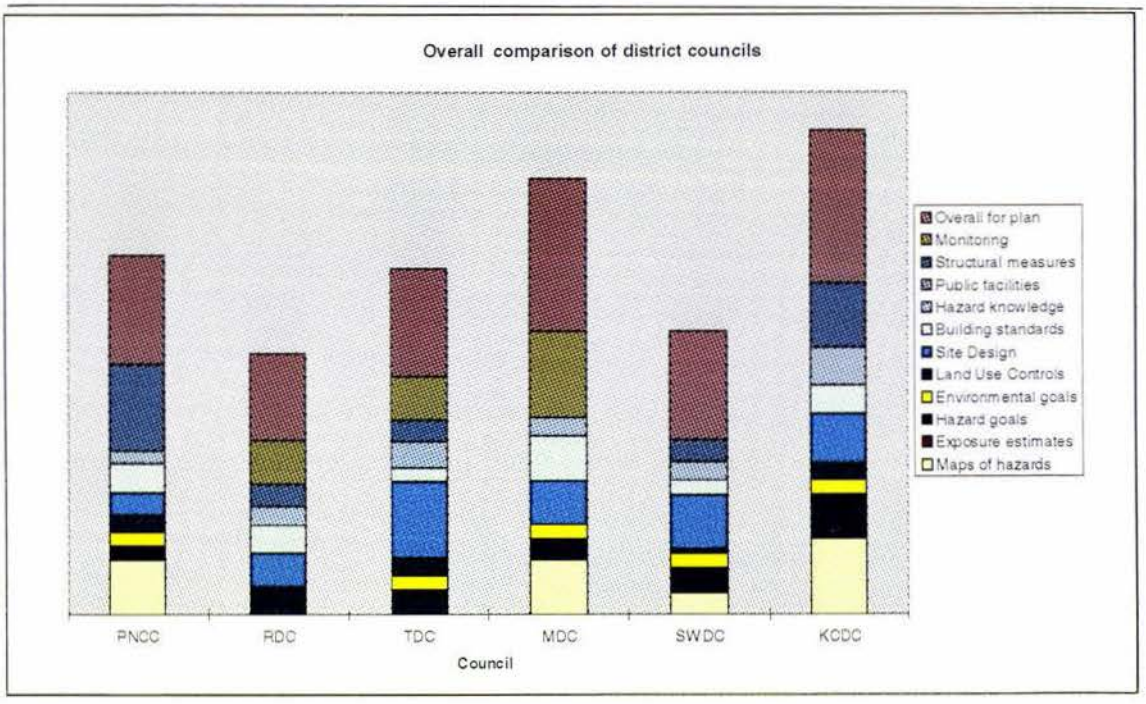


Figure 5.1. Council scores by indice*.

The interview results presented in Tables 5.4-5.16 offer some insights into why the councils may have achieved the results they did in the coding. The interview results examine the operating environment within which the councils are preparing their district and regional plans and planning for flood hazard reduction.

[22] Regional councils are included in the plan analysis for an assessment of the integration between council levels. They are not comparable with district councils overall performance due to their different functions and responsibilities.

* see footnote 21 for table legend

# Plan Interview Results

The following tables present the responses to the interview questionnaires (Appendix 4.1, 4.2). The text both summarises and expands on, the information presented in the tables and presents information that interviewees did not wish to be directly reported on.

## Nature of Flood Hazard in the area

As Table 5.4 illustrates, all the chosen councils had a flood problem of enough proportions to be a problem. All of the areas had experienced flooding during the 1990s and many of the councils experienced frequent flooding in their districts. Both of the larger urban-based councils are subject to regular flooding which may be exacerbated because of their large populations. One interviewee suggested that flooding was not an issue in the district although evidence from other sources including the relevant regional council disputes this[23].

## Development intensity and pressure

Both regions are vulnerable to considerable development pressure within them as shown in Table 5.5. The larger urban-based councils were particularly aware of this development pressure and took steps to control flood loss potential, usually in the form of zoning. The conflict between development and flood hazard protection was evident in response to this question, particularly in the smaller, rurally based councils. These councils were still trying to encourage development in their areas while aware of the potential hazard. Controls on development in floodable areas were significantly less stringent in these plans than in the larger urban-based plans.

## Information Availability

Table 5.6 outlines the responses to the question concerning the amount of available information on flooding in the relevant area. The amount of information available on flooding varied significantly between councils and extracting this information from the regional councils appeared to be problematic for most districts. Most of the planners in the district councils thought that the regional councils did not have good information and that obtaining this information from them was, in any case "difficult at best". One planner noted "they have a lot of data and not much information", a sentiment also expressed in varying degrees by others.

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[23] Works Consultancy Services, 1994. Noah problem! Momentum, January/February, p 5.

Much of the information that was available was considered to be out of date and staff were wary of using it for planning purposes in case it turned out to be incorrect. Another interviewee expressed doubts on the accurate use and interpretation of data by councils. This person considered that frequency curves may be being misinterpreted by one council through their hydrological data underestimating the events that are occurring and therefore getting larger than average floods more frequently.

## Amount of structural protection

The amount of structural protection varied greatly between councils as can be seen in Table 5.7. The existing protection tended to depend on the population of the area, the historical precedent set by past floods and catchment board activity. Some catchment boards were more active in certain areas within their jurisdictions than others meaning that some areas are now extensively protected and others are not.

Structural protection in the districts was most commonly in the form of stopbanks. Councils were all investigating the provision of further structural protection in the form of stopbanks, although this process is now more problematic because government subsidies are no longer available and communities must now bear the costs of protection works themselves. Many of the planners had no idea of the design levels of their protection and the interviewees that did know design levels reluctantly admitted that there were areas of protection in which the design levels were "anybody's guess" and just a "ballpark figure".

## Non-structural mitigation methods for flood hazard reduction, including those within the district plan

As Table 5.8 illustrates, only two of the district councils are using zoning as a means of controlling development and activities in floodable areas. One council has a flood protection policy area, (although the exact location of this is not clearly shown on the plan's maps), and the planner admitted that the use of policy areas allowed them to take a flexible view. The only other non-structural method in use by councils for effective control of the flood hazard is the use of minimum floor levels. Some councils advocated the use of a flood-free building site in the interviews, although this was not explicitly stated in any of the plans. Several councils are choosing to tag titles under the Building Act 36(2), (Appendix 2.8). Both regional councils have taken the approach of choosing to deal with flooding through the provision of rules for inclusion in district plans for designated floodable areas. Education is frequently promoted as a method for flood hazard reduction by councils.

**Table 5.4 Nature of the flood hazard in the region/district**

| Councils | Comments |
|---|---|
| Palmerston North City Council | The last real flooding we had was in May '92 |
| Tararua District Council | It's not really an issue in Tararua, although the Mangatainoka has some problems particularly around Pahiatua. |
| Ruapehu District Council | We do have a flood problem in part of the district, especially out Ohura way, to the west of Taumaranui. The last major flood in Taumaranui was in the '60s. Ohura used to get flooded every one to two years, although it is slightly less frequent now. |
| Manawatu-Wanganui Regional Council | The most recent flooding in our region would have been the '92 flood of the Manawatu River, Oroua River and other rivers throughout the region, and the Taonui basin flood of 1995- although this was more of a drainage scheme problem. We still get problems in terms of our non-structurally solved areas, for example the Alfredton/Eketahuna corner. |
| Masterton District Council | We don't have a major flood problem but there is a potential risk of flooding. There is a slight possibility that the Waingawa River could cut through the town when in flood. The main areas that we are concerned about in relation to flooding would be the Ruamahanga, Waingawa and Tauweru Rivers and around the Tinui area. |
| South Wairarapa District Council | We are an area which is very much prone to flooding. The main reason for this is our location- we are in a low catchment and the rivers run directly to the sea. If there is heavy rainfall in the Tararua's then there is a chance we will get flooded, mainly from the Waiohine. |

| | |
|---|---|
| Kapiti Coast District Council | We do have a flood hazard here. Flooding occurs in Otaihanga every couple of years. |
| Wellington Regional Council | Both Wairarapa and the eastern side have had a number of floods over the past few years. The largest flood we have had on the eastern side in the last five years would have been a 12 year flood at Waikanae. In 1990 we had a 10-12 year flood in the Kapiti area. In recent times we haven't really had the events on the eastern side which is part of our problem in terms of people perceiving that there is not a flood hazard here. |

**Table 5.5 Current intensity and future development pressure for floodplain**

| Councils | Comments |
|---|---|
| Palmerston North City Council | There is pressure but no floodprone land will be made available for development. |
| Tararua District Council | In Pahiatua there's a shortage of land in what was the old Pahiatua Borough. Most of the undeveloped land is what was in the old district scheme zoned flood controlled or something like that. That is where our difficulties arise because people want to develop in that area and we only allow them to do it if they are prepared to tag titles under the Building Act. Until we can resolve that situation a lot of development isn't happening that might be happening. |
| Ruapehu District Council | Ohura was an urban area with a population of about 650 which is now down to around the 100 mark. More sections are undeveloped than developed so it is really low intensity. There is not the development pressure. Taumaranui has all its' floodplains pretty well developed, they were the first to be developed and are now urban, commercial and industrial areas. |
| Manawatu-Wanganui Regional Council | There is a lot of pressure for future floodplain development around here. Some of the districts have not really woken up to the idea that they shouldn't be adding to the flood risk. There is a lot of infilling going on and every house they put on the floodplain is one more that gets flooded. Some of the districts could plan their way out of it with their house values but they are not. They are trying for structural solutions. |
| Masterton District Council | There is some pressure for development on the floodplain especially of the rural-residential variety. There is an increasing density in town and with this a corresponding decrease in lot sizes. |

| | |
|---|---|
| South Wairarapa District Council | There has been quite an increase in development in the area, not just the floodable areas, which has been brought about by a number of things. For example with rural-residential development, council has taken a flexible view to encourage development in the area. |
| Kapiti Coast District Council | We have a very high population growth and quite a bit of development pressure, especially in Paraparaumu. |
| Wellington Regional Council | We have severe intensity of development in our floodplains and there is continual pressure for future floodplain development. Kapiti is in a great position in terms of their continual growth to be able to control floodplain development. |

**Table 5.6 Amount of information available on flooding in the area**

| Councils | Comments |
|---|---|
| Palmerston North City Council | The historical records date back to the 1890s. The regional council has defined the areas subject to flood hazard based on aerial photographs which may not be very accurate. |
| Tararua District Council | The only data I'm aware of is that done by the Manawatu Catchment Board in 1972. In both the Woodville County Plan and the Pahiatua Borough Plan they had flood zones marked based on this data. When we prepared our new plan we purposely left all that out and the regional council made a submission saying we should reinstate it. According to us they will have to justify it. If they can't, it puts us in a better position when we are dealing with the landowners. |
| Ruapehu District Council | There isn't much information around and that is one of our issues. We do hold a little bit on Taumaranui but that was prepared in the '60s so its validity is questionable. |
| Manawatu-Wanganui Regional Council | We have one of the best hydrological records in the country in regard to riverine flooding because the floodplain was always such a big problem here. We have a pretty much continuous record from about 1880. We get information from aerial photography off the Palmerston North '53 flood which gave us a lot of information. In all the floods since then we have been up in the air taking photographs so that's what we use for planning information.<br><br>It is a difficult exercise to produce accurate maps but something is better than nothing. If we have photographs of where the water has been we can use these, plus think about the return periods of events, and allow for a safety margin. |

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| | If we have good information we can be stricter with the standards we set, but to work out where the water will flood in the Alfredton area is too hard to justify.<br><br>It can be a struggle to make some councils wake up and realise that we have this information. We have models that let us know how and where the water will migrate through Palmerston North etc. In some instances we may have too much information, you have to sift it down to a level that people can work with. |
| Masterton District Council | We have minimal information. However, the information that we have now is significantly better than that we had for the district scheme in 1988. Then all we could produce is one map labelled 'guide only' to show areas of possible flooding. The lack of information is a major problem as we need good information if we want to impose stricter subdivision standards. |
| South Wairarapa District Council | That is more the area of our engineering department so I don't get involved in it a lot. Unfortunately with a small staff our staff tends to change a bit so a lot of knowledge goes too. At the moment if I get a consent application in an area I know may be prone to flooding I have to fire it up to the regional council. The regional council would have had enough data to make a submission on identifying our floodable areas which is how they have been identified, in combination with local knowledge. |
| Kapiti Coast District Council | There's loads of information including that from the former Manawatu Catchment Board. WRC have it. Information for our 1 % extent was based on their computer modelling. We have detailed flooding maps, based on regional council information which they downloaded from their GIS to ours. We had a bit of fun and |

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| | games with mapping locations but they were basically teething problems. |
| Wellington Regional Council | We have a fairly good information base now, particularly in the western areas. It's variable for the secondary watercourses but we will pick them up over a period of time. At this stage we are concentrating on the main ones and getting through the floodplain management plans, identifying the hazard through flood hazard assessments. The eastern side's information base is nowhere near as comprehensive, but I'm not saying that is good or bad as they have much more sparse development with one or two houses rather than hundreds of them. |

**Table 5.7 Levels of structural protection**

| Councils | Comments |
|---|---|
| Palmerston North City | We have major controls on all the local rivers. The Manawatu Scheme has a design level of about a 120 year return period. |
| Tararua District Council | This council has no structural protection. |
| Ruapehu District Council | Taumaranui has stopbanks protecting it but I couldn't tell you what the design levels are. |
| Manawatu-Wanganui Regional | We have basically 100 year stopbank protection from Palmerston North to the sea on the Manawatu River. Our network isn't designed to contain the big flood everywhere so we have spillways set up to divert water down through pre-determined places which are zoned accordingly. The Oroua River to Kopane is 100 year and from Kopane down it is 25 year. The Mangaone has got 15 year stopbank protection through the city.<br><br>We also have a lot of detention dams. On the Mangaone by Alfredton, there are dams which have successfully controlled some flooding and have been there for a long time. There are also the Moutoa floodgates.<br><br>We've covered most of the big floodplains apart from Eketahuna but there are only small amounts of vulnerable land over there, and we have got stopbanking systems on part of the Mangatainoka. |
| Masterton District Council | There is structural protection in the lower river area. |
| South Wairarapa District Council | We do have stopbanks but couldn't comment on design levels as they are a regional council responsibility. We have the Lower Valley |

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| | Development Scheme to control water levels which fits in with the lakes. The regional council controls Lake Wairarapa through floodgates on the lower reaches of the river and the lake and a similar situation exists for Lake Onoke. A Floodway is being constructed at the entrance to Martinborough to take excess water from the Huangarua. The river would burst its banks and close the road so access in and out of town was a major problem. |
| Kapiti Coast District Council | Do have stopbanks but design levels vary. |
| Wellington Regional Council | Waikanae is 10 year. The Hutt system was designed to cope with a 1000 year but the system doesn't have the structural strength so I would say it is 100 year. It varies but nominally we are still working at around the 100 year for most of our work. In the future our rural areas may come back and our urban areas should increase. There is still a perception that a 100 year is fine. If you have 100 year protection there are other things to worry about. |

**Table 5.8 Non-structural methods used by councils to mitigate flooding**

| Councils | Comments |
|---|---|
| Palmerston North City Council | We have used the flood protection zone where building in this area is a prohibited activity and we use minimum floor levels in our identified ponding areas. The city should not have been established here and the future growth paths of the city take this into account, including no flood prone land being made available for future development. Regulation is an important element and vital to protect people from themselves. The council would possibly face financial liability if insufficient regulations were imposed. I'm not aware of any. The regional council has a few monitoring posts around but this council hasn't got any. We will tag titles in some areas. |
| Tararua District Council | We've got nothing in our plan. We've got a few brief statements but there are no real rules. A few vague sounding rules but there's nothing definite in our plan and we are looking for the cross-submission process to reinforce that with the regional council. |
| Ruapehu District Council | No sophisticated warning systems or anything. In the old Taumaranui County Scheme there were prohibited activities which prohibited or made development difficult in that area, although we haven't carried that through in the proposed plan. We looked at that as a Building Act matter which we can deal with under the Building Act. We don't tag titles as we don't have enough information to be confident to do that.<br><br>Our proposed plan uses the approach whereby we haven't done anything. We've just got objectives, polices and methods, no rules. One of the methods is as soon as we get some decent information we'll be looking at that chapter and varying it through a plan change. |
| Manawatu-Wanganui Regional Council | We have a range of these including warning systems, civil defence responsibilities etc. but our main method in relation to the flood hazard is the advice and advocacy role, for example putting in cross-submissions to reinforce the Awatea ponding area in the PNCC District Plan. |

We are currently employing someone to go through all our available information and create flood maps to put back into the district plans. In the current round of plans, most of the councils have left them out.

We did consider having a regional plan for natural hazards and the flood hazard but we chose to take the approach of dealing with flooding through mechanisms such as designations in district plans. For example, the regional council makes rules for those areas designated as Flood Protection Zone in the PNCC District Plan. One factor against having a plan to control the flood hazard is that it would mean yet another layer of plans. I am working on a plan for Lakes, Rivers and Wetlands which contains rules for controlling land use on land designated for flood protection.

(on the district plans) In the Ruapehu area the Wanganui River floods occasionally near Taumaranui. There are small areas of flood prone land along the Wanganui near Taumaranui and at Ohura and Maitere. The flood hazard is currently being mapped by us for the district. Flooding is not a significant issue in Taumaranui and will not require as much detailed mapping as the other districts. They have no rules in their plan for flood control, they seem to have missed it out. We will have to rectify that and get them to put some in.

In Tararua, mapping of floodprone areas has nearly been completed. We do not see a need for major mitigation works or structures for flood protection. Controls on floodable land through the district plan is considered the best option for management of flood prone areas in the district.

Palmerston North City Council have included mapped areas of floodable land in their plan and this council is currently mapping additional areas for inclusion in the plan. We expect controls on development of these areas such as subdivision or minimum floor levels.

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| Masterton District Council | Consent processes and tagging titles. We have tight consent requirements. |
| South Wairarapa District Council | Consent processes and have tagged a title before under Local Government Act. We don't have zones as such, we have policy areas so we can do virtually anything anywhere, if you can get through the consent process. We have identified the floodplain areas on our maps which we call flood corridors.<br><br>In terms of our flood prone areas have given specific mention of that in our plan and we deal with activities through the consent process in areas we know are prone to flooding, i.e., the requirement for a flood free building site on a subdivision consent. In the flood protection policy area (30-40 metres either side of a water body) we would prohibit building, unless it's something like hides for bird-watching. |
| Kapiti Coast District Council | We have warning systems in combination with the WRC and a River Corridor Zone in our district plan.<br><br>We use zones, elevation requirements and the tagging of titles. If subdivision consents don't have a flood free building site we turn them down. WRC wrote the flood corridor section of our plan so they are pretty happy with that. |
| Wellington Regional Council | My view is we have a more holistic approach. I've got both engineering and planning staff on my staff so they are doing operational planning as opposed to just statutory planning and we are doing the full range of it rather than just one part or the other. I have an operations section; a floodplain management section; and an advisory section, all within the one department.<br><br>Implementation is the key. I think that structures do actually make a difference and I'm sure that gives us a strength. What we are trying to do is implement a new regime with old structures to some extent and that's where you get conflict because things fall through the hole because it's no-ones job to make it happen.<br><br>We use the Building Act, the Town and Country Planning Act transitional regional plan rules, zoning and the public acquisition of land. We have purchased a lot of land for flood control. It is |

extremely expensive but effectively it is the only tool if we want to preserve river corridors. We have not been able to do it using planning legislation previously or even now.

Our draft RPS stated that matters to do with land in regard to hazards would be dealt with by the districts. When it was written my understanding was that the river bed was wider than just the bed it was the corridor. But when it came to interpretation it was decided 'that land's not river bed' so all the things we wanted to control down the river corridor became a problem in relation to who was responsible for the area. In the end it went to the districts.

We wanted floodplain management in our regional plan but the Canterbury declaration came out from the Tribunal which meant we had to put floodplain management rules into the district plans. for example with Kapiti. The declaration has since been overturned but it was too late the direction had been set.

We are currently writing floodplain management plans. We are writing the plan for Waikanae and we are up to phase three for Otaki (refining the options for floodplain management).

We haven't finished the plan because we should be able to say what the long term planning restrictions are going to be. We haven't been able to do that because of the time frames for meeting district plans.

The flood hazard does not really fit easily anywhere at the moment but there is a section in our regional freshwater plan on flood mitigation as it had to go somewhere.

## Alternative methods considered for flood hazard reduction

The alternatives looked at by councils for flood hazard management consisted of a tentative investigation into economic instruments by some councils, which was considered by all to be too hard to implement i.e., "an administrative nightmare". The councils that did have flood hazard reduction methods in their plans tended to take a traditional approach in using regulation, and assessed alternatives such as structural protection and education. These results are presented in Table 5.9.

## Consultation

Table 5.10 illustrates that consultation with the community, on methods and options for reducing the flood hazard by district councils, was virtually non-existent. Both regional councils appeared to have made a significantly better effort at this for a variety of reasons including planning purposes. Several interviewees questioned the form and process of consultation that was occurring. They thought that the line between consultation in the true sense and simply telling people what was happening was blurred. Others felt frustrated by their politicians and senior management who they considered were portraying an inappropriate process to the public by not allowing the full clarification of all the issues and pushing through certain decisions.

## Assistance from regional councils

Despite the mixed responses illustrated in Table 5.11 below, the relationship between district councils and regional councils generally appeared to be a tentative one. One of the planners commented that "they pretty much leave us to it" and another commented that "the lack of information is a regional council problem". Another interviewee stated that the regional council was not really that helpful and it was difficult to get advice and assistance from them, even after repeated attempts.

## TLA responses to regional council initiatives in flood hazard management

Table 5.12 details the responses of regional council staff to the question of what reactions the regional councils had experienced from TLAs' in managing the flood hazard. All three regional council staff considered they had a generally good professional relationship with their constituent districts. Two of these staff expressed various forms of exasperation with some of their districts which they considered to be dragging their heels somewhat, in proactively managing the flood hazard. It was thought by these interviewees that the districts were taking some time to come on board with flood hazard planning and not participating fully. One interviewee commented "We do all the work and they just pick it up".

## Divisions of responsibilities between regional and district councils

Planners were divided on responses to this question as illustrated in Table 5.13. Some thought it worked well, while others considered it was a confusing situation. This appeared to be directly related to how well their own situation was working. Two district planners thought that flooding was still effectively a regional council function, and that they retained little real responsibility. Case law had confused some interviewees who complained of the contradictory direction coming from the legal system.

## Use of external advice in managing flooding

Table 5.14 describes the responses to the question of what external advice councils' used to assist them in undertaking flood hazard reduction. Apart from consultants used for actual district plan writing in the smaller councils, all of the district councils had not used any external advice in planning for flood hazard reduction. There appears to be a lack of suitably qualified specialists in this area outside of the regional councils. The regional councils used external information from the National Institute for Water and Atmospheric Research (NIWA), Works Consultancy and obtained legal advice.

## Councillor attitudes to the flood hazard

Table 5.15 details staff impressions of councillor attitudes to the flood hazard and flood hazard reduction. Support for flood hazard reduction by councillors varied depending on the severity of the hazard in the area and the local environmental conditions such as the degree of development pressure. Liability was a concern, particularly in the regional councils and larger urban-based councils. Several interviewees commented that their politicians were not interested and one or two "thought it was a bit of a joke". Membership of the Local Authority Protection Programme varied and one interviewee expressed reservation about the scheme commenting that the "rules are very uncertain". Some interviewees commented that obtaining money from councils for flood protection works or planning was sometimes difficult.

**Table 5.9 Alternative methods considered for flood hazard reduction**

| Councils | Comments |
|---|---|
| Palmerston North City Council | Education was felt by us to be very important with hazards and not something that the plan itself can achieve. We looked at rating but felt that it was not administratively feasible. The methods we chose for the plan were the ones we felt were easiest to impose in terms of achieving compliance in a high liability area. There was no certainty that other methods would be effective in situ with a lot at stake. |
| Tararua District Council | Not applicable as no methods in plan. |
| Ruapehu District Council | In terms of service delivery we are looking at providing protection through stopbanks. We really have no alternative other than that. |
| Manawatu-Wanganui Regional Council | We are using alternatives such as education. The use of incentives and disincentives are more of a district council responsibility. |
| South Wairarapa District Council | As we are a small council with few resources we are a bit limited in what we can do. |
| Kapiti Coast District Council | We thought about rating but it is too difficult and very messy to implement. |
| Wellington Regional Council | Education is part of our approach, which is the reason our floodplain management processes have taken so long, due to the level of public consultation and involvement. It is consultation in the true sense rather than telling them what is going to happen. We actually get them involved, which means you have to educate them first and get them to have an understanding so they can be involved in the decision-making process.<br><br>Regulation is the bottom line, it must be there and it must be backed up. Incentives and disincentives have not been used in a big way. It's hard to provide incentives. The disincentive works in terms of someone wanting to develop in a certain area and if they have to go through the hoops to get the approval they may not do it. We also use public land acquisition. |

**Table 5.10 Depth of consultation on the flood hazard during plan preparation**

| Councils | Comments |
|---|---|
| Palmerston North City Council | Limited. |
| Tararua District Council | Not really during consultation for the plan, it was never raised by anybody. |
| Ruapehu District Council | It came up at a public meeting we had at Ohura but it never went much further than that, so it was low level discussion. |
| Manawatu-Wanganui Regional Council | It was addressed during consultation for the RPS. |
| Masterton District Council | It was looked at in a minor way. |
| South Wairarapa District Council | We did a lot of consultation for the plan. For flooding it would have been part of the input from the regional council. |
| Kapiti Coast District Council | WRC spent three years doing flood hazard consultation for their part of the plan. They have spent a lot of money on working groups, user groups and residents groups, which seems to have paid off. We did not do much consultation in regard to floodplains because they did it all. |
| Wellington Regional Council | Our floodplain management plans have gone through consultation phases and people have agreed on the sorts of standards in terms of flood protection that they are looking for. Basically, people are sticking with the 100 year flood which means in 70 years you have a reasonable chance of being flooded out. In our view it's a low standard but it's a common one and people accept it. Flooding was also addressed by council through consultation for the RPS. |

**Table 5.11 Amount of assistance provided by regional councils to districts councils.**

| Councils | Comments |
|---|---|
| Palmerston North City Council | Interaction with the regional council is generally good in obtaining information. They are starting to become more responsible about flooding and did the first review of the flood protection system in 1987. They have given us some technical advice but we would have liked more. |
| Tararua District Council | They were helpful every time I have spoken to them but all they can produce is this old data and they obviously don't have the financial resources to do a lot better right now. |
| Ruapehu District Council | They have been helpful in providing technical advice and financial resources for the Ohura stopbanks and they also provide us with technical advice in relation to the Taumaranui ones.<br><br>In terms of actual information for planning our experience is, there is no information coming through. The proposed RPS for this area indicates that the regional council will provide all this information and through the district plan preparation we had a few "gos" at them with no success. |
| Masterton District Council | They have given us some technical advice in the past. They don't have much information but they eventually provided us with some sketchy information for the plan. |
| South Wairarapa District Council | The regional council are good at giving information. |
| Kapiti Coast Regional Council | We have a good relationship with them which is symbiotic I suppose. They know we will help them out with their efforts and they know we will pay for our own stormwater drains etc. |

**Table 5.12 Reactions regional councils have experienced from the districts in managing flooding.**

| Councils | Comments |
|---|---|
| Manawatu-Wanganui Regional Council | Most of them co-operate well, a lot depends on your relationship with them. Most of them are happy to receive help and advice from us, as they are aware that we have expertise in this area due to catchment board history. We have gently nudged the districts in the direction we want to go and have not had much opposition to how we have defined the responsibilities in the RPS, surprisingly.<br><br>We have a good relationship with all of them. One of the reasons why catchment boards were formed was because someone managed this bit and someone else managed that bit. It has been proven in this area that breaking it up doesn't work effectively and they are keen for us to do it. They don't want to be involved in the major works and we don't want to be involved in their work. |
| Wellington Regional Council | It's getting better. Some are still relatively narrow in that they still think the 100 year standard is fine. In my view if you have got greenfield development you should be looking at much higher standards to start off with. |

**Table 5.13 Clarification of responsibilities between district and regional councils**

| Councils | Comments |
|---|---|
| Palmerston North City Council | This area does need clarification as both should be working together which they are not really doing at the moment. |
| Tararua District Council | Its o.k., each has its job to do. |
| Ruapehu District Council | A bit of a grey area. |
| Manawatu-Wanganui Regional Council | There is a lot of grey area, not in terms of controlling it, in terms of doing things about it. In our region a lot of rivers have schemes on them, so some of the districts think we do it all.<br><br>It's amazing the number of calls we get diverted to us, the public ring up and say 'we've got a problem on the Kawerau Stream'. To which we reply 'Its not our problem ring the city' and they say 'we've already rung them and they say it's your problem', but that's more of a staff misunderstanding than a policy decision. |
| Masterton District Council | Why is there a dual relationship? What logic lies behind this? All it appears to do is cause confusion and conflict. Why not give one, one responsibility and the other another? |
| South Wairarapa District Council | Basically, flooding and surface water are practically regional council functions under RMA. So we don't have an involvement in terms of the technical aspects and the paper work. |
| Kapiti Coast District Council | The clarifications are a bit hazy but its not too bad really. We've got it pretty much sorted, we don't pay for stopbanks or anything. They have taken that on board but we look after the minor stuff. We could get philosophical about it but we don't as that is a waste of time and energy. |
| Wellington Regional Council | We lost the division of hazard responsibilities argument earlier than the declaration through internal decisions. Then with the declaration, the direction was set and once you have set it because of timing requirements etc. you can't change it. You know that |

that's history even though the high court overturned the decision it was too late as the direction was set for a lot of councils.

I think its got to be a dual responsibility as TLAs' are administering the Building Act and the approval of subdivisional plans. Both levels of local government have got to work together and I guess the success of the outcome is dependent on how good that relationship is.

Because we have overlapping functions in terms of hazards, if a TLA wants to approve an area for subdivision we can make it hard by appealing it and following through but if you're doing that you are not working very well as a council on behalf of the public. If we can get our information out front they can accept it and integrate it into their work and then it works much better.

**Table 5.14 Use of external advice other than regional councils in dealing with the flood hazard**

| Councils | Comments |
|---|---|
| Palmerston North City Council | No. MfE were not interested. |
| Tararua District Council | Worleys [Consultants] did our plan writing as I am the sole planning staff. |
| Ruapehu District Council | No. |
| Manawatu-Wanganui Regional | We use NIWA a lot, especially the hydrology department. We also use outside consultants occasionally, for example with the Lower Manawatu Scheme. Unfortunately/fortunately depending which side of the fence you are on, catchment boards and regional councils have dominated the flood hazard scene for so long, there is a limited number of people outside with river understanding and flooding. |
| Masterton District Council | No. |
| South Wairarapa District Council | Not for flooding but we used a consultant for writing our plan as I am the sole planning staff. MfE did not provide any assistance. |
| Kapiti Coast District Council | No, MfE were hopeless no help at all. |
| Wellington Regional Council | Yes, we had a lot of legal advice and opinions in terms of what the intention of the act was and to assist in interpretation. We also had input from the Department of Conservation and the Fish and Game Council. |

**Table 5.15 Councillor attitudes to the flood hazard**

| Councils | Comments |
|---|---|
| Palmerston North City Council | The flood hazard is very important in terms of council priorities. Councillors are particularly worried about legal implications such as liability. Our Council is fully aware of the amount of devolution for the flood hazard under the current regime and the level of responsibility they now hold. |
| Tararua District Council | In terms of priorities for our council flooding is not an issue. Council probably does not appreciate the level of responsibility they now have for flooding as they have other things to worry about. |
| Ruapehu District Council | There is not the perception that it is a major issue for Taumaranui although there is for Ohura. In Taumaranui we are fairly confident that the stopbanks will do their job. We spend money maintaining these and have just finished a maintenance programme with them.<br><br>With Ohura the issue is more of a priority so we are looking at stopbanks to resolve this issue. Council is concerned about liability under the Building Act but our habit has been to tag titles which we believe alleviates our liability. Other than that we don't actually believe we hold a lot of liability for floods. |
| Manawatu-Wanganui Regional Council | Our councillors are very aware of the flood control responsibility as it has been a function of this council through catchment boards and therefore a precedent was set. The flooding in the Taonui Basin last year caused some concern to councillors, it was also an election year.<br><br>The other side of the coin is that because we have done such a good job and we haven't had a disastrous flood for so long they don't perceive the hazard at all. Council is very committed to the maintenance of structural protection such as stopbanks.<br><br>Councillors have realised that money from government is a thing of the past. We have brought into the Local Authority Protection Programme. Very few regional councils are in it, although there are quite a few district councils. It's an insurance scheme and in the |

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| | long term we will pay as much as we get back but it smoothes the cash flow. |
| Masterton District Council | In terms of council's priorities it would come up about once a year. Major flooding occurs here about once every ten years or so. It is felt that a flood threat of 1/100 is acceptable. There is also a perception that it is a regional council problem. Council is controlling subdivision on floodplains to maintain the productive capacity of the soil. There was some concern recently about the planting of a forestry block on the floodplain and its effect on floodflows. |
| South Wairarapa District Council | I do not think that our council have appreciated the extent to which flood hazard responsibility now rests with local government. We are with LAPP and we have public liability insurance. As we are a small council people don't really appreciate the areas we have to cover. |
| Kapiti Coast District Council | As far as priorities go, it seems to have quietened down a bit although it is still simmering. Generally, our current councillors take the flood threat seriously especially those on the planning committee. Liability is quite a concern so that's why they have the 1% for subdivisions although they use the 2% for building. |
| Wellington Regional Council | Our councillors fully support flood hazard mitigation but within financial constraints. Council are highly committed to the maintenance of structural protection. There is a lot of concern about deferred maintenance. I only have to mention deferred maintenance and there is a lot of nervousness about.<br><br>Potential liability is a concern. If they don't allocate the resources then the liability rests with them as the council are named by default. If we don't maintain the system to perform as it meant to and a flood comes along and wipes everything out, and I say 'it was because you didn't give me money to fix it', there's a potential liability. I'm not saying we are liable but if someone challenges us you can bet we'll be in court with everyone else. We have some big corporations that will want to have a go and if two or three of them got together well... We do have insurance to cover this but premiums would go up etc. |

## Opposition to flood hazard reduction measures

Stories of opposition to attempts to reduce the flood hazard were rife. Public opposition ranged from developers secretly taping meetings in order to put councils in libellous situations, to personal vendettas against interviewees and departments. Opposition to flood hazard management measures also came from organisations such as the Department of Conservation and the Fish and Game Council.

Opposition to flood hazard reduction measures also came from within councils, particularly in regard to spending money on hazard control with one interviewee describing it as a "constant battle". The other major opposition to flood hazard reduction measures from within councils was the issue of permitted activities. Departments are being required to obtain resource consents from within their own councils for river works was becoming a source of potentially serious conflict. Staff with operational responsibilities thought it was ridiculous to have to apply for consents for activities they considered should be permitted. Table 5.16 summarises the opposition experienced by those working for flood hazard reduction.

**Table 5.16 Opposition to flood hazard reduction measures of councils**

| Councils | Comments |
|---|---|
| Palmerston North City Council | Some affected landowners have made submissions to have restrictions on land use removed, due to loss of the possible use of their land and related financial implications. |
| Tararua District Council | Not applicable as nothing to really oppose. |
| Ruapehu District Council | Council is working through the consents for the Ohura stopbanks which have not been notified yet but there is opposition. People feel the town should be moving rather than the river controlled and that we should plant the catchment instead. The main opponents are from landowners who don't think it is necessary because they don't want to have to pay for it. |
| Manawatu-Wanganui Regional Council | Palmerston North encountered some opposition to their minimum floor levels in the ponding areas during their submission process from residents wanting them removed but we opposed them in the cross-submission stage.<br><br>The only opposition we got from the public over the Lower Manawatu Scheme was from those who claim they couldn't afford to pay for it. It is only 30 dollars a year and those who claim they can't afford to pay for it often don't have insurance either. |
| Masterton District council | No opposition from residents. |
| South Wairarapa District Council | None really. People are really cognisant that it is stupid to build on a floodplain. |
| Kapiti Coast District Council | We didn't have any initially but in 1990 the first versions of the flood maps came out and Otaki was up in arms completely. They either couldn't subdivide or they had to build so far off the ground. The builders and developers said "Who do Wellington think they are- its not going to flood" all the usual jumping up and down. I think they have got that out of their system now.<br><br>In Otaihanga there was a big issue in 1991 when they put the Kapiti Borough Review out. They had the 1% extent on as a flood zone and people spent thousands protesting it and it went to the |

Tribunal. All they did in the end was change the flood zone to an estimated 1 % flood standard which doesn't change a thing in terms of what you can do but its a perception thing and the public were happier and could sell their properties.

Wellington Regional Council

We have had opposition in many forms including developers and some of the TLAs' have been quite negative.

When we took over the Kapiti area the Otaki Borough Review had just been released with floodable areas placed in it prepared by the former Manawatu Catchment Board. So we had to defend their decisions and the same happened with Waikanae. Kapiti at that stage were three very small councils. They were pro-development and fighting each other so flooding was not an interest as the developers had a grip on Kapiti in terms of control and power base. Then we came along and said "hang on, there are a lot of floodable areas out there, you need to stop". It took a few cases to the Planning Tribunal with us defending all the way, but it did send the message that we were not going to tolerate development in floodable areas.

Up until now, we have been dealing with resource groups and community based groups rather than individuals. We are just getting to the point where the things we are doing are impacting on individual aspirations, so we are now getting the people who are negatively affected trying to defend their own interest as opposed to the community interest.

The other opposition in terms of outcomes would be DOC and Fish and Game Council. They have environmental objectives and do not necessarily recognise the balance between environment and development.

The other form of opposition you can't ignore is negative publicity through the media, especially newspaper reports. It can add quite a bit of pressure.

This chapter has presented the findings of both phases of the field research. Chapter Six synthesises and analyses the findings with reference to the insights gained through the literature review. Several key themes which impinge on the ability of councils to implement their flood hazard responsibilities effectively will be discussed.

# Chapter Six: Analysis.

The goal of this research is to examine how councils are implementing their flood hazard responsibilities under the RMA. The previous reliance on structural works to control flooding is becoming a less attractive option for many communities as they now have to fund the structural works themselves. As well as the withdrawal of central government funding, local government now has full responsibility for flood hazard reduction. This research examined how councils are implementing their flood hazard responsibilities, through plan coding, and identifying through the interview process the constraints which may prevent councils from adequately implementing sustainable flood hazard management.

The following analysis synthesises the research results and the literature review, and discusses them around several themes which emerged from the field research. The themes identify aspects of the environments within which planners are implementing flood hazard reduction. These themes are: the division of responsibility for flood hazard reduction between the two levels of government; the use of information in fulfilling flood hazard responsibilities; the lack of initiative in flood hazard management; policy integration; and RMA requirements such as sustainability and monitoring. Many aspects of these themes are inter-related and this will be reflected in the discussion.

## The division of responsibility between levels of government.

Responsibility for natural hazards (and hazardous substances) is divided between both regional councils and TLAs' (district and city councils) under RMA. Along with the principle of sustainable management, the concept of integrated management is an important cornerstone of the Act. The philosophy behind the division of natural hazard responsibilities between regional and local government is that an integrated approach can be applied to natural hazards. Theoretically, an integrated approach can share the difficulties associated with natural hazard reduction between the two levels of government and flood hazard reduction can be implemented in a holistic way, each with their respective roles and strengths in mind. Each level of government has its own responsibilities in the implementation of natural hazard reduction, as discussed in chapter three.

The structure of the RMA mandate has a notable effect on the relationship between levels of government. The RMA provides strong procedural prescriptions but is lacking in substantive prescriptions in how to actually achieve the goals set by the legislation. A co-operatively based regime such as the RMA, relies on the use of research, initiative, and co-operation. The Ministry for the Environment staff have deliberately held back in providing substantive prescriptions on how to achieve the goals set out under RMA as they did not want to provide a 'how to do it' model for councils to follow (Baird, 1994) which may stifle innovation. It then follows that the better resourced and staffed councils will manage adequately while the smaller, less resourced councils will fall behind.

The co-operatively based RMA is enabling legislation. This means that responsibility for flooding has been devolved to lower levels of government to allow them to initiate sustainable management of natural and physical resources tailored to the requirements of their own particular area. It was thought to be inappropriate to require Auckland to be subject to the same resource management requirements as Central Otago as these areas are not comparable and therefore have different requirements and needs. Central government has not provided any additional resources to help local government fulfil these new responsibilities. The assumptions of a co-operatively styled mandate such as RMA are that lower level government will be assisted by higher level government in carrying out their functions, through the enhancement of the capacity and commitment of TLA's. Regional councils are not mandated to build up local government capacity and commitment, nor have they been provided with additional resources to accomplish this.

Under the previous legislative regime of the Water and Soil Conservation Act 1967 and the Soil Conservation and Rivers Control Act 1941, regional level government bodies, including catchment boards had the mandate, the financial resources, the threat of sanctions and the lure of incentives to assist them in achieving the ends they sought. Towards the end of their era, NWASCA's flood hazard reduction programmes were beginning to have the desired effect on Territorial Local Authorities, some of whom had begun to produce flood hazard plans and maps. Under the previous mandate, these institutions had the capacity to do this and towards the end of this era, progress in areas of flood hazard management such as mapping was beginning to be made.

Several factors act as impediments to better intergovernmental co-operation. Regional level government has previously had a precarious existence. While regional government is concentrating on fulfilling their responsibilities effectively and efficiently, there is always the threat that they may be abolished or become unitary authorities. There have also been at least two episodes of opposition from TLA's challenging the land use management powers of regional councils under the RMA. The first example concerned the Canterbury Regional Council's flood plain management plan which restricted building on the Waimakariri floodplain and was discussed in chapter three. The second example is also mentioned in chapter three and concerns the challenge to the Court of

Appeal from district and city councils in the Auckland region in response to the regional council's restrictions on future expansion in the Auckland area. The precarious existence of regional government, in combination with TLA challenges to their power all result in a rather tentative relationship between TLA's and regional councils. Moreover, local government reform undertaken in the late 1980s promoted the idea of a partnership between levels of local government rather than a hierarchical relationship. This partnership between regional councils and TLAs' is still evolving and this was clearly shown in both the plans and the interviews.

The interviews further revealed that the area of inter-governmental co-ordination is a domain of both confusion and minor resentment. Two of the district planners agreed that the regional councils provided adequate advice and assistance to their districts. Most of the district planners stated that the regional councils were not providing the data they required and had not given them enough help. The interviews revealed that a tentative relationship exists between regional councils and district councils, and that, in particular, communication barriers exist between the two levels. The exception to this was Kapiti Coast District Council where the Regional Council staff had written the flood hazard management section of the plan. This confusion and near animosity between levels of government can be extended to the relationship between all levels of government. District planning staff in particular, thought that the Ministry for the Environment staff could have provided some assistance in implementing the new regime.

Many of the staff of the smaller districts, in particular, perceived that the flood hazard was, to all intents and purposes, a responsibility of the regional council. There could be several reasons why many of these district planners thought this. One reason is that there has been a historical precedent set for flood hazard reduction at other levels, through the activities of NWASCA and the catchment boards. It was obvious some interviewees still regarded flood hazard management as predominantly a regional council responsibility and perceived the duties of the regional council as essentially the same as those they had under the previous legislation. This belief is to some extent justified as the regional councils are still essentially acting in a catchment board type role, through their responsibility for rivers and structural protection.

It appears that some of the district councils are ignoring their hazard responsibilities on the basis that these are a regional council responsibility. It is highly likely that staff from the district councils, particularly the smaller councils, simply do not have the support from their politicians to deal with this problem. Some of the smaller councils considered flood hazard reduction was not a priority within their council as they had so much else to worry about, in other words they lacked the commitment to implement effective flood hazard reduction. The lack of commitment from some councils in implementing flood hazard reduction is further complicated by the nature of the problem being addressed. Floods are a low probability occurrence and measures to reduce the potential damages of

floods are seen to inhibit community growth and as costly to implement. This raises the question of whose responsibility it should be to implement flood hazard reduction measures? Many district councils simply do not have the resources to collect and integrate flood hazard information, particularly when their councils are all but opposed to any mitigation measures, that is when flood hazard mitigation is seen as too costly to implement and as obstructing local development.

It became apparent from the plan coding results and during the interviews that the smaller councils relied more on the regional councils as they simply did not have the capacity to manage flooding, as well as their other responsibilities alone. The 'integration with other authorities' scores were higher for the smaller councils as they were more dependent on the regional councils for assistance with flood hazard management. In particular, the smaller councils relied more on the regional councils for the provision of information and assistance with structural protection works, than the three larger district councils[24] included in this research. This is what should be expected of a co-operative mandate, however the regional councils were not always perceived by the district council planners as delivering the required assistance.

To complicate this inter-authority integration further, the impression gained from the interviews was that the bigger, urban-based councils appeared to be a higher priority with the regional councils, while the smaller councils seemed to be lower on the regional councils' agendas. One reason for this could be that the larger district and city councils have higher population bases, and therefore, are more of a priority for regional councils in flood hazard reduction. Regional councils still justify much of their flood protection work in terms of the outcomes of Cost-Benefit Analysis and therefore areas of higher population provide more favourable cost-benefit ratios.

Another possibility for the lack of priority afforded to the smaller councils stems from a comment one interviewee made. He stated that he thought the former Manawatu Catchment Board had regarded the Kapiti Coast area as a 'bit of a backwater' when it was under their jurisdiction. One impression gained from the interviews by the researcher was that the further the council is from the regional council headquarters, the less salient they are on the regional council's list of priorities so it may be that the 'out of mind, out of sight' sentiment is still applicable.

Both regional councils have chosen to take a similar approach of dealing with the flood hazard through the inclusion of rules in regional freshwater plans. Both regional councils have provided rules for designated flood hazard areas (for example flood protection zones) in district plans. The difference between the two approaches appears in the division for responsibility for objectives, polices and rules for flood hazard management over other areas. The Wellington Regional Council provides the objectives and polices

[24]Palmerston North City, Masterton District and Kapiti Coast District Councils

on flood hazard control for land not under regional council jurisdiction and entrusts the rule writing for flood hazard control in other areas up to the council concerned. The Manawatu-Wanganui Regional Council has delegated responsibility for the development of objectives, polices and rules for land other than that under regional council control, to the TLA's. The regional council staff interviewed all considered they had a good relationship with their district counterparts although various forms of frustration were encountered in trying to encourage and advise their TLA's on how to deal with flood hazard management.

## Information use and abuse

Related to the co-ordination of levels of government and relationships between these organisations was the issue of information use in flood hazard reduction. Section 35 of the RMA requires that all local authorities must gather information and keep records, so they can effectively perform the duties imposed on them under this act. This requirement is very important for the implementation of flood hazard reduction. The respective regional policy statements take a similar approach to the provision of information on the flood hazard. This is that the regional council will investigate and assess the flood hazard on all the 'major' floodplains and catchments in the regions. Both regional policy statements will facilitate and encourage district councils to carry out their own investigations into the flood hazard for urban areas within their jurisdiction.

District councils generally considered that the gathering of information for flood hazard reduction purposes was the responsibility of the regional council. This was stated by many of the district council planners as the reason for the lack of flood hazard reduction measures in their plans. Some of these planners asserted that they simply did not have the information to plan for flood hazard reduction. This is symptomatic of the communication problem between district and regional councils. Regional council staff consider that they have plenty of information on the flood hazard in the respective areas, although they also feel that they do not have all that they could use.

At first glance, the inability of district councils to plan for flood hazard reduction because of a lack of information, appears to be a valid excuse. The provision of accurate information is a vital aspect of planning for flood hazard reduction. If the information used in planning and decision-making is not accurate, then the standards specified in the plan cannot be justified before politicians or the public, or in terms of a section 32 analysis. In addition, the district planners were wary of using data which may be out of date and regarded it as unable to be used as it was effectively invalid. This is a bona fide concern as out-of-date data can result in erroneous design levels for structural protection. However, some data is better than none, and the regional councils did not have a problem with using 'old' data as they simply allowed for a margin of error to ensure safety.

No plans for flood hazard reduction will start from zero base because of existing measures such as structural protection and zoning. The information gained for these measures are an extremely valuable and necessary resource (Parliamentary Commissioner for the Environment, 1988). District councils are under an obligation to collect information on local flooding and generally are not doing so at the moment. Instead, they are choosing to avoid or postpone fulfilling this responsibility by claiming it is a regional council problem.

Nevertheless, on subsequent examination, it was apparent that some of the councils were using this lack of information as a valid excuse to ignore their flood hazard responsibilities. As was pointed out in chapter two, stating a lack of information as a reason for a council to ignore planning for a particular duty provides a credible excuse for the lack of action on the issue (Feldman and March, 1988). Information availability or the lack of available information, has connotations of scientific validity and reason. The inability to take an action because of a lack of available information may inspire a feeling of trustworthiness in the organisation, who are likely to be perceived as rational and methodical for this reason. As demonstrated in other areas of local government activity (such as main street programmes), when a council is committed to a project it can obtain a spectacular result.

Berke (1994) regards the fact basis characteristic as the most important aspect of effective hazard reduction. The Kapiti Coast District Plan obtained the best score of all the councils for the Hazard Maps indice. The Palmerston North City Council Plan rated the next highest in the provision of flood hazard maps, followed by the Masterton District Council Plan. These maps are however, barely adequate for planning purposes. Ruapehu and Tararua both scored nil in the Hazard Maps indice and South Wairarapa obtained a token score. The quality of information contained in the district plans, as measured by the provision of flood hazard information through the use of maps, appeared to be a reflection of several interrelated factors.

The first of these factors is the degree of flood hazard which the area had experienced. As the Human Ecological Approach suggests this raises the visibility of the flood hazard in the eyes of politicians by crossing their awareness thresholds. This greatly increases the possibility that something will be done to mitigate the threat of further flooding. Considering the extent to which Palmerston North is at threat from flooding, its fact basis score should have been higher. The second factor is the extent of regional council involvement in the plan preparation. The Wellington Regional Council had prepared the Flood Corridor Zone in the Kapiti Coast District Plan and the Wairarapa division of the Regional Council provided the information for the Masterton District Plan. The Manawatu-Wanganui Regional Council also had considerable input into Palmerston North's Flood Protection Zone. The third influencing factor was the size of the council

involved. Kapiti Coast, Masterton and Palmerston North have the largest urban areas of the case study councils. At the other end of the scale, South Wairarapa obtained a low score for the Fact Basis characteristic despite the frequent flooding it experiences. This reflects the lack of capacity of the council to act on this. This council has only one planner who, at the time of the interview, was also the Acting Building Inspector.

The plan coding also revealed that not one of the plans or policy statements contained estimates of exposure to the hazard. Identifying who is at risk from flooding is a basic principle and essential first step, for planning for flood hazard reduction. If councils cannot identify who will be affected by the flood hazard of a certain size, it will be difficult for them to justify the allocation of costs for mitigation measures and the spatial allocation of mitigation measures. The interviews revealed both regional councils had information on flooding extent and the number of houses and population affected by certain sized floods for the larger urban areas. They had gathered this for the purposes of scheme reviews and investigations into their structural protection measures. This was undertaken as the identification of the spatial distribution of those at risk is necessary for conducting a cost-benefit analysis. This lack of exposure information in the district plans and regional policy statements must beg the question of whose responsibility this must be and where this assessment should be most suitably placed. For example, if the district plan is not the most appropriate place for an assessment of flood hazard exposure, then perhaps a more suitable place is within the civil defence plans.

The lack of resources for flood hazard management was a concern to some of the councils involved. The Wellington Regional Council plans to gather information on secondary watercourses over the next few years. However, interviews revealed that the regional council may have overcommitted itself during the consultation phases of its plan writing. This has resulted in the community expecting significant help which may not be forthcoming as the council has now tied up its resources in its strategic plan. The Manawatu-Wanganui Regional Council, which appears to have a much more user-pays focus, has indicated that because of the nature of its population distribution and funding structure, it cannot justify spending a large amount of money on flood control investigations which will benefit only a small amount of people.

Herein lies a major problem for the smaller councils. If the regional council cannot justify an investigation into the flood hazard on the basis of limited benefit, then it will be even harder for a district council with even less resources to do so. Regional councils are solely resource management agencies. District councils, on the other hand, are regulatory and service organisations with a number of, sometimes conflicting roles, duties and functions. If the regional council cannot justify investigating and supplying flood control works such as stopbanks for the jurisdiction, then it will be even harder for district councils to find the financial resources to do so due to economies of scale. Some of the district councils mentioned in the interviews and included in their plans, the

investigation of the provision of stopbanks for flood protection, if this proves to be economically feasible. However, it would seem that if district councils cannot see the need to expend their resources on information collection to identify those at risk from specified design sized floods, then the provision of structural protection by the district council is a unrealistic option.

## Lack of initiative in flood hazard management

The conservative methods used for flood hazard reduction -when there were any at all - contained in the district plans showed that councils are continuing to rely on traditional methods of flood control. Many of the case study councils were still looking to their structural protection as the sole means of protecting them from the destructive effects of floods. Those councils that had no or minimal existing structural protection were looking to the provision of new or extended structural protection as the main method for reducing their flood loss susceptibility.

Councils can be traditional organisations which are often cautious in implementing changes in process and practice. There is comfort in familiar remedies to the same problems even if these are shown to be less than effective. The methods used in the district plans, demonstrated a lack of innovation and initiative in dealing with flooding from all the district councils involved in the research. Planning should be future-orientated with a range of regulatory and non-regulatory instruments, however, the district plans reviewed for this research tended to be traditional and unimaginative in their approach. At the very least, it was hoped that some tailoring to local conditions would appear in the district plans in relation to flooding, but this was also conspicuous by its absence.

Effective leadership is very important for stimulating the solutions to problem-solving by staff and for encouraging the initiation of new programmes by councils. Central government can no longer be relied on to provide local government with new solutions and remedies to problems. Many councils are resistant to new ideas, unless those in positions of authority are prepared to justify, validate and support these. A reluctance to take risks was also readily apparent in the district plans. If those in positions of authority are threatened in any way by innovation and creative thinking by younger staff (Penning-Rowsell, 1987) then the solutions to the problem of flood control will remain at the same stage they are at today.

Part of this problem may be the lack of sufficiently trained planning staff and the disciplinary perspectives of other professionals involved in hazard management. Many of those currently holding managerial positions have backgrounds in a wide range of

disciplines and subsequently may not have either the conceptual knowledge or the technical skills required for creative solutions for hazard management.

Several of the interviewees expressed dissatisfaction with their management in the interviews. An example of a supportive environment is demonstrated in the Wellington Regional Council Rivers Department where staff are encouraged to provide new ideas and imaginative solutions to problems. This is reflected in the River Corridor Zone section of the Kapiti Coast District Plan which integrated a range of methods and controls for the significant flood hazard potential in the district.

Another reason for the lack of creative solutions, is a lack of information. This can be remedied by the use of information gained from a variety of sources both internally and externally (Comfort, 1988). One district planner stated that the search for flood hazard information and literature was a regional council responsibility. Admittedly, with high workloads, scanning overseas literature for information on new methods of flood hazard reduction is hardly a priority for district planners. It is important that professional bodies such as the New Zealand Planning Institute exercise leadership and contribute to the ongoing professional education of their members. The provision of information on flood hazard management to planners is an important step towards increasing innovation and subsequently, the flexibility and skills of the planning profession. The use of information to enhance creativity and innovation is another reason why district councils should be fulfilling their information gathering responsibilities.

The literature review described a range of the most commonly used methods for flood hazard reduction. These reduction measures are divided by Human Ecologists into three categories: modifying the flood event; modifying the susceptibility of people to floods; and modifying flood losses. Chapter two explained how there had been a move away from modifying the flood event to the modification of flood loss susceptibility primarily through the use of land use planning. This move had been the focus of research predominantly in the United States, although European research was also included.

This research has found that the move towards reduction of flood loss susceptibility is still not really occurring in the lower North Island of New Zealand. Most of the interviews and plans used in this case study, with one or two exceptions, demonstrated that councils are little further ahead than in 1986 when flood hazard responses were documented in Creating Flood Disasters? New Zealand's need for a new approach to urban flood hazard (Ericksen, 1986a). It appears that some councils may have even regressed as it was revealed in the interviews that many of the schemes produced under the Town and Country Planning Act 1977 and other related legislation contained flood hazard controls which have been left out of the new district plans. It could be that the councils chosen for this case study, which was limited in scope, were unusually conservative, as other recent research (Dixon, Ericksen and Michaels, 1995) found that

there has been a shift towards the adoption of non-structural approaches to flood hazard management.

The district councils all scored poorly in the plan coding analysis, despite the fact that the plan coding method had been adapted for the New Zealand situation, with the functions of the respective councils in mind. The methods used in the district plans for flood hazard reduction consisted of the consent process, the tagging of titles, and in two instances the provision of zones, in which activities affecting the potential for flood losses were controlled. The regional councils performed slightly better than the district councils with both of them obtaining over half marks for their regional policy statements.

Section 32 (Appendix 2.4) requirements did not appear to be being very comprehensively fulfilled. The assessment of the alternatives of an action, including the costs and benefits, is good planning practice. Some of the interviewees perceived section 32 as more of a process inherent in the plan writing and others felt that their section 32 report was included in the plan. Whatever the perception of staff was, most of the district plans did not show any signs of having been tested by a thorough assessment of alternatives for flood hazard reduction. If this had been comprehensively undertaken in the plan preparation process, methods other than the consent process and the tagging of titles may have been used for flood hazard control.

All of the district plans mentioned the use of education as a tool for flood hazard and other natural hazard reduction. This appears to have been a generic addition as none of the councils made specific mention of how they were to implement this. An investigation into the effectiveness of education as a tool for changing behaviour and reducing the potential for flood losses by councils, would reveal that education can be ineffective in changing behaviour (Ericksen, 1980; 1986a). If councils choose to persist with this intention to educate, they are in a unique position as a provider of services to create a high level of awareness about local flood hazards. The use of visual displays in library facilities is one example of how district councils could educate their public. The ultimate test of whether these councils will actually implement these education programmes is through the funding of these programmes in the annual plan process.

The process of plan preparation is, in itself, a tool for educating the public, particularly through the consultation process. People who have written flood hazard management plans such as the flood management plan for the Thames Coromandel area, have educated the public in the process of consultation for the plan. From these processes it appears that consultation, in addition to being mandatory under the RMA, is one of the best methods of public education. The public are involved in the process and therefore feel some ownership of it, particularly if the options chosen to be implemented in the plan, have been derived from the consultation process. The interviews revealed that the flood hazard was generally ignored during the process of consultation for the district

plans. The Wellington Regional Council had used extensive consultation in its plan writing process and through this, was able to make significant progress in overcoming significant opposition from local interests to their flood hazard reduction measures.

Door to door delivered pamphlets are another simple way of educating the public. These could include a map to show who will be most affected by a certain sized flood and simple floodproofing measures to limit damage should a flood occur. Signs are mentioned in the literature review as a simple yet effective way of alerting the public to the existence of a hazard. In certain areas a simple mark on a lamp-post with an accompanying statement saying something to the effect of "There is a 1 % chance every year that a flood will occur up to this depth" would remind the public that the possibility of the hazard is a real one.

The use of zones for flood hazard reduction in the district plans was minimal. Zones are slightly out of fashion under our 'effects-based' regime, yet researchers (i.e., Burby et al., 1988) have shown that zones can be a way of raising public awareness and influencing the likelihood of flood damages. The restriction of development on floodways and floodfringes was also ignored by most of the district plans as was the public acquisition of land.

The lack of flood hazard zones in the district plans can be attributed to several factors. The first is the lack of information and consequently justification for zoning, although some of the districts which had had flood hazard zones in their previous schemes, had left them out of the new district plans. Another factor was political opposition as many councillors felt that flooding was simply not a concern. One interviewee commented "the more effective we are at mitigating flooding, the less people think they need it". The impact of reduction measures on development, was another influencing factor on the omission of zones as those councils with smallest rating bases, were the most concerned about the effect of flood hazard controls on development. These councils chose to deal with flooding on a case by case basis through the consent process. Chapter two explained that the delineation of areas as flood hazard zones or as subject to flooding only affected those potential purchasers who had previously experienced a flood. For all other buyers of floodplain land, other characteristics such as the amenity values of the property outweighed the influence of the susceptibility of the property to flooding and therefore had little affect on their decision to purchase a property delineated as potentially subject to flooding (Burby et al., 1988).

The use of economic instruments was completely absent from the plans. This is not unexpected, as the use of these instruments is an undeveloped area of planning in New Zealand. Most councils regard this form of mitigation measures as messy to implement and administratively impossible. Under a co-operative mandate it should be up to the

Ministry for the Environment and regional councils to take the initiative and provide workable solutions and processes for the implementation of these methods.

# Integration

A comprehensive, integrated approach to the environment is mandated under the RMA. Therefore, it is necessary that a thorough and holistic approach must be adopted in dealing with all land use matters. The integration of issues and methods was generally lacking in the district plans. The regional policy statements were better in this regard than the district plans, although this is to be expected since this is the purpose of regional policy statements under the RMA (section 59, Appendix 2.5).

The plans analysed in the coding generally scored badly in their hazard goals (the exceptions being Wellington Regional Policy Statement and Kapiti Coast District Plan) and even more poorly in their environmental goals. The Kapiti Coast District Council prepared a strategic plan before it prepared the district plan. This is reflected in the comprehensive, integrated approach of the plan, including the flood hazard section (even though this was written by the regional council[25]). It was the only district council to score full marks for its hazard reduction goals as these could be evaluated within the context of greater community development as set out in the strategic plan.

May and Williams (1986) found that communities achieved more extensive hazard reduction through the use of environmental goals, than through the use of direct hazard goals. The increase in hazard reduction through the use of environmental goals was considered to be due to the increase in feasibility and political acceptability if measures used for hazard reduction were linked to other issues, especially that of environmental protection. The reduction of natural hazards may have to be legitimised through other means as natural hazards have a low political salience and a low probability of occurrence. This is despite section 3 of the RMA (Appendix 2.1) specifically defining effects as including "any potential effect of a low probability which has a high potential impact" and the onus on councils to avoid, mitigate or remedy these effects under section 17 of the RMA.

In most of the plans and policy statements coded for this analysis integration of the flood hazard with other issues was inadequate. The majority of the district plans contained a passing reference to stormwater management in their subdivision sections. This facet of flood hazard mitigation plays an important part in reducing flood losses. None of the district councils restricted the amount of impervious surfaces allowed per subdivision, or

[25] The Wellington Regional Council prepared the Flood Corridor section but had to adjust this to fit in with the style of the district plan.

were required to have some form of stormwater storage on the property, a method used in some other district plans[26].

Some of the district plans mentioned of the use of esplanade reserves in relation to flooding. One of the purposes of esplanade reserves stated in section 229 (Appendix 2.7) is the mitigation of natural hazards. This mechanism is a simple way of both preserving the areas adjacent to watercourses, ensuring these areas are available to the public for various purposes whilst also reducing the potential for damage from flooding. If the provision of these reserves will benefit the public and reduce the susceptibility of certain areas to flood damages, this should be explicitly stated in the natural hazards sections of plans as a method of reducing the potential for flood losses. Generally, most councils dealt with their flood hazard responsibilities using the consent process through which they specified the requirements for areas subject to flood hazard. There was minimal integration with other issues and many plans made no reference at all to the flood hazard apart from the section on natural hazards.

Many of the district council planners did not know the design levels of their structural protection such as stopbanks. This could be attributed to a lack of communication and integration between and within councils. The separation of engineering departments from planning departments within councils does little to enhance planning for flood hazard reduction. Both departments have information valuable to the other. In addition to this, planners often lack the scientific and quantitative knowledge required for effective flood hazard reduction while engineers may lack necessary procedural and qualitative skills, and the ability to envisage their activities within a broader social, economic and environmental framework. The exchange of information between these two departments is often constrained by internal council communication processes.

As both departments have interrelated functions and responsibilities the exchange of information between these two departments is vital for multi-objective planning. One interviewee commented that "what we are trying to do is implement an old regime with new structures and that's where you get conflict because things fall through the hole because it is no-one's job to make it happen". The siting of these departments next to each other within an organisation could remedy this, as could the amalgamation of the two departments with related functions. This could encourage more informal exchanges of information and result in greater efficiency, as well as avoiding a 'them and us' feeling. The Wellington Regional Council Rivers Department has a multi-disciplinary approach in that it contains planners, engineers and operations staff within the one department. The result of this multi-disciplinary approach can be seen in the regional policy statement and Flood Corridor section of the Kapiti Coast District Plan. In the plan coding, this plan scored relatively highly in the Structural Measures indice as it integrated both structural

[26] Such as the Southland District Plan.

and non-structural approaches in a comprehensive manner, recognising that neither was the sole answer to effective flood hazard reduction.

Lack of knowledge by district planners of the level of protection provided by structural measures is one obstacle to effective flood hazard planning at the district level. As the district council interviewees generally wrote the natural hazards section of the district plan, this is a notable omission from the information gathered and processed. Even if these stopbanks and dams are the property of the respective regional council, they can have catastrophic effects on the local district and flood losses if they fail. District planners should be aware of what areas are at risk from the failure of structural measures so they can initiate the appropriate controls at the district level.

The regional council staff are very aware of the likelihood of structural failure and do all they can to prevent this from occurring. However, the possibility of a failure in engineering works will always be present and the question arises of what residual precautions must be in place to protect the community should this occur. The Rivers Department staff in Wellington Regional Council is considering this question at the moment. If district planners are not aware of the design levels of structural protection, planning for the protection of their populations in the public interest will be more difficult to achieve. Some stopbanks in urban areas offer as little as 15 or 25 year protection and, if the planner responsible is not aware of this he/she may be under the impression that they offer far more protection than actually exists.

Section 59 of the RMA (Appendix 2.5) states that the purpose of an RPS is to provide an overview of the regions' resource management issues " ...policies and methods to achieve integrated management of the natural and physical resources of the whole region." The regional policy statements for both regions dealt with the flood hazard in a separate section devoted to natural hazards. In other parts of the regional policy statements the relationship between flooding and soil erosion was mentioned in relation to the effects of land use practices, the most notable being the clearance of vegetation. This is to be expected given the past functions of catchment boards. The effects of gravel extraction on waterbodies and flooding was also referred to within the regional policy statements.

Also mentioned in both regional policy statements was the use of riparian strips for flood hazard management purposes. The impact of flooding on natural habitats and water quality was omitted from the statements. The use of wetlands as a method for flood hazard control was also neglected in the statements. The creation of new wetlands and preservation of existing wetlands, presents a formidable problem for regional councils. If another reason can be found to justify their preservation and creation this should be included within the RPS. Wetlands are capable of being used as a natural, environmentally compatible, method of flood hazard control through their ability to act as natural sponges, thereby reducing runoff to waterbodies. Many flood control works

have had adverse effects on wetlands through the deprivation of the wetland of the periodic flooding it needs. The inclusion of this method of flood control into RPS' is one example in which the policy statement could integrate flooding into other resource management concerns.

## Sustainability

Five years after the implementation of the RMA, the concept of sustainable management still causes debate and confusion. The sustainability concept requires a change of thinking towards natural resource management. In chapter three it was stated that the Ministry for the Environment promoted the use of a flexible definition as necessary to allow for appropriate responses to a myriad of situations.

The requirement for sustainable management under RMA places the use of structural protection from the flood hazard into serious doubt. Despite the chance of failure of structural protection works, the concept of sustainability does not exclude the use of structural works for flood hazard reduction. While, these works do have a necessary function in the use of New Zealand's floodplains, the problem lies in the total reliance of some communities, including planners, on them and the ignoring of the risks associated with them. Structural protection has an important role to play in minimising damage to existing development and in the protection of communities from smaller, regular floods. As stated in the literature review, the 'protection' is actually a misnomer as communities are only protected up to a certain design level. If this design level proves to be incorrect i.e., through the inaccurate use of data, then the use of engineering works could possibly be placing a lot of people at risk from flood damages. Structural works such as stopbanks can fail or be damaged by events such as an earthquake, placing people at risk who wrongly perceive themselves as 'protected'. When this happens, with the accompanying catastrophic results, the provision of structural protection will appear anything but sustainable.

However, the issue of prevention and containment of the flood risk by controlling development in areas subject to hazard, is the only sustainable answer to future flood hazard management. Palmerston North City Council has made progress towards sustainable floodplain management through the provision of flood free land for future development. Floodproofing and structural protection can only protect to a certain level, which is not really compatible with the concept of sustainability in the long term.

In addition to the financial costs of the provision and maintenance of structural protection which communities may find unsustainable, engineering works can have important adverse effects on rivers and their ecosystems through the interruption of natural processes. In the future, consents for these works will be required and possibly harder to

obtain, and indications emerged from the interviews that this is already beginning to happen. Regional council planners are now requiring consents for flood protection and river works that engineers consider should be permitted activities. The interviews also revealed that some elements of the public are taking a sustainable and holistic view and wanting councils to plant catchments instead of providing works for their 'protection'.

The use of insurance within the parameters of sustainable resource management also comes under scrutiny. Insurance externalises the costs associated with an action. The decision to locate on a floodplain, although it may be in some circumstances through a lack of personal choice, creates a risk that, should a flood occur, will be paid for by others. The district plans all omitted the use of insurance as a method of flood hazard reduction. This is acceptable as the hazard is not reduced in any way, although the impact of it is. Under section 5 (Appendix 2.1) of the RMA which provides for the "social, economic and cultural well being" the use of insurance is not necessarily excluded. Encouraging the taking out of insurance policies in the district plan may be one method councils can use to provide for this section 5 duty, while also minimising the impact of flood losses.

Another question that arises within the context of sustainable management is the use by councils of the tagging of titles under section 36 (2) of the Building Act 1991 (Appendix 2.8). Almost all of the district councils used the tagging of titles to alleviate their liability. This is not assisting the promotion of sustainable management. Councils can take two routes in providing for flood hazard reduction. The first is that they can proactively plan for flood hazard reduction under the RMA, thereby preventing future development from being placed at risk from flood damages or at least mitigating the effects of the hazard, or councils can choose the second path. This path chooses the tagging of titles under the Building Act as a way of alleviating council liability and leaving the flood hazard reduction up to the individual. As individuals generally take no action to reduce the impact of a flood should one occur, this path undermines the council's responsibility to protect the public interest.

# Monitoring

Only one of the plans or policy statements made any specific mention of monitoring for hazard reduction. This was the Masterton District Council which had included a reference in their natural hazard section, dedicated to monitoring and review procedures. The plan stated it would co-ordinate with the regional council in maintaining a database, monitoring the effectiveness of rules in precluding development from high risk hazardous areas; respond to and address matters arising from natural hazard management; and regularly assess the effectiveness of selected methods in implementing policies relating to land resources, including the reconsideration of alternative methods.

Most of the plan and the policy statements included a brief section on monitoring at the end of the plan. All of these were extremely general and demonstrated that the councils had not really given any thought on how to implement this requirement. Monitoring that is mandated by law is a new concept but this does not mean that simply because there are difficulties in implementation, councils can effectively ignore it. Monitoring is inherent in planning processes and a way of measuring the effectiveness of policy implementation, as it provides feedback for planners who can improve their plans and policies.

An essential first step for effective monitoring is the identification of the environmental outcomes that are aimed to be achieved. These provide benchmarks against which progress can be measured. If no outcomes are stated then clear objectives are required for the same purpose. Some of the plans fulfilled this requirement, some did not. The poor scores in the objectives/policies characteristic of the plans means that monitoring will be harder to achieve as there is nothing with which to compare progress. There are many different techniques available for the monitoring of various issues. For example with natural hazards, indicators of the effectiveness of policies and methods could be gained by assessing the amount of insurance payouts for flood damage in the area; the amount of relief paid out by various agencies; or the amount of money spent on repairing flood damage by contracted organisations.

The research has revealed that the planning and implementation for flood hazard reduction in New Zealand is generally being ignored by the district councils chosen for this case study. The intention of this research was to determine how well central New Zealand councils i.e., councils without large budgets and lacking the leadership of the larger metropolitan areas, are fulfilling their flood hazard responsibilities. The prognosis is (slightly) disappointing. The two regional councils are further towards the goal of sustainable flood hazard management than the district councils, probably because of their previous experience in water and soil management. Chapter seven draws together findings from this research, assesses the research design and methodology and comments on how more effective flood hazard reduction can be implemented.

# Chapter Seven: Conclusions

This chapter presents an overview of the research findings in light of the research goal and objectives. Suggestions for improvements in the implementation of flood hazard reduction follow the overview. The chapter concludes with an evaluation of the research design and methodology.

## Research goal and objectives

The goal of the research was to determine how local government is implementing flood hazard reduction measures under the current regime. The objectives were to: describe the theoretical approaches to flood hazard management; describe the historical and present institutional context for flood hazard management; and identify the approaches councils are adopting in fulfilling their flood hazard responsibilities. Chapters two and three provided an overview of the range of responses available to councils in implementing flood hazard reduction and identification of possible constraints on the implementation of these measures.

The RMA has now been in place for five years. Prior to this Act, responsibility for flood hazard management was fragmented and incremental, resulting in an emphasis on structural protection to protect communities from the ravages of floods. This emphasis on structural protection occurred despite attempts to initiate flood hazard management reduction through land use planning by NWASCA and the catchment boards of the previous regime. The emphasis on structural protection means that a precedent has been set for flood hazard management, which local government should be attempting to rectify in order to achieve the goal of sustainable management. Accompanying this devolution of flood hazard responsibility to local government, has been a halt to government funding for protection works and the limiting of relief provisions should a flood occur.

The enactment of the RMA has not been without difficulties. The focus of the Act is on sustainability, integration, and environmental effects as opposed to activities. Conceptually, the RMA is a radical departure from the previous planning regime. Territorial Local Authorities were not given any increase in resources to assist them in implementing this legislation, while some regional councils did receive limited assistance. As well as this shortfall in financial assistance, sanctions or incentives to encourage local government to implement the legislation effectively are absent.

The enactment of this legislation has not necessarily been accompanied by a change in thinking by those now responsible for the implementation of the Act. Generally speaking, the research findings show that Territorial Local Authorities remain uncommitted to

flood hazard management. The district and city councils reviewed in this research are not implementing flood hazard reduction measures in any substantial way. The previous reliance on structural measures to fulfil flood hazard responsibilities remains in place. It even appears that some district councils have regressed in regard to flood hazard reduction, as the measures councils were undertaking under the old legislation to reduce the flood hazard (such as zones) have disappeared from the current round of district plans. Most of the district and city council staff interviewed are using the consent process as the only way of implementing flood hazard management. These councils are, therefore, avoiding a managed, integrated approach to flood hazard reduction.

Parochialism and vested interests combine with an apparent lack of information to make planning and implementing flood hazard reduction difficult. Erroneous perceptions of downturns in property prices and increases in council liability for provision of the 'wrong' information still persist, even though these have been disproved. The lack of commitment and interest of local government in mitigating the flood hazard is unlikely to change because the flood hazard is a low probability occurrence of high potential impact, even though these types of effects are required to be considered under the RMA.

In this research, both levels of government showed a lack of innovation and integration in the use of flood hazard reduction methods within the plans and regional policy statements. The plans used for the case study, were among the first notified and, therefore, may have been a little less sophisticated than some of their more recent counter-parts.

## Suggestions for improving practice

The historical precedent for flood hazard management within regional councils, ensures that there is the interest and the expertise to reduce flood damage potential. As regional councils are primarily resource management agencies, it seems logical that they should take a leading role in floodplain management, leaving Territorial Local Authorities with the responsibility for implementing the building and subdivisional requirements for flood hazard reduction. Some district and city councils do have a greater capacity for flood hazard management than others, and may take a more proactive role in this regard.

Public education was included in all of the plans and policy statements as a method of flood hazard reduction. However, none of the plans elaborate on how they are proposing to implement the education of their communities on flood hazard reduction. The inclusion of a method in a plan is ineffective unless there is a real commitment to implement this method. While raising awareness of flooding has its place, a range of methods is needed to effectively implement flood hazard reduction. One very effective way of achieving education is through the consultation process.

The use of multi-objective planning is one technique by which councils could achieve improved policy integration. Multi-objective planning is becoming an increasing trend in overseas planning especially in relation to waterbodies. Multi-objective planning is a prerequisite for effective flood hazard reduction. The case studies demonstrated that hazard planning is occurring in isolation from other land management activities. Segregating the flood hazard as a separate issue will not assist in reducing flood damages because politicians and the public will not perceive the need for reduction measures.

Organisationally, the River's Department of the Wellington Regional Council is a model for other regional councils to follow. It works towards a multi-objective approach through the inclusion of planners, engineers and operations staff within the one department. This eliminates some of the confusion and lack of communication that exists in other regional councils and enhances an integrated, holistically-based approach. This holistic approach (and therefore departmental structure) is reflected in their RPS and the Kapiti Coast District Plan, which regional council staff contributed to.

Another tool which could greatly enhance the effective implementation of sustainable flood hazard management is the use of strategic planning. Strategic plans commonly have 25 year time horizons which make them an appropriate tool for the implementation of sustainable flood hazard management. The preparation of a strategic plan requires the council and its community to consider the future of their area and reflect on the type of environment they want to live in. Strategic plans are not mandatory under RMA or other legislation. This means that the preparation of strategic plans will be limited to councils that both want, and can afford, to prepare them. Ideally, strategic plans should be finished before the preparation of district plans. District plans have shorter time spans (10 years) and should assist in transforming the vision provided by the strategic plan into a workable reality. Time constraints on the current round of district plans meant that the preparation of strategic plans preceding district plans has not often happened.

Another value of strategic planning in implementing for flood hazard reduction is that the chances of a flood occurring in the time horizon of the plan are significantly increased. If the potential for changes in climate are also included in the strategic plan, the chances of a 100 year flood occurring during the plan's time span are reasonably likely. The other valuable contribution of a strategic plan for flood hazard management is that it allows the future development patterns of the community to be assessed in a holistic manner over a extended time horizon, enabling the identification of areas which may be subject to conflicts over future land use. When other aspects of community development and land use are considered, and uncertainty reduced, then flood hazard management has a context within which realistic assessment of potential problems. This form of assessment is far

more sustainable than planning on a piecemeal basis for the next ten years which could be overturned by the next incoming council, elected on a three yearly basis.

Ideally this holistic assessment should be part of the district plan preparation, however the new legislative context of RMA has meant that a narrower view of land use planning has been taken by councils. The strategic planning process, the district plan preparation process and the use of annual plans for the allocation of resources must all be fully integrated in order to achieve flood hazard reduction. Explicit integration of these plans and the processes through which they are prepared will result in a more comprehensive assessment of flood hazard reduction measures and ensure that funds are allocated for these as required.

# Reflections on the research

Research design and methodology can always be improved. One of the strengths of doing research is that the researcher learns a useful set of skills for future application. Having applied research design and methods has been a rewarding experience. The process of interviewing was, for example, highly informative.

The constraints and difficulties of doing a 50 point thesis were considerable. It was difficult to limit the field research to a small sample without reducing the validity of the findings. This reluctance to restrict the amount of case study councils to less than eight resulted in the fieldwork being more time consuming than originally envisaged. This was compensated in some respect by restriction of the plan coding to the regional policy statements and the district plans.

The exclusion of stormwater flooding from riverine flooding was a rather tentative one, particularly in urban areas as the two are invariably connected. After an initial investigation, the issue of stormwater flooding was perceived to be more of an infrastructure problem and subsequently omitted this from the research. This was mainly because of the time constraints of a 50 point thesis and that an investigation into the provision and maintenance of infrastructure was another thesis topic in itself.

Some difficulty was experienced in obtaining appropriate case study councils. The necessity of choosing councils with notified district plans made finding three district councils within the Manawatu-Wanganui Regional Council and Wellington Regional Council boundaries difficult, as few plans had been notified. This meant that some of the districts within these regions with more prominent flood hazards had to be omitted from the research and some districts with less significant flood hazards were included, although all the councils did have a flood problem.

Future research could investigate whether the findings of this research are replicated elsewhere in New Zealand. Council commitment to, and capacity for, the implementation of flood hazard reduction appeared to be minimal in the majority of the district councils drawn on in this research. A similar investigation reviewing other councils would ascertain whether the results obtained in this research are indicative of the country as a whole, or of this region of the North Island. This would assist in clarifying to what extent councils are implementing flood hazard reduction under a devolved and co-operative mandate.

# Appendix 1

# Plan coding guidelines

**Source: Adapted from Chapman, 1995.**

| **Definitions:**<br>**Types of information** | Not detailed | Detailed |
|---|---|---|
| 1 Delineation of location of hazard: Geographic identification of hazard. | General description in text indicating the presence of hazard. | Detailed map illustrating location of hazard zones. |
| 2 Delineation of magnitude of hazard:<br>Geographic identification of level of potential hazard severity by zone of occurrence. | General description in text indicating potential severity of hazard. | Detailed map illustrating hazard severity levels by hazard zone. |
| 3 Number of people exposed: Assessments of number of people exposed to hazard. | Community-wide estimates of number of current population exposed to hazard, but not by hazard zone. | Estimates of current and future population exposed to hazard, by hazard zone. |
| 4 Loss estimations to public structures: Assessment of loss in number (or length in metres) and value of public structures. | Community-wide estimates of loss in no. and/or total value of public structures, but not by zone and no future projections. | Estimates and projections of loss in number and total value of public structures by zone. |
| 5 Loss estimations to private structures:<br>Assessments of loss in number and value of private structures such as houses. | Community-wide estimates of total loss of number and/or total value of private structures but not by zone. | Estimates and projections of loss in number and total value of different types of private structures by hazard zone. |

| **Definitions: Goals/Policies** | Not mentioned | Mentioned |
| --- | --- | --- |
| Degree to which plan goals and policies explicitly address hazard-an expression of the extent to which a community values hazard reduction. | Goal is not mentioned in plan (applies to 2.1-2.6). | Goal is mentioned in plan (applies to 2.1-2.6). |
| 6 Any goal to reduce property loss. | | |
| 7 Any goal to protect the safety of the population. | | |
| 8 Any goal to reduce damage to public property. | | |
| 9 Any goal to minimise the fiscal impacts of disasters | | |
| 10 Any goal to distribute hazard management costs equitably. | | |
| 11 Any goal that promotes a hazards awareness programme. | | |

| | | |
|---|---|---|
| 12 Any goal to reduce hazards impacts that also achieves the preservation of natural areas. | Not mentioned<br><br>Goal is not mentioned in plan (applies to 2.7-2.9) | Mentioned<br><br>Goal is mentioned in plan (applies to 2.7-2.9) |
| 13 Any goal to reduce hazard impact that also achieves the preservation of open space and recreation areas (such as integration of hazard with esplanade reserves). | | |
| 14 Any goal to reduce hazards that also achieves the maintenance of good water quality (such as the planting of riparian strips). | | |

| **Definitions:**<br>**Measure**<br>**Policies/Methods** | Suggested | Mandatory |
|---|---|---|
| 15 Permitted uses: identification of permitted use types by hazard zone. | A measure is suggested if key words such as: shall, consider, volunteer, may should or desirable appear in policy statements regarding the use of the measure. | A measure is mandatory if key words such as: will, require, or mandate appear in policy statements regarding use of the measure. |
| 16 Density of land use: Amount of development allowed per unit of land. | | |
| 17 Transfer of development rights: Development rights are transferred from high hazard area to less hazard-prone area. | | |
| 18 Density Bonus: Higher development density offered in return for dedication or donation of land in areas subject to hazard. | | |
| 19 Tax abatement/ Rates relief: Provides incentives to property owners and developers who use mitigation methods for new development. | | |

| | | |
|---|---|---|
| 20 Setbacks: Width of land to keep buildings and infrastructure from being placed on or near areas subject to impacts from flooding.<br><br>21 Site Review: an analysis of the physical conditions of a development site, providing an assessment of exposure to the hazard and potential site uses.<br><br>22 Cluster development: Development density transferred to hazard free portion of site (such as flood free building site).<br><br>23 Project Impact Assessment: Assessments provide a basis for determining hazard reduction standards for development. | Suggested<br><br>A measure is suggested if key words such as: shall, consider, volunteer, may should or desirable appear in policy statements regarding the use of the measure. | Mandatory<br><br>A measure is mandatory if key words such as: will, require, or mandate appear in policy statements regarding use of the measure. |

| | | |
|---|---|---|
| 24 Building Codes: Construction standards designed to make new private structures less susceptible to the hazard. | Suggested<br><br>A measure is suggested if key words such as: shall, consider, volunteer, may should or desirable appear in policy statements regarding the use of the measure. | Mandatory<br><br>A measure is mandatory if key words such as: will, require, or mandate appear in policy statements regarding use of the measure. |
| 25 Mandatory retrofitting of private structures: Bringing privately owned structures into compliance with building standards designed to mitigate the impact of the hazard. | | |
| 26 Retrofitting incentives: Bringing privately owned structures into compliance with building standards designed to mitigate the impacts of the hazard. | | |

| | Suggested | Mandatory |
|---|---|---|
| 27 Education programs: Provides information to the public regarding the risks of hazards and various methods of hazard mitigation. | A measure is suggested if key words such as: shall, consider, volunteer, may should or desirable appear in policy statements regarding the use of the measure. | A measure is mandatory if key words such as: will, require, or mandate appear in policy statements regarding use of the measure. |
| 28 Mandatory real estate disclosure: Informs real estate consumers and users about the nature and extent of hazard risks to new and existing structures (i.e. tagging of titles) | | |
| 29 Encouragement of voluntary real estate disclosure: Informs potential buyers about the nature of hazard risks for real estate transactions. | | |
| 30 Technical Assistance to developers or property owners for mitigation: Provided to help developers or property owners reduce losses from hazards. | | |
| 31 Programme to encourage purchase of insurance: Self-defining. | | |

| | | |
|---|---|---|
| 32 Disaster Warning and Response programme: Provides information to the public regarding emergency planning (e.g. hazard risks, what to expect when a flood occurs). | Suggested<br><br>A measure is suggested if key words such as: shall, consider, volunteer, may should or desirable appear in policy statements regarding the use of the measure. | Mandatory<br><br>A measure is mandatory if key words such as: will, require, or mandate appear in policy statements regarding use of the measure. |
| 33 Hazards Signage: Informs public of the potential presence of a hazard at particular sites where signs are posted. | | |
| 34 Retrofitting Public Facilities: Making structural improvements to city buildings, bringing them into compliance with standards acceptable for these facilities. | | |
| 35 Critical Facilities Standards: Construction and land use practices that assure impacts of hazards are minimised on public and private buildings, lifelines and other necessary services/functions. | | |

| | | |
|---|---|---|
| 36 Any type of Structural protection: Physical structures put in place in an attempt to lessen the impacts of the hazard (i.e. stopbanks). | Suggested<br><br>A measure is suggested if key words such as: shall, consider, volunteer, may should or desirable appear in policy statements regarding the use of the measure. | Mandatory<br><br>A measure is mandatory if key words such as: will, require, or mandate appear in policy statements regarding use of the measure. |
| 37 Recognition of residual hazard: Recognises and provides for mitigation of residual hazard stemming from structural protection. | | |
| 38 Further Information: Any intention to gather further information. | | |
| 39 Monitoring: Any proposed monitoring strategy to assess the effectiveness of mitigation measures. | | |

| **Definitions: Attributes** | Low Achievement | High achievement |
|---|---|---|
| 40 Comprehensiveness: Presentation of hazard problem and solutions to such problems. | Limited presentation of hazard problem and/or limited discussion of solutions to problems. | Plan takes a comprehensive approach. |
| 41 Integration with other issues: Solutions that address other local problems also address hazard problem. | Mention is made as to integration of non-hazard issues, but is not obvious. | Various non-hazard issues are integrated with hazard issues. |
| 42 Readability/Legibility: Self-defining | Plan is not well illustrated and text is not written in a form easily understandable to public. | Plan is well illustrated and text is clearly written and understandable. |
| 43 Inter organisational co-ordination: Degree to which local planning activities are co-ordinated with other organisations. | Little reference to co-ordination and use of resources of other organisations. | Extensive reference to co-ordination and resources of other organisations to achieve local mitigation. |
| 44 Implementation Roles: Reference is made to other organisations in implementing flood hazard reduction. | Little reference is made to other organisations for implementation. | Extensive reference to which organisations have roles to implement specific planning activities at specific times. |

# Appendix 2.1

## Part I: Interpretation and Application
## The *Resource Management Act 1991*

**3. Meaning of "effect"**- In this Act, unless the context otherwise requires, the term "effect" includes-

(a) Any positive or adverse effect; and

(b) Any temporary or permanent effect; and

(c) Any past, present, or future effect; and

(d) Any cumulative effect which arises over time or in combination with other effects-regardless of the scale, intensity, duration, or frequency of the effect, and also includes-

(e) Any potential effect of high probability; and

(f) Any potential effect of low probability which has a high potential impact.

## Part II: Purpose and Principles
## The *Resource Management Act 1991*

**5. Purpose-**(1)The purpose of this Act is to promote the sustainable management of natural and physical resources.

(2) In this Act, "sustainable management" means managing the use, development, and protection of natural and physical resources in a way or at a rate, which enables people and communities to provide for their social, economic, and cultural well being and for their health and safety while-

(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

# Appendix 2.2

## Part III: Duties and Restrictions under this Act
## The *Resource Management Act 1991*

**11. Restrictions on the subdivision of land-** (1) No person may subdivide land, within the meaning of section 218, unless the subdivision is-

(a) Expressly allowed by a rule in a district plan [and in any relevant proposed district plan] or a resource consent, and a survey plan relating to the subdivision has in accordance with Part X-

(i) Been deposited by a District Land Registrar or a Registrar of Deeds; or

(ii) In the case of a subdivision by or on behalf of a Minister of the Crown, been approved by the Chief Surveyor for the purpose of section 228; or

(b) Effected by the acquisition, taking, transfer, or disposal of part of an allotment under the Public Works Act 1981 (except that, in the case of the deposition of land under the Public Works Act 1981, each existing separate parcel of land shall, unless otherwise provided by that Act, be disposed of without further division of that parcel of land); or

(c) Effected by the establishment, change, or cancellation of a reserve under [section 338 of the Maori Land Act 1993]; or

(ca) Effected by a transfer under section 23 of the State-Owned Enterprises Act 1986 or a resumption under section 27D of that Act; or

(cb) Effected by any vesting in or transfer or gift of any land to the Crown or any local authority or administering body (as defined in section 2 of the Reserves Act 1977) for the purposes (other than administrative purposes) of the Conservation Act 1987 or any other Act specified in the First Schedule to that Act; or

(cc) Effected by transfer or gift of any land to the New Zealand Historic Places Trust or the Queen Elizabeth the Second National Trust for the purposes of the Historic Places Act 1993 or the Queen Elizabeth the Second National Trust Act 1977; or

(d) Effected by any transfer, exchange, or other disposition of land made by an order under section 129B of the Property Law Act 1952 (which relates to the granting of access to land locked land).

(2) Subsection (1) does not apply in respect of Maori land within the meaning of the [Maori Land Act 1993] unless that Act otherwise provides.

# Appendix 2.3

## Part III Duties and Restrictions under the Act
## The Resource Management Act 1991

**30. Functions of regional councils under this Act-** (1) Every regional council shall have the following functions for the purpose of giving effect to this Act in it's region:

(a) The establishment, implementation, and review of objectives, policies and methods to achieve integrated management of the natural and physical resources of the region:

(b) The preparation of objectives and polices in relation to any actual or potential effects of the use, development, or protection of land which are of regional significance:

(c) The control of the use of land for the purpose of-

(i) Soil conservation:

(ii) The maintenance and enhancement of the quality of water in water bodies and coastal water:

(iii) The maintenance of the quantity of water in water bodies and coastal water:

(iv) The avoidance or mitigation of natural hazards:

(v) The prevention or mitigation of any adverse effects of the storage, use, disposal, or transportation of hazardous substances:

(d) In respect of any coastal marine area in the region, the control (in conjunction with the Minister of Conservation) of-

(i) Land and associated natural and physical resources:

[(ii) The occupation of space on land of the Crown or land vested in the regional council, that is foreshore or seabed, and the extraction of sand, shingle, shell, or other natural material from that land:]

(iii) The taking, use, damming, and diversion of water:

(iv) Discharges of contaminants into or onto land, air, or water and discharges of water into water:

(v) Any actual or potential effects of the use, development, or protection of land, including the avoidance or mitigation of natural hazards and the prevention or mitigation of any adverse effects of the storage, use, disposal, or transportation of hazardous substances:

(vi) The emission of noise and the mitigation of the effects of noise:

(vii) Activities in relation to the surface of water:

(e) The control of the taking, use, damming, and diversion of water, and the control of the quantity, level, and flow of water in any water body, including-

(i) The setting of any maximum or minimum levels or flows of water:

(ii) The control of the range, or rate of change, of levels or flows of water:

(iii) The control of the taking or use of geothermal energy:

(f) The control of discharges of contaminants into or onto land, air, or water and discharges of water into water:

(g) In relation to any bed of a water body, the control of the introduction or planting of any plant, in, on, or under that land, for the purpose of-

(i) Soil conservation:

(ii) The maintenance and enhancement of the quality of water in that water body:

(iii) The maintenance of the quantity of water in that water body:

(iv) The avoidance or mitigation of natural hazards:

(h) Any other functions specified in this Act.

(2) The functions of the regional council and the Minister of Conservation [under subparagraph (i) or subparagraph (ii) or subparagraph (iii) of subsection (1) (d)] do not apply to the control of the harvesting or enhancement of populations of aquatic organisms, where the purpose of that control is to conserve, enhance, protect, allocate, or manage any fishery controlled by the Fisheries Act 1983.

**31. Functions of territorial authorities under this act-** Every territorial authority shall have the following functions for the purpose of giving effect to this Act in its district:

(a) The establishment, implementation, and review of objectives, policies and methods to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district:

[(b) The control of any actual or potential effects of the use, development, or protection of land, including for the purpose of the avoidance or mitigation of natural hazards and the prevention or mitigation of any adverse effects of the storage, use, disposal, or transportation of hazardous substances:]

(c) The control of the subdivision of land:

(d) The control of the emission of noise and the mitigation of the effects of noise:

(e) The control of any actual or potential effects of activities in relation to the surface of water in rivers and lakes:

(f) Any other functions specified in this Act.

# Appendix 2.4

## Part III: Duties and Restrictions under this Act
## The *Resource Management Act 1991*

**32. Duties to consider alternatives, assess benefits and costs, etc.**- (1) In achieving the purpose of this Act, before adopting any objective, policy rule, or other method in relation to any function described in subsection (2), any person described in that section shall-

(a) Have regard to-

(i) The extent (if any) to which any such objective, policy, rule, or other method is necessary in achieving the purpose of this Act; and

(ii) Other means in addition to or in place of such objective, policy, rule, or other method which, under this Act or any other enactment, may be used in achieving the purpose of the Act, including the provision of information services, or incentives, and the levying of charges (including rates); and

(iii) The reasons for and against adopting the proposed objective, policy, rule, or other method and the principle alternative means available, or of taking no action where this Act does not require otherwise; and

(b) Carry out an evaluation, which that person is satisfied is appropriate to the circumstances, of the likely benefits and costs of the principle alternative means including, in the case of any rule or other method, the extent to which it is likely to be effective in achieving the objective or policy and the likely implementation and compliance costs; and

(c) Be satisfied that any such objective, policy, rule, or other method ( or any combination thereof)-

(i) Is necessary in achieving the purpose of this Act; and

(ii) Is the most appropriate means of exercising the function, having regard to its efficiency and effectiveness relative to other means.

(2) Subsection (1) applies to-

(a) The Minister, in relation to-

(i) The recommendation of the issue, change, or revocation of any national policy statement under sections 52 and 53:

(ii) The recommendation of the making of any regulations under section 43:

(b) The Minister of Conservation, in relation to -

(i) The preparation and recommendation of New Zealand coastal policy statement under section 57:

(ii) The approval of regional coastal plans in accordance with the First Schedule:

(c) Every local authority, in relation to the setting of objectives, policies and rules under Part V.

[(3) No person shall challenge any objective, policy or rule in any plan or proposed plan, regional policy statement or proposed regional policy statement or proposed national policy statement or proposed New Zealand coastal policy statement, on the grounds that subsection (1) has not been complied with, other than-

(a) In a submission made under the First Schedule; or

(b) In a request under clause 21 of the First Schedule; or

(c) In a submission made under section 49 or section 50 on a proposed national policy statement; or

(d) In a submission made under section 57 on a proposed New Zealand coastal policy statement.]

**35. Duty to gather information, monitor and keep records**-(1) Every local authority shall gather such information, and undertake or commission such research, as is necessary to carry out effectively its functions under this Act.

(2) Every local authority shall monitor-

(a) That state of the whole or any part of the environment of its region or district to the extent that is appropriate to enable the local authority to effectively carry out its functions under this Act; and

(b) The suitability and effectiveness of any policy statement or plan for it's region or district; and

(c) The exercise of any functions, powers, or duties delegated or transferred by it; and

(d) The exercise of the resource consents that have effect in its region or district, as the case may be,-

and take appropriate action ( having regard to the methods available to it under this Act) where this is shown to be necessary.

(3) Every local authority shall keep reasonably available at its principle office, information which is relevant to the administration of policy statements and plans, the monitoring of resource consents, and the current issues relating to the environment of the area, to enable the public-

(a) To be better informed of their duties and of the functions, powers, and duties of the local authority; and

(b) To participate effectively under this Act.

(4) Every local authority shall keep a reasonably available at each of the offices in its region or district such of the information referred to in subsection (3) as relates to that part of the region or district.

(5) The information to be kept by a local authority under subsection (3) shall include-

(a) Copies of its operative and any proposed policy statements and plans including all requirements for designations and heritage orders, and all operative and proposed changes to those policy statements and plans; and

(b) All its decisions relating to submissions on any proposed policy statements and plans which have not yet become operative; and

(c) In the case of a territorial authority, copies of every operative and proposed regional policy statement and regional plan for the region of which its district forms a part; and

(d) In the case of a regional council, copies of every operative and proposed district plan for every territorial authority in its region; and

(e) In the case of a regional council, a copy of every Order in Council served on it under section 154 (a); and

(f) Copies of any national policy statement or New Zealand coastal policy statement; and

(g) Records of each resource consent granted by it, including any transfer of a resource consent; and

(h) Records of all extensions of time periods and waivers granted by it under section 37 in relation to applications under section 10 (which relates to existing uses), section 125 (which relates to lapsing of consents), and section 184 (which relates to lapsing of designations) during the preceding 5 years; and

(i) A summary of all written complaints received by it during the preceding 5 years concerning alleged breaches of the Act or a plan, and information on how it dealt with each complaint; and

*(j)Records of natural hazards to the extent that the local authority considers appropriate for the effective discharge of its functions; and*

[(ja) In the case of a territorial authority, the location and area of all esplanade reserves, esplanade strips, and access strips in the district, and]

(k) Any other information gathered in subsections (1) and (2).

# Appendix 2.5

## Part III: Duties and Restrictions under this Act
## The *Resource Management Act 1991*

**59. Purpose of regional policy statements**- The purpose of a regional policy statement is to achieve the purpose of the Act by providing an overview of the resource management issues of the region and policies and methods to achieve *integrated management of the natural and physical resources of the whole region.*

**62. Contents of regional policy statements**-(1) A regional policy statement shall make provision for such of the matters set out in Part I of the Second Schedule, (and such of the matters set out in Part II of that Schedule as are of regional significance), that are appropriate to the circumstances of the region, and shall state-

(a) The significant resource management issues of the region; and

(b) Matters of resource management significance to iwi authorities; and

(c) The objectives sought to be achieved by the statement; and

(d) The policies in regard to those significant issues and objectives, and an explanation of those policies; and

(e) The methods used or to be used to implement the policies; and

(f) The principle reasons for adopting the objectives, policies, and methods of implementation set out in the statement; and

(g) The environmental results anticipated from implementation of those policies and methods; and

(h) The processes to be used to deal with issues which cross local authority boundaries, and issues between territorial authorities or between regions; and

[*(ha) For the region or any part of the region, which local authority shall have responsibility within its own area for developing objectives, policies, and rules, relating to the control of the use of land for-*

*(i) The avoidance or mitigation of natural hazards:*

*(ii) The prevention or mitigation of any adverse effects of the storage, use, disposal, or transportation of hazardous substances-and may state particular responsibilities for particular hazards or hazardous substances or groups of hazards or hazardous substances; but if no responsibilities for a hazard or hazardous substance are identified in the policy statement, the regional council shall retain primary responsibility for the hazard or hazardous substance; and*]

(i) The procedures to be used to review the matters set out in paragraphs (a) to [(ha)], and to monitor the effectiveness of the statement as a means of achieving its objectives and policies; and

(j) Any other information that the regional council considers appropriate; and

(k) Such additional matters as may be appropriate for the purpose of fulfilling the regional council's functions, powers, and duties under this Act.

(2) A regional policy statement shall not be inconsistent with any national policy statement, New Zealand coastal policy statement, or water conservation order.

**65. Preparation and change of other regional plans**- (1) A regional council may have, in addition to its regional coastal plan, one or more regional plans prepared in the manner set out in the First Schedule.

(2) A regional plan may-

(a) Be prepared in respect of any aspect of any function for which the regional council is responsible; and

(b)Apply to the whole or any part of the region.

(3) Without limiting the power of a regional council to prepare a regional plan at any time, a regional council shall consider the desirability of preparing a regional plan whenever any of the following circumstances or considerations arise or are likely to arise:

(a) Any significant conflict between the use, development, or protection of natural and physical resources or the avoidance or mitigation of such conflict:

(b) Any significant need or demand for the protection of natural and physical resources or of any site, feature, place or area of regional significance:

*(c) Any threat from natural hazards or any actual or potential adverse effects of the storage, use, disposal, or transportation effects of hazardous substances which may be avoided or mitigated:*

(d) Any foreseeable demand for or on natural and physical resources:

(e) Any significant concerns of tangata whenua for their cultural heritage in relation to natural and physical resources:

(f) The restoration or enhancement of any natural and physical resources in a deteriorated state or the avoidance or mitigation of any such deterioration:

(g) The implementation of a national policy statement or New Zealand coastal policy statement:

(h) Any use of land or water that has actual or potential adverse effects on soil conservation or air quality or water quality:

(i) Any other significant issue relating to any function of the regional council under this Act.

(4) Any person may request a regional council to prepare or change a regional plan in the manner set out by the First Schedule.

(5) A regional plan may be changed [by the regional council] in the manner set out by the First Schedule.

**68. Regional rules**-(1) A regional council may, for the purpose of -

(a) Carrying out its functions under this Act (other than those described in paragraphs (a) and (b) of section 30(1)); and

(b) Achieving the objectives and policies of the plan,-include in a regional plan rules which prohibit, regulate, or allow activities.

(2) Every such rule shall have the force and effect of a regulation in force under this Act but, to the extent that any such rule is inconsistent with any such regulation, the regulation shall prevail.

[*(2A) Notwithstanding section 7 (2) of the Building Act 1991, rules may be made under this section, for the protection of other property (as defined in section 2 of that Act) from the effects of surface water, which require persons undertaking building work to achieve performance criteria additional to, or more restrictive than, those specified in the building code in force under that Act.*]

(3) In making a rule, the regional council shall have regard to the actual or potential effect on the environment of activities, including, in particular, any adverse effect; and rules may accordingly [provide for] permitted activities, controlled activities, discretionary activities, and restricted coastal activities.

[(3A) Where a rule in a regional plan or proposed regional plan provides for a controlled activity-

(a) The rule shall also-

(i) State the standards and terms that the activity shall comply with; and

(ii) State the matters which the regional council shall exercise its control over; and

(b) The rule may state whether an application for a resource consent may be considered without notification or the need to obtain the written approval of affected persons in accordance with section 94(1)(b).

(3B)Where a rule in a regional plan or proposed regional plan provides for a discretionary activity, the rule may also-

(a) State the standards and terms that the activity shall comply with; and

(b) State the matters to which the regional council has restricted the exercise of its discretion; and

(c) If a regional council has restricted the exercise of its discretion in accordance with paragraphs (a) and (b), state whether an application for a resource consent may be considered without notification or the need to obtain the written approval of affected persons in accordance with section 94(1A).]

(4) Notwithstanding subsection (3), a rule may specify an activity as a restricted coastal activity only if the rule is in a regional coastal plan and the Minister of Conservation has required the activity to be so specified on the grounds that the activity-

(a) Has or is likely to have significant or irreversible adverse effects on a coast marine area; or

(b) Occurs or is likely to occur in an area having significant conservation value.

(5) A rule may-

(a) Apply throughout the region or a part of the region:

(b) Make different provision for -

(i) Different parts of the region; or

(ii) Different classes of effects arising from an activity:

(c) Apply all the time or for stated periods or seasons:

(d) Be specific or general in its application:

(e) Require a resource consent to be obtained for any activity not specifically referred to in the plan.

(6) Where a regional rule affects the use of particular areas of land, the regional council shall notify the relevant territorial authority of the rule, and the territorial authority shall ensure that the rule is annexed to, and appropriate annotations are made in, every copy of the authority's district plan that is under the authority's control.

[(7) Where a regional plan includes a rule relating to maximum or minimum levels of flow or rates of use of water, or minimum standards of water quality or air quality, or ranges of temperature or pressure of geothermal water, the plan may state-

(a) Whether the rule shall affect, under section 130, the exercise of existing resource consents for activities which contravene the rule; and

(b) That the holders of resource consents may comply with the terms of the rule, or rules, in stages or over specified periods.]

**76. District rules**- (1) A territorial authority may, for the purpose of-

(a) Carrying out its functions under this Act; and

(b)Achieving the objectives and policies of the plan,- include in its district plan rules which prohibit, regulate, or allow activities.

(2) Every such rule shall have the force and effect of a regulation in force under this Act but, to the extent that any such rule is inconsistent with any such regulation, the regulation shall prevail.

[*(2A) Notwithstanding section 7 (2) of the Building Act 1991, rules may be made under this section, for the protection of other property (as defined in section 2 of that Act) from the effects of surface water, which require persons undertaking building work to achieve performance criteria additional to, or more restrictive than, those specified in the building code in force under that Act.*]

(3) In making a rule, the territorial authority shall have regard to the actual or potential effect on the environment of activities, including, in particular, any adverse effect; and rules may accordingly [provide for] permitted activities, controlled activities, discretionary activities, and restricted coastal activities.

[(3A) Where a rule in a district plan or proposed district plan provides for a controlled activity-

(a) The rule shall also-

(i) State the standards and terms that the activity shall comply with; and

(ii) State the matters which the regional council shall exercise its control over; and

(b) The rule may state whether an application for a land use consent may be considered without notification or the need to obtain the written approval of affected persons in accordance with section 94(1)(b).

(3B)Where a rule in a district plan or proposed district plan provides for a discretionary activity, the rule may also-

(a) State the standards and terms that the activity shall comply with; and

(b) State the matters to which the territorial authority has restricted the exercise of its discretion; and

(c) If the territorial authority has restricted the exercise of its discretion in accordance with paragraphs (a) and (b), state whether an application for a resource consent may be considered without notification or the need to obtain the written approval of affected persons in accordance with section 94(1A).]

(4) A rule may-

(a) Apply throughout a district or part of a district:

(b) Make different provision for-

(i) Different parts of the district; or-

(ii) Different classes of effects arising from an activity:

(c) Apply all the time or for stated periods or seasons:

(d) Be specific or general in its application:

(e) Require a resource consent to be obtained for any activity not specifically referred to in a plan.

# Appendix 2.6

## Part VI: Resource Consents
## The *Resource Management Act 1991*

**106. Subdivision consent not to be granted in certain circumstances**-(1) A consent authority shall not grant a subdivision consent if it considers that either-

(a) *Any land in respect of which a consent is sought, or any structure on that land, is or is likely to be subject to material damage by erosion, [falling debris,] subsidence, slippage or inundation from any source; or*

*(b) Any subsequent use that is likely to be made of the land is likely to accelerate, worsen, or result in material damage to that land, other land, or structure, by erosion, [falling debris,] subsidence, slippage, or inundation from any source-*

unless the consent authority is satisfied that sufficient provision has been made or will be made in accordance with subsection (2).

(2) A consent authority may grant a subdivision consent if it is satisfied that the effects described in subsection (1) will be avoided, remedied, or mitigated by one or more of the following:

(a) Rules in the district plan.

(b) Conditions of a resource consent, either generally or pursuant to section 220(1)(d):

(c) Other matters, including works.

# Appendix 2.7

## Part X: Subdivisions and Reclamations
## The *Resource Management Act 1991*

**229. Purposes of esplanade reserves and esplanade strips**- An esplanade reserve or esplanade strip has one or more of the following purposes:

(a) To contribute to the protection of conservation values by, in particular,-

(i) Maintaining or enhancing the natural functioning of the adjacent sea, river, or lake; or

(ii) Maintaining or enhancing water quality; or

(iii)Maintaining or enhancing aquatic habitats; or

(iv) Protecting the natural values associated with the esplanade reserve or esplanade strip; or

*(v) Mitigating natural hazards; or*

(b) To enable public access to or along any sea, river, or lake,; or

(c) To enable public recreational use of the esplanade reserve or esplanade strip and adjacent sea, river, or lake, where the use is compatible with conservation values.

# Appendix 2.8

## Part V: Building Work and Use of Buildings
## The *Building Act 1991*

### Limitations and Restrictions on Building Consents

**36. Building on land subject to erosion, etc.**-(1) Except as provided for in subsection (2) of this section, a territorial authority shall refuse to grant a building consent involving construction of a building or major alterations to a building if-

(a) The land on which the building work is to take place is subject to, or is likely to be subject to, erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage; or

(b) The building work itself is likely to accelerate, worsen, or result in erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage of that land or any other property-

unless the territorial authority is satisfied that adequate provision has been made or will be made to-

(c) protect the land or building work or that other property concerned from erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage; or

(d) Restore any damage to the land or that other property concerned as a result of the building work.

(2) Where a building consent is applied for and the territorial authority considers that-

(a) The building work itself will not accelerate, worsen, or result in erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage of that land, or any other property; but

(b) the land on which the building work is to take place is subject to, erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage; and

(c) The building work which is to take pace is in all other respects such that the requirements of section 34 of this Act have been met-

the territorial authority shall, if it is satisfied that the applicant is the owner in terms of this section, grant the building consent and shall include as a condition of that consent that the territorial authority shall, forthwith upon the issue of that consent, notify the District Land Registrar of the land registration district in which the land to which the consent relates is situated; and the District Land Registrar shall make an entry of the certificate of title to the land that a building consent has been issued in respect of a building on land that is described in subsection (1)(a) of this section.

(3) Where the territorial authority determines that the entry referred to in subsection (2) of this section is no longer required, it shall send notice of the determination to the District Land Registrar who shall amend his or her records accordingly.

(4) Where-

(a) Any building consent has been issued under subsection (2) of this section; and

(b) The territorial authority has notified the District Land Registrar under subsection (2) of this section that it has issued the consent; and

(c) the territorial authority has not notified the District Land Registrar under subsection (3) of this section that it has determined that the entry made on the certificate of title of the land is no longer required; and

(d) The building to which the building consent relates later suffers damage arising directly or indirectly from erosion, subsidence, avulsion, alluvion, falling debris, or slippage-

the territorial authority and every member, employee, or agent of the territorial authority shall not be under any civil liability to any person having an interest in that building on the grounds that it issued a building consent for the building in the knowledge that the building from which the consent was issued or the land on which the building was situated was, or was likely to be, subject to damage arising, directly or indirectly, from erosion, subsidence, avulsion, alluvion, falling debris, inundation or slippage, or from inundation arising from such erosion, subsidence, avulsion, alluvion, falling debris, or slippage.

(5) Where an application made by or on behalf of the Crown is such that, if the applicant were not the Crown, subsections (2) and (4) of this section would otherwise apply, the territorial authority, in approving any such application, shall notify the appropriate Minister and the Chief Surveyor for the land district in which the land is situated, and include with that notification a copy of the project information memorandum issued in respect of the building consent; and such notification shall be deemed to meet the requirements of this section.

(6) Where an application made by or on behalf of the owners of Maori Land is such that, if the application were not in respect of Maori land, subsection (2) of this section would otherwise apply, the territorial authority, in approving any such application, shall notify the Registrar of the Maori Land Court, and include with that notification a copy of the project information memorandum issued in respect of the building consent; and such notification shall be deemed to meet the requirements of this section.

(7) Where any notification is given pursuant to subsection (5) or subsection (6) of this section, the Chief Surveyor or the Registrar of the Maori Land Court, as the case may be, shall enter in his or her records a copy of the project information memorandum included with that notification.

(8) For the purposes of subsection(2) of this section, the term "owner" means the person having ownership of the fee simple of the land on which the building work is or has taken place.

# Appendix 3.1
# Confirmation letter

Kim Harding
90 Gillespies Line
Palmerston North

_____
_____Council
_____

7 December 1995

Dear _____

I am writing to confirm our interview date on the 12th of December at 10.00. I hope this is still convenient for you. This interview will be part of my fieldwork for my masterate thesis in planning, which is investigating how councils are implementing flood hazard reduction measures in their districts. I have enclosed a copy of the interview schedule for your perusal. I realise your time is precious and do not want to keep you for more than half an hour. For this reason, and to ensure I gain as much as possible from the interview, I would appreciate you allowing me to tape the interview. The information will be kept confidential and you will have an opportunity to review the transcript once the interview has been transcribed. This will be sent to you to review and alter if necessary.

Thank you very much for your time. I look forward to seeing you.
Yours Sincerely

Kim Harding

# Appendix 3.2
# Transcript letter

Kim Harding
90 Gillespies Line
Palmerston North

_____
_____ Council
_____

11 January 1996

Dear _____

Thank you very much for allowing the time to speak to me on Friday. Enclosed is the interview transcript, please read it and make any alterations you see fit. I have put question marks beside the points I am not sure of. The information will be mainly used as background information but to ensure your professional status is in no way compromised, and as I have to identify my case study councils in my thesis, could you please highlight any parts you do not wish to be quoted. If you could send back the altered copy in the envelope provided as soon as possible I would be very grateful. If you have any queries please don't hesitate to ring me.

Thanks again for your time and effort.
Yours Sincerely

Kim Harding

# Appendix 4.1
# Interview Schedule for district councils

What is your professional status within this council?

What is your educational background/professional affiliations?

What is the nature of the flood hazard in the your area?

-recent flooding
-structural protection such as stopbanks
-non-structural mitigation methods already in place
-type and intensity of development on floodplains
-pressure for future floodplain development

How prominent is the flood hazard problem in terms of councils priorities?

-yearly occurrence
-more than once a year
-after heavy rainfall
-monthly

How much information is available on the flood hazard in the your district?

-length of historical records
-interaction with the regional council

What are the design levels of structural protection (i.e. stopbanks) within the District?

-what data is this based on?

What does the district plan propose to further reduce the flood hazard?

What alternatives, if any, to those proposed in the plan were considered?

i.e. -the 'do nothing' option
-education
-regulation

-incentives and disincentives (i.e. financial)
-section 32 report available?

Why were the above methods rejected in preference to those contained within the plan?

Was the flood hazard problem specifically addressed by council during public consultation for the plan?

How do current councillors perceive the flood hazard?
-worries over legal implications i.e. liability
-concerned about it
-prefer not to know
-want to encourage community to take responsibility for hazard mitigation

Has the regional council been helpful in dealing with the problem of the flood hazard?
-technical advice
-financial resources
-human resources

Did you have any other external advice in approaching the flood hazard problem when writing the plan?
-MfE?
-consultants

Has council appreciated the extent to which central government has shifted responsibility for the flood hazard on to local government and communities?
-earthquake and war damage insurance
-LAPP
-disaster fund

What opposition has there been to any attempts to reduce the flood hazard by council, particularly through the plan?
-by whom?
-in what form was this opposition?
-main concerns of opponents

Is there anything that I have not asked you that you think I would find helpful in my research?

# Appendix 4.2
# Interview schedule for regional councils

What is your position within this council?

What is your educational background/professional affiliations?

What is the nature of the flood hazard in your region?

-recent flooding
-degree of structural protection such as stopbanks
-non-structural mitigation methods already in place
- intensity of development on floodplains
-pressure for future floodplain development

How prominent is the flood hazard problem in terms of councils priorities?

-yearly occurrence
-more than once a year
-after heavy rainfall
-monthly

How much information is available on the flood hazard in your area?

-length of historical records

What are the design levels of structural protection such as stopbanks?

How committed is council to maintenance of structural protection such as stopbanks?

-financial resources allocated

Has council considered having a regional plan for the flood hazard?

Does council think that the 1993 amendment to the RMA [76(2)(a)] and court of appeal decision (Waimakariri Floodplain Management Plan) have clarified the responsibilities of district and regional councils in regard to flood hazard management sufficiently?

Have you had any other external advice in approaching the flood hazard problem?

-MfE?

-consultants

What alternatives, if any, to those proposed in the plan/policy statement were considered?

-the 'do nothing' option

-education

-regulation

-incentives and disincentives (i.e. financial)

Why were the above methods rejected over those adopted by the council?

Was the flood hazard problem specifically addressed by council during consultation for the RPS?

How do current councillors perceive the flood hazard?

-worries over legal implications i.e. liability

-concerned about it

-prefer not to know

-want to encourage community to take responsibility for hazard mitigation

Has council appreciated the extent to which central government has shifted responsibility for the flood hazard on to local government and communities?

What opposition has there been to any attempts to reduce the flood hazard by council?

-by whom?

-in what form was this opposition?

-main concerns of opponents

What reactions has council experienced from Local Territorial Authorities in managing the flood hazard?

Is there anything that I have not asked you that you think I would find helpful in my research?

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