

11. Natural Hazards

11.1 Introduction

Hazards may be broadly categorised into two classes: natural hazards and technological hazards. Hazards in the latter category, including hazardous substance incidents and accidents arising from the production, storage, transportation, use and disposal of hazardous substances, are considered in the Waste Management and Hazardous Substances chapter (chapter 13). This chapter deals with natural hazards.

S. 2 of the Act defines the term "natural hazard" to mean "any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire, or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment".

With the exception of geothermal activity, the Wellington Region is susceptible to all of the hazards listed above. All of the Region is susceptible, from the densely populated urban areas to the sparsely populated rural areas. Hazards may affect localised areas or their effects may be widespread throughout the Region. Some hazards occur at low magnitudes but with high frequency and so the accumulation of effects can pose significant problems. Other hazards occur only occasionally, but have a high potential impact.

In the Wellington Region, the hazards with the potential to cause the greatest adverse effects are flooding and earthquakes. Many of the Region's major floodplains have been substantially developed, and there are now considerable assets at risk from the flood hazard. Of particular concern are the Hutt, Otaki, Waikanae, Porirua, Waingawa, Waiohine and Ruamahanga floodplains. The Hutt floodplain has an asset value of approximately \$10 billion, the second highest in New Zealand.

The Wellington Region sits astride the boundary of two great crustal plates and is cut by a number of major active fault lines. The Region is not infrequently shaken by large earthquakes and, with the continuing movement of the two plates, more major earthquakes can be expected in the future.

The objectives and policies on natural hazards in this chapter are generic and apply to all natural hazards, except sedimentation and soil erosion. Because these hazards have strong links to water and land management they are dealt with in chapters 5 and 6.

See also chapter 5 (Fresh Water) and chapter 6 (Soil and Minerals).

The following facts need to be considered when dealing with natural hazards:

- Natural hazard events **will** occur in the Wellington Region.
- **Implementation** of risk mitigation strategies is the key to successful risk reduction — good ideas and intentions are not enough.

A coherent approach to anticipating and dealing with natural hazards is needed. Such an approach requires an understanding of the likelihood, characteristics and effects of the different types of natural hazards, measures to mitigate risk and enhance preparedness, and a response and recovery system. This approach would provide the Regional community with an acceptable level of security.

The term "risk" as used here is a combination of a natural hazard event and our vulnerability to it. Risk may be measured quantitatively or qualitatively, and will be associated with a given probability or specified time period. Risk could be specified in terms of expected number of lives lost, persons injured, damage to property, disruption of economic activity or loss of essential services and facilities due to a particular natural hazard.

Reducing the impacts of natural hazards is one of the major functions of the Wellington Regional Council. The function spans resource management, warning, protection, awareness raising, provision of advice, and emergency response. The Council's functions come from a number of statutes, including the Resource Management Act 1991, Soil Conservation and Rivers Control Act 1941, Wellington Regional Water Board Act 1972, Land Drainage Act 1908, Transit New Zealand Act 1989, Civil Defence Act 1983, Forest and Rural Fire Act 1977, Building Act 1991 and Local Government Act 1974.

11.2

Issues

All Natural Hazards Issues

Issue 1	<p>The Wellington Region is susceptible to a range of natural hazards which have the potential to cause substantial adverse effects on the environment. The scale of effects may range from ones that impact on an individual site (such as a landslip) to ones that impact on the whole Region (such as an earthquake).</p>	relate to Objective 1.
Issue 2	<p>For the major natural hazards in the Wellington Region, such as flooding and earthquakes, it is not practicable to eliminate risks entirely. The aim should be to ensure that the level of risk is understood and acceptable. However, acceptable levels of risk are generally unknown.</p>	
Issue 3	<p>Current knowledge of the nature and potential effects of many natural hazards in the Wellington Region is limited. As a consequence, decisions on the use, development and protection of natural and physical resources are often made with inadequate information on natural hazards.</p>	
Issue 4	<p>The frequency and magnitude of natural hazard events can be increased or decreased by human actions. For example, many activities in the Wellington Region involve modification of landform to provide building platforms for development. This may result in the oversteepening of hill slopes, or the flattening of sand dunes with consequential interruption to beach processes. Human actions can also reduce hazards, for example by the removal of steep slopes through recontouring of the land during the development of a new subdivision. In addition, some attempts to safeguard against natural hazards can themselves exacerbate the problems and may have other adverse effects on the environment. For example, sea walls can aggravate erosion, degrade the natural character of the coast and bring about a loss of intertidal marine habitat.</p>	See also Soil Issue 7.
Issue 5	<p>The frequency and magnitude of natural hazard events in the Wellington Region may also alter due to climate change. Warmer global temperatures may increase the Region's exposure to tropical cyclones such as the Wahine storm, which would increase the frequency of major flood and landslip events and may increase coastal erosion hazard from projected sea level rise.</p>	See also Air Issue 2.
Issue 6	<p>People and communities in the Wellington Region are generally inadequately prepared for natural hazard events which may occur with little or no warning. This is particularly the case for</p>	

major events, such as damaging earthquakes, and flooding on the major floodplains such as Hutt and Otaki.

11.3 Objective

Objective 1

Any adverse effects of natural hazards on the environment of the Wellington Region are reduced to an acceptable level.

Objective 1 relates to all Natural Hazards policies.

Natural hazards may have a range of adverse effects on the environment. Of particular concern are the adverse effects on people and communities, including loss of life, injury, damage to property and disruption of social and economic activities. The objective does not seek the total elimination or avoidance of adverse effects, because for some hazards, such as earthquakes, this is not possible. There are also benefits to be gained from using hazard prone land, while accepting some level of risk.

An acceptable level of risk will be one that balances the benefits and costs of risk reduction measures, taking into account non-monetary costs, community aspirations and the statutory responsibilities of relevant authorities. Public input is required to determine the level of acceptable risk.

See also Soil Objective 4.

The principal reasons for adopting the objective are an acceptance of the fact that natural hazard events with the potential to cause substantial adverse effects on the environment **will** occur in the Wellington Region and, in order to promote sustainable management, it is necessary to avoid or mitigate these effects wherever possible.

The Wellington Region has suffered substantial adverse effects from natural hazard events in the past. These events now have a greater potential to cause adverse effects because of the greater level of development within the Region. For example, an earthquake of the same magnitude as the West Wairarapa earthquake in 1855 would probably cause major damage, loss of life, injuries, etc., today, because of the greater population and development in the area compared with that which existed in 1855. The same argument can be applied to the 1898 flood in the Hutt Valley.

11.4 Policies

Policy 1

To ensure that there is sufficient information available on natural hazards to guide decision making.

Natural Hazards Methods 1-8 and 15.

This policy aims to ensure that resource managers have access to sufficient information on natural hazards to allow potential adverse effects to be considered in the decision making process. "Sufficient information" will include data on the probability of occurrence, magnitude and location of effects from potential natural hazard events. Where data on these factors are not available, various scenarios should be considered.

The principal reason for adopting this policy is that informed decisions can only be made with adequate information and the current level of information on natural hazards is inadequate in many areas; further investigations are required. The collection and provision of information needs to be an ongoing process which reflects advances in understanding and methods of assessment.

Policy 2

To consider all of the following matters when planning for, and making decisions on, new subdivision, use, and development in areas which are known to be susceptible to natural hazards:

Natural Hazards Methods 9-10 and 14-15.

- (1) *The probability of occurrence and magnitude of the natural hazards, and the location of the effects, including any possible changes which might arise from climate change;*
- (2) *The potential consequences of a natural hazard event occurring, both on-site and off-site. Potential loss of life, injury, social and economic disruption, civil defence implications, costs to the community, and any other adverse effects on the environment should be considered;*
- (3) *The measures proposed to mitigate the effects of natural hazard events, the degree of mitigation they will provide, and any effects on the environment from adopting such measures;*
- (4) *Alternative measures that might be incorporated into the subdivision, use and development to mitigate the effects of natural hazard events, the degree of mitigation they will*

provide, and any effects on the environment from adopting such measures. Both structural and non-structural measures should be considered;

- (5) The benefits and costs of alternative mitigation measures;*
- (6) The availability of alternative sites for the activity or use; and*
- (7) Any statutory obligations to protect people and communities from natural hazards.*

This policy provides guidance for district and regional plans, and for resource consent decisions, to ensure that appropriate weight is given to the potential consequences of natural hazard events. Opportunities to avoid and mitigate hazards should be evaluated, so that these may be incorporated in the planning documents or consent decisions, where appropriate.

Policy 3

To recognise the risks to existing development from natural hazards and promote risk reduction measures to reduce this risk to an acceptable level, consistent with Part II of the Act.

Natural Hazards Methods 10 and 11.

It is readily apparent that much development in the Wellington Region has taken place in hazardous locations. This policy is directed towards the reduction of risks to existing development from natural hazards. Risks may be reduced either by altering the nature of the hazards (e.g., by building stopbanks to prevent flooding) or by reducing the vulnerability of the development to the hazard (e.g., by raising the floor levels of buildings situated in a floodplain). The first step in achieving risk reduction is for the people and communities affected, as well as the local authorities involved, to actually recognise the risk. Risk reduction can be promoted through advocacy and through the provision of information.

See also Soil Policy 8.

An "acceptable level" of risk will be one that balances the benefits and costs of risk reduction measures, taking into account non-monetary costs, community aspirations and the statutory responsibilities of relevant authorities. Public input is required to determine this level. The most important step, however, is the implementation of risk mitigation measures.

Policy 4

To ensure that human activities which modify the environment only change the probability and magnitude of natural hazard

Natural Hazards Method 9.

events where these changes have been explicitly recognised and accepted.

This policy recognises that human activities can affect both the frequency and magnitude of natural hazard events. The effects may be confined to the site where activities are occurring (e.g., excavation of a hill slope may cause instability) or may be off-site (e.g., building in a floodway may divert river flows and cause downstream problems). The policy aims to ensure that any possible adverse effects on the risks from natural hazards are explicitly recognised and accepted before the activity proceeds.

Policy 5

To encourage people and communities to prepare for the occurrence of natural hazard events by providing them with relevant information and advice.

Natural Hazards Methods 1-8.

This policy seeks to increase the level of preparedness of people and communities for the occurrence of natural hazard events. Being prepared for natural hazard events is an essential means by which adverse effects can be minimised. In many situations it will not be possible to eliminate risks or even reduce them to levels where consequences will be minor. In these situations the best and most cost effective approach is to be prepared for the hazards.

In order to be adequately prepared, people and communities need information, both on the likely hazards and their effects, and on ways in which they can prepare to minimise the consequences. Being prepared involves knowing what actions to take and having the essential items available to take those actions. For example, people and communities should have emergency water supplies available for use following a major earthquake, when normal supplies may be cut for some time.

The information and advice referred to in the policy includes information about the hazard events themselves (e.g., the probability, location and magnitude of flooding), the potential consequences of that event on people and communities and ways in which the adverse impacts can be reduced.

11.5 Methods

Method 1

The Wellington Regional Council will complete flood hazard assessments on all major floodplains in the Region. The assessments will include an analysis of the potential effect of

Natural Hazards Polices 1 and 5.

flooding events.

Detailed flood hazard assessments are underway for major floodplains in the Region. Flood hazard assessments have been completed for the Waikanae, Otaki, Porirua and Waingawa floodplains and are programmed to be completed for the Hutt, Waiohine and Ruamahanga Rivers. Future work will address a number of other known floodable areas.

See also Soil Methods 27-31.

This method has been adopted because of the significant assets at risk from flooding and the potential cost of damage that may occur and because avoiding or mitigating this hazard is one of the major functions of the Wellington Regional Council.

Method 2

The Wellington Regional Council will complete regional scale assessments of the various components of seismic hazard including surface fault rupture, ground shaking, tsunami, liquefaction and ground damage, landslides, and locally significant hazards.

Natural Hazards Policies and 5. 1

The Wellington Regional Council commenced regional scale assessment of earthquake hazards in 1988. Studies are being progressively completed on the various components of earthquake hazard for the urban areas of the Region. The principal reasons for adopting this method are to provide improved information on seismic hazards and their consequences.

Method 3

The Wellington Regional Council will continue to identify and investigate the risks from slope instability within areas of greatest development or development potential within the Region.

Natural Hazards Policies and 5. 1

Initially this information will provide an overview and identify general areas of highest risk from slope instability within and around developed areas. More specific investigations may be carried out once the regional scale assessment has been completed. The principal reasons for adopting this method are to provide improved information on slope instability hazards and their consequences.

See also Soil Method 26.

Method 4

The Wellington Regional Council will identify those areas in the Region which are susceptible to coastal erosion and inundation. The work will concentrate on the areas of greatest development or development potential.

Natural Hazards Policies and 5. 1

Areas in the Region susceptible to coastal erosion will be identified through a review of past shoreline positions. This will

distinguish long-term trends from short-term fluctuations (which may require a different response or an alternative form of management). The investigation will also consider the potential effects of rising sea levels due to climate change.

Method 5

The Wellington Regional Council will undertake a scoping study on the hazards of wild fire, severe wind, tsunami and drought and set priorities for more detailed investigations of these hazards if the scoping study shows this to be warranted.

Natural Hazards Policies and 5. 1

Information on the hazards of wild fire, severe wind, tsunami from distant sources and drought in the Wellington Region is limited. The proposed work will identify potential risks and determine whether more detailed studies are warranted. If so, future studies will be prioritised according to the perceived level of risk and the opportunities for mitigation which might arise out of the study. The study would also consider the potential impacts of climate change.

Method 6

The Wellington Regional Council will periodically review the current knowledge on climate change and possible effects on natural hazards.

Natural Hazards Policies and 5. 1

Climate change effects resulting from the "Greenhouse Effect" are not yet well understood, and are the subject of major studies worldwide. This method requires the Council to review regularly the available information and assess possible effects on the frequency and magnitude of natural hazards in the Region.

Method 7

The Wellington Regional Council will make information it has on natural hazards available to the people and communities of the Wellington Region.

Natural Hazards Policies and 5. 1

The Wellington Regional Council has a recognised role in the provision of information on major natural hazards within the Region. There is a substantial amount of information held within the Council on natural hazards and, in particular, on hazards within the Region. This method will require the Wellington Regional Council to make sure that its natural hazard information is maintained in a way that makes it available to the people and communities of the Region.

The principal reasons for adopting this method are to ensure that existing information on natural hazards available within the Council is available to the public and to fulfil the Council's

responsibilities under s. 35 of the Act.

Method 8

The Wellington Regional Council will encourage and assist, where possible, territorial authorities to investigate natural hazards within their districts. These investigations should include flood hazard assessments for land in floodways managed by territorial authorities (including watercourses managed by agreement with the Wellington Regional Council) and seismic hazard and landslip studies at a greater level of detail than provided for in the regional scale studies.

Natural Hazards Policies and 5. 1

Many territorial authorities have undertaken studies of natural hazards within their districts. The Wellington Regional Council will encourage and assist with such studies, where possible, on request. As appropriate, information and expertise within the Council will be made available for such studies. The Council will produce guidelines for the assessment of flood hazard and the subsequent evaluation of flood mitigation options.

See also Soil Method 26.

Method 9

The Wellington Regional Council will, in situations where it is the consent granting authority, require applicants for resource consents to include, in their assessment of effects, the risks posed by natural hazards. The level of assessment should be appropriate to the potential consequences of the hazard and the location of the activity in relation to known natural hazards.

Natural Hazards Policy 4.

The Wellington Regional Council is the consent granting authority for the discharge of contaminants, the taking and use of water, all activities in the coastal marine area (except for restricted coastal activities), activities in the beds of rivers and lakes, and potentially for control of the use of land in relation to soil conservation, natural hazards and hazardous materials. As consent granting authority, the Council can ensure that information supplied with an application is sufficient to enable proper assessment of the effects on the environment.

Method 10

The Wellington Regional Council will use its information on natural hazards to identify the risks to existing development and ways in which these can be reduced.

Natural Hazards Policy 3.

Once the Council has collected information on the characteristics of the major natural hazards, it will assess the potential impacts of hazard events on human life, property, economic and social activities, and other aspects of the environment. This will define current levels of risk which exist. The Council will then identify opportunities for risk reduction. These will include actions to

reduce the hazard itself and actions to reduce the vulnerability of people and communities to the effects of the hazard.

Method 11

The Wellington Regional Council will implement measures directly within its power to ensure risk levels are acceptable. This will involve the Council exercising its functions, powers, and duties under the legislation which governs its operations. The cost effectiveness of any measures must be acceptable to the Council.

Natural Hazards Policy 3.

Council powers of particular relevance to the implementation of this method are those under the Civil Defence Act 1983 and the Soil Conservation and Rivers Control Act 1941. An example of the use of this method would be for the Council to identify the construction of a flood detention dam as the most effective way of mitigating the flood hazard in a particular catchment. The Council could then use its powers under the Soil Conservation and Rivers Control Act 1941 to construct the dam.

Method 12

The Wellington Regional Council will, in consultation with major regional civil defence responding organisations, territorial authorities and other interested parties, prepare a five year strategy to inform people and communities in the Region about the ways in which they can prepare for the occurrence of natural hazard events.

Natural Hazards Policy 5.

In developing the strategy consideration will be given to:

- (1) The various means available to inform the public including advertising programmes, brochures, presentations to schools and interest groups, signs, and the provision of reports;*
- (2) The actions that people can and should take to prepare themselves for the occurrence of natural hazard events;*
- (3) Funding implications; and*
- (4) Identification of the appropriate agencies to implement the strategy.*

Current approaches to informing the community about natural hazards and preparedness are largely ad hoc and involve several agencies working independently. A co-ordinated approach is likely to be efficient and effective. This method will require the preparation of an integrated plan of action over a five year period

to inform people and communities about natural hazards and actions they can and should take to reduce the potential adverse effects.

The Wellington Regional Council will act as the primary agency with responsibility for preparation of the strategy, but it will be necessary for all agencies and organisations with a potential role to be involved.

Method 13

The Wellington Regional Council will ensure that the risks from natural hazards to its own assets and operations are minimised. Where significant risks still exist, the Council will prepare contingency plans to ensure that essential operations can continue to function following a major natural hazard event. The Council will also ensure that, as far as practicable, it is covered by insurance against damage from natural hazard events.

Natural Hazards Policy 5.

The Wellington Regional Council owns and operates major assets in the Region, including bulk water supply facilities, flood schemes, etc. Under this method the Council will ensure that the vulnerability of these facilities to natural hazards is minimised and that the Council is, as far as possible, able to take responsibility for any adverse effects of natural hazards on the facilities.

Method 14

The Wellington Regional Council will implement natural hazards policies, as appropriate, through regional plans.

Natural Hazards Policies 1-4.

Regional plans are an appropriate means of implementing some of the policies in this chapter. However, the ways in which the plans could deal with the various hazards will require further investigation.

Method 15

District plans would be an appropriate means of implementing Natural Hazards Policies 1 and 2.

Natural Hazards Policies 1 and 2. 1

District plans would be appropriate documents to contain a description of the natural hazards that may occur within a district, and maps showing existing information on natural hazards. The information could be derived from a review of current knowledge of natural hazards within the district and be presented at a level of detail appropriate to the hazard.

11.6 Anticipated Environmental Results

- (1) The adverse environmental effects arising from natural hazards are minimised as far as possible.
- (2) Risks to existing subdivision, use and development are identified, and mitigation measures implemented where appropriate.
- (3) New development in hazard prone areas occurs only after explicit consideration of the natural hazard aspects of the proposals.
- (4) People and communities in the Region are better prepared to cope with the occurrence of natural hazard events.

11.7 Responsibilities

The responsibilities for **developing objectives, policies and rules for the control of the use of land** for the avoidance or mitigation of natural hazards are shown in table 11. In this table "land" has been divided into three types: the coastal marine area, the beds of lakes and rivers, and all other land.

Table 11 : Responsibilities for the Control of the Use of Land for the Avoidance or Mitigation of Natural Hazards

	Responsibility for Developing Objectives	Responsibility for Developing Policies	Responsibility for Developing Rules
Coastal Marine Area	WRC	WRC	WRC
Beds of Lakes and Rivers	WRC	WRC	WRC
Other Land	WRC* TA	WRC* TA	WRC TA*

Key

WRC = Wellington Regional Council

TA = Territorial authorities

* = Primary responsibility

The table shows that **the Regional Council has the primary responsibility** for the control of the use of land for the avoidance or mitigation of natural hazards. For land other than land in the coastal marine area and the beds of lakes and rivers, the Regional Council will carry out this responsibility through this Regional Policy Statement and through the development of objectives and policies in regional plans. It will not write regional rules for this purpose, **unless** any relevant regional objective or policy is not able to be achieved through rules in district plans.

Territorial authorities therefore have primary responsibility for writing rules for the control of the use of land (other than in the coastal marine area and the beds of lakes and rivers) for the avoidance or mitigation of natural hazards, but these rules must not be inconsistent with either the Regional Policy Statement or the relevant objectives and policies in a regional plan.

The responsibilities shown in table 11 apply **only** to the development of objectives, policies and rules for the control of the use of land for the avoidance or mitigation of natural hazards, and do not affect any other responsibilities set out in s. 30 and 31 of the Act.