

Notes for track changes. Recommendations made by the Air Officers Report are shown in **Blue**. Words recommended to be added are shown in underline, words recommended to be removed are shown in ~~strike-through~~.

## 10 Natural Hazards

### 10.1 Scope and Background

This chapter establishes an overall framework for natural hazard management under the ~~Resource Management Act 1991 (RMA)~~<sup>1</sup>. It also sets out the division of responsibilities between the Regional Council and Territorial Authorities for natural hazard management under the Act.

The Region is vulnerable to a number of natural hazards. The principal threat is from flooding. Other natural hazards include earthquakes, tsunami, volcanic ~~eruptions~~action and land subsidence<sup>1</sup> ~~and the of e~~ Climate<sup>1</sup> change ~~and erosion is likely to influence the frequency, scale or intensity of atmospherically influenced natural hazards such as flooding~~<sup>1</sup>. The vulnerability of the Manawatu-Wanganui Region to natural hazard events is increased because of human activity, such as:

- ~~Soil~~land<sup>1</sup> disturbance\* and vegetation clearance\*, particularly on hill slopes in the Hill Country Erosion Management Area<sup>1</sup>, which can increase the erosion risk and the amount of sediment in the flood channel, in turn increasing the intensity of and effects from floods and reducing the effectiveness of mitigation measures such as stop banks.
- the increasing number of people living in hazard-prone areas (including associated infrastructure\*) such as along the coast and adjacent to rivers, which increases the damage potential from natural hazard events, putting lives at risk. It can also reduce the effectiveness of existing mitigation measures such as stopbanks.

Most of the Regional Council's operational work on natural hazard management is carried out under the Soil Conservation and Rivers Control Act 1941, which provides for the establishment of river and drainage schemes. Emergency response, community readiness, ~~and~~<sup>1</sup> recovery planning, and research into natural hazard risks, is carried out under the Civil Defence and Emergency Management Act 2002. These roles are implemented through the Civil Defence and Emergency Management Group Plan rather than through the One Plan<sup>1</sup>. The role of the Regional Council and Territorial Authorities under the RMA is primarily one of risk reduction<sup>1</sup> to ensure that resource use activities do not exacerbate natural hazard risks or impede natural hazard mitigation works, ~~Therefore and by~~<sup>1</sup> ensuring that developments do not put people or property in places or circumstances of undue risk.

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<sup>1</sup> Recommendation NH2



The approach to managing natural hazards in this Plan is to:

- (a) set out a clear regional framework for natural hazard management
- (b) improve clarity around the respective roles of the Regional Council and Territorial Authorities under the Resource Management Act 1991
- (c) discourage future residential development and placement of critical infrastructure\* in areas prone to natural hazard events, particularly areas at high risk of flooding
- (d) continue to provide information to Territorial Authorities and the general public with regard to natural hazards.

### **Flooding**

Flooding occurs frequently in the Manawatu-Wanganui Region. The impacts of floods are mostly localised, but the likelihood of a major flood occurring in any year is high.

The February 2004 storm event caused widespread flooding. Recovery from that event will span many years. It showed only too well the problems that can arise from [the combination of a large storm event with](#)<sup>2</sup> vegetation clearance\* on hill slopes and from residential settlements and infrastructure on flood-prone or unstable land. The resulting sedimentation in waterways and erosion on land has impacted on infrastructure\*, people, land use and the natural environment.

Today over half of the Region's population lives on the floodplains of the major rivers. The establishment of river and drainage schemes (with the associated construction of stopbanks, floodgates, spillways and retention dams) has been an integral part of the development of the Region. Current schemes undergo regular review and assessments are undertaken for areas that could be included in these schemes or established as new schemes. More information on minimising the effects of erosion/flooding on the beds of rivers and lakes can be found in the Chapter 6.

### **Erosion**

Hillcountry erosion and coastal erosion are both of concern, as human activity has the potential to greatly increase erosion risk and associated impacts on people and property. Erosion is addressed in Chapter 5.

### **Other natural hazards**

Other natural hazards that occur less frequently include earthquakes, [volcanism/volcanic action, land subsidence](#)<sup>2</sup> and coastal environment hazards (including tsunami, storm surge and sea level rise hazards). Despite their low frequency, they have potential to put the Region at risk. ~~Factors such as climate change are likely to exacerbate the risk of climatic hazards.~~<sup>2</sup> Although little is known of the risks of these hazards, current research, such as Horizons' tsunami hazards study, will enable better future planning. [Due to limited knowledge of the influence climate change may have on some natural hazard events, a precautionary approach to establishing or intensifying land use activities in areas potentially subject to natural hazards is required.](#)<sup>2</sup> Potential impacts will continue to be dealt with by contingency planning, such as the regional civil defence response team and insurance schemes, until further research can be undertaken.

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<sup>2</sup> Recommendation NH2



## 10.2 Significant Resource Management Issue

### Issue 10-1: Effects of natural hazard events

Natural hazard events can adversely affect people, [including their social, economic and cultural well-being, and the natural and physical resources they rely on, such as property](#)<sup>3</sup> and infrastructure\*. In particular:

- (a) development can exacerbate the risks from natural hazards, particularly flooding and coastal hazards, by placing more people, property and infrastructure\* in hazard-prone areas and by reducing the effectiveness of existing hazard mitigation measures such as stop banks
- (b) climate change is likely to cause the hydrological cycle to become more extreme resulting in an increase in the intensity and frequency of hazards such as droughts, heavy rainfall, cyclones and storm surges. ~~Predicted sea level rise\* is likely to increase the risk of inundation and damage to communities and infrastructure\* in coastal areas during natural hazard events.~~
- (c) [predicted sea level rise\\* is likely to increase the risk of inundation and damage to communities and infrastructure\\* in coastal areas during natural hazard events.](#)<sup>4</sup>

## 10.3 Objective

### Objective 10-1: Effects of natural hazard events

The adverse effects of natural hazard events on people, property, [infrastructure\\*](#) [and](#)<sup>4</sup> the [economic](#)<sup>4</sup> well being of communities [and infrastructure\\*](#)<sup>4</sup> are avoided or mitigated.

[This Objective relates to Issue 10-1](#)<sup>4</sup>

#### **Whāinga 10-1: Ngā pānga o ngā mea mōrearea o te ao tūroa**

*Ka parea, ka whakangāwaritia ngā pānga kōaro o ngā mea mōrearea o te ao tūroa ki te tangata, ngā rawa, me te oranga ōhanga o ngā hapori me ngā kaupapa o raro.*

## 10.4 Policies

### Policy 10-1: Responsibilities for natural hazard management

In accordance with s 62(1)(i) RMA, local authority responsibilities for natural hazard management in the Manawatu-Wanganui Region are as follows:

- (a) The Regional Council and Territorial Authorities shall be jointly responsible for:
  - (i) raising public awareness of the risks of natural hazards through education, including information about what natural hazards exist in the Region, what people can do to minimise their own level of risk, and what help is available.
- (b) The Regional Council shall be responsible for:

<sup>3</sup> Recommendation NH3

<sup>4</sup> Recommendation NH3



- (i) developing objectives and policies for region-wide management of activities for the purpose of avoiding or mitigating natural hazards
  - (ii) developing specific objectives, policies and methods (including rules) for the control of:
    - (A) all land-use activities in the coastal marine area
    - (B) erosion protection works that cross or adjoin mean high water spring
    - (C) all land-use activities in the beds of rivers and lakes for the purpose of avoiding or mitigating natural hazards
  - (iii) taking the lead role in collecting, analysing, and storing regional natural hazard information and communicating this information to Territorial Authorities.
- (c) Territorial Authorities shall be responsible for:
- (i) developing objectives, policies, and methods (including rules) for the control of the use of land to avoid or mitigate natural hazards in all areas and for all activities except those areas and activities described in (b)(ii) above, including
  - (ii) identifying floodways (as shown in Schedule I) and other areas known to be inundated by a 0.5% annual exceedence probability flood event [on planning maps](#)<sup>5</sup> in [District Plans](#), and controlling land-use activities in these areas in accordance with Policies 10-2, 10-3 and 10-54<sup>6</sup>.

[This Policy relates to Issue 10-1 and Objective 10-1](#)<sup>6</sup>

### **Policy 10-2: Development in [floodways and other](#)<sup>7</sup> areas prone to flooding**

- [\(a\) The Regional Council and Territorial Authorities shall prevent the establishment of any new structure or activity, or an increase in the scale of any existing structure or activity, within a floodway\\* mapped in Schedule I unless](#)
- [\(i\) It is necessary to locate the structure or activity within such an area owing to functional constraints—](#)  
in which case the structure or activity may be allowed.
- [\(b\) the Regional Council and Territorial Authorities shall prevent the establishment of any new structure or activity, or an increase in the scale of any existing structure or activity, within any other area likely to be inundated by a 0.5% annual exceedence probability flood event unless either—](#)
- [\(i\) It is necessary to locate the structure or activity within such an area owing to functional constraints; or](#)
  - [\(ii\) the residual inundation\\* of land within a privately owned property\\* or on a road will be no deeper than 0.5m above finished ground level with a maximum water velocity of 1m/s, or some other combination of water depth and velocity that can be shown to result in no greater risk to human life, infrastructure or property—](#)  
in which case the structure or activity may be allowed.
- [\(c\) in circumstances where a structure or activity is allowed in accordance with clause \(a\) or clause \(b\), the following effects shall be avoided or mitigated:](#)
- [\(i\) any increase in risk to human life, infrastructure or property, except where these effects are adequately avoided or mitigated by managing the residual inundation\\* in accordance with clause \(b\)\(ii\); and](#)

<sup>5</sup> Recommendation NH5

<sup>6</sup> Recommendation NH5

<sup>7</sup> Recommendation NH6



- (ii) any increase in flood risk; and
- (iii) any reduction in the effectiveness of existing works or structures, including works and structures within River and Drainage Schemes, or natural landforms for avoiding or mitigating the effects of flood hazard events.

(d) This Policy does not apply to new critical infrastructure\*.

This Policy relates to Issue 10-1 and Objective 10-1<sup>7</sup>

- ~~(a) — **Floodways** — The function of floodways, as mapped in Schedule I, shall be maintained by generally not allowing any new development or any increase in the scale of existing development within the mapped areas, except as provided for by Policy 10-3.~~
- ~~(b) — **Floodable areas** — In other areas likely to be inundated by a 0.5% annual exceedence probability flood event (including those floodable areas mapped in Schedule I), any new development and any increase in the scale of existing development, including any increase in the number of dwelling houses, shall be avoided unless it can be shown that the activity will not cause any of the following effects, after taking into account both individual and cumulative effects:
 
  - ~~(i) — increased risks to human life~~
  - ~~(ii) — increased risks to infrastructure\* or the property of another person~~
  - ~~(iii) — a restriction or diversion of flow that is likely to cause a reduction in the effectiveness of existing works and structures, or natural landforms, which serve to mitigate the effects of flood hazards, or any other significant increase in flood risk~~
  - ~~(iv) — a reduction in any other way of the effectiveness of existing works, structures, natural landforms or other measures which serve to mitigate the effects of flooding, including structures in river and drainage schemes~~~~

~~except as provided for by Policy 10-3.~~

### ~~**Policy 10-3: Activities that need to be located in areas prone to flooding**~~

~~An exception to Policy 10-2 may be made for structures and activities that cannot be located outside floodways and other areas likely to be inundated by a 0.5% annual exceedence probability flood event because of functional constraints, provided any adverse effects are avoided or mitigated.<sup>8</sup>~~

### ~~**Policy 10-4: New Critical<sup>9</sup> infrastructure**~~

- ~~(a) The Regional Council and Territorial Authorities shall prevent the establishment. The placement<sup>9</sup> of new critical infrastructure\* within<sup>9</sup> an area likely to be affected by a natural hazard event, including the floodways\* mapped in Schedule I and other areas likely to be <sup>9</sup>inundated by a 0.5% annual exceedence probability flood event (including floodways mapped in Schedule I), or in an area likely to be affected by another type of natural hazard, shall be avoided unless there is no reasonable alternative. <sup>9</sup>~~

<sup>8</sup> Recommendation NH7

<sup>9</sup> Recommendation NH8



- (i) it is necessary to locate the critical infrastructure\* within such an area owing to functional constraints; and
- (ii) the critical infrastructure\* is designed so that the adverse effects of the natural hazard event on the critical infrastructure\* are avoided or mitigated—

in which case the critical infrastructure\* may be allowed.

(b) In circumstances where critical infrastructure\* is allowed in accordance with clause (a), the following effects shall be avoided or mitigated:

- (i) any restriction to flood flows and any consequential increase in upstream flood levels or flow velocities; and
- (ii) any change in the course of flood flows; and
- (iii) any entrapment of flood debris; and
- (iv) any increase in erosion or scouring during flood events; and
- (v) any effect arising from a failure of the infrastructure\* in the vicinity or, in the case of flooding, downstream where it may cause or exacerbate a debris blockage.

This Policy related to Issue 10-1 and Objective 10-1<sup>10</sup>

#### **Policy 10-5: Other types of natural hazards**

The Regional Council and Territorial Authorities shall manage Ffuture<sup>11</sup> development and activities in areas susceptible to natural hazard events (excluding flooding) shall be managed<sup>11</sup> in a manner which:

- (a) ensures that any increase in risk to human life, property or infrastructure\* from natural hazard events is avoided where practicable, or mitigated where the risk cannot be practicably avoided
- (b) is unlikely to reduce the effectiveness of existing works, structures, natural landforms or other measures which serve to mitigate the effects of natural hazard events
- (c) is unlikely to cause a significant increase in the scale or intensity of natural hazard events.

This Policy relates to Issue 10-1 and Objective 10-1<sup>11</sup>

#### **Policy 10-6: Climate change**

The Regional Council and Territorial Authorities shall take Aa<sup>12</sup> precautionary approach shall be taken<sup>12</sup> for managing the effects of climate change and sea level rise\*, and any associated changes to the scale and frequency of natural hazards, in particular for:

- (a) stormwater discharges and effluent disposal
- (b) coastal development and coastal land use
- (c) activities adjacent to rivers and streams
- (d) water allocation and water takes
- (e) activities on or near ~~unsustainable~~<sup>12</sup> hill country, and<sup>12</sup>

<sup>10</sup> Recommendation NH8

<sup>11</sup> Recommendation NH9



- (f) flood mitigation ~~efforts activities, and~~<sup>12</sup>  
~~(g) storm surge.~~<sup>12</sup>

This Policy relates to Issue 10-1 and Objective 10-1<sup>12</sup>

## 10.5

### Methods

~~The Regional Council is managing the environmental impacts of natural hazards from the following non-regulatory approach:~~

The following are non-regulatory Methods to implement the Policies of Chapter 10:<sup>13</sup>

Project Name <u>Method 10-1</u> <sup>14</sup>	Hazards Research
<u>Project</u> <sup>14</sup> Description	This <u>project/Method</u> <sup>14</sup> provides for the investigation, identification and mapping of those parts of the Region that are at risk from natural hazards, including seismic, volcanic, subsidence, tsunami flooding and coastal erosion hazards. <u>It includes</u> <sup>14</sup> consideration of sea level rise* and climate change implications on those hazards.  This information will be provided to Territorial Authorities for district planning purposes and to other interested parties, and maps will be updated as required.
Who	Civil Defence and Emergency Management Group, Regional Council, Territorial Authorities and research institutes.
Links to Policy	This <u>project links to Method implements</u> <sup>14</sup> Policies 10-1, 10- <del>54</del> and 10- <del>75</del> .
Target	Hazards are mapped by 2010 and updated regularly as required.

Project Name <u>Method 10-2</u> <sup>15</sup>	Floodable Areas Research
<u>Project</u> <sup>15</sup> Description	A region-wide study of floodable areas <u>, which incorporates climate change influences,</u> <sup>15</sup> will be carried out to update flood maps and information in order to assist Territorial Authorities in the development of district plans, and the Regional Council's advice service.
Who	Civil Defence and Emergency Management Group, Regional Council, and research institutes.
Links to Policy	This <u>project links to Method implements</u> <sup>15</sup> Policies <u>10-1,</u> 10-2, 10-3, 10-4 and 10- <del>65</del> . <sup>15</sup>
Target	Hazards are mapped by 2010 and updated as required.

Project Name <u>Method 10-3</u> <sup>16</sup>	Natural Hazard Information and Advice
<u>Project</u> <sup>16</sup> Description	The Regional Council will provide Territorial Authorities and other interested

<sup>12</sup> Recommendation NH10

<sup>13</sup> Recommendation NH11

<sup>14</sup> Recommendation NH11

<sup>15</sup> Recommendation NH12

<sup>16</sup> Recommendation NH13



Project Name <u>Method 10-3</u> <sup>16</sup>	Natural Hazard Information and Advice
	parties with up-to-date natural hazard information to assist in the assessment of land development <a href="#">resource consents applications</a> , <sup>16</sup> particularly subdivisions.
Who	Regional Council.
Links to Policy	This <a href="#">project links to Method implements</a> <sup>16</sup> Policies 10-1, 10-2, 10-3, 10-4, <a href="#">and 10-5, 10-6 and 10-7</a> . <sup>16</sup>
Target	Ongoing advice to Territorial Authorities and other interested parties.

Project Name <u>Method 10-4</u> <sup>17</sup>	Public Information – Natural Hazards
<a href="#">Project Description</a> <sup>17</sup>	Easily accessible information will be developed and provided to increase public awareness of the risks of natural hazards, including seismic, volcanic, subsidence, tsunami, flooding, <a href="#">and</a> <sup>17</sup> coastal erosion, <del>and climate change hazards,</del> <a href="#">and the effects of climate change</a> . <sup>17</sup>  Up-to-date natural hazard information will be provided to the general public and other interested parties (for example, advance warning flood and lahar systems and civil defence literature), together with advice on appropriate options for avoiding or mitigating natural hazards.
Who	Civil Defence and Emergency Management Group, Regional Council, Territorial Authorities, research institutes and other relevant agencies.
Links to Policy	This <a href="#">project links to Method implements</a> <sup>18</sup> Policies 10-1, 10-2, 10-3, 10-4, <a href="#">and 10-5, 10-6 and 10-7</a> . <sup>18</sup>
Target	Information provided via website and available in paper form by 2010.

## 10.6 Anticipated Environmental Results

Anticipated Environmental Result	Links to Policies and Methods <sup>19</sup>	Indicator	Data Source
By 2017, the risk to people, property and critical infrastructure will be the same as or less than before this Plan became operative.	Natural Hazards Policies: 10-1, 10-2, 10-3, <a href="#">10-4, and 10-5 and 10-4</a> . <sup>19</sup>  <a href="#">Methods: 10-1, 10-2 and 10-3</a> <sup>19</sup>  Land Policies: 5-1, 5-2, 5-3 and 5-5  Water Policies: 6-29, 6-31, 6-33 and 6-34	<ul style="list-style-type: none"> <li>• Number of new dwelling houses in floodable areas consistent with Policy 10-2</li> <li>• Number of incidents where activities are affecting schemes, especially stop-banks</li> <li>• Natural hazard information shared with Territorial Authorities and interested parties</li> <li>• <a href="#">District plans incorporating hazardous areas on planning maps and associated regulation of land use in</a></li> </ul>	<ul style="list-style-type: none"> <li>• Territorial Authorities</li> <li>• Operations group maintenance records</li> <li>• Compliance database</li> <li>• Incidents database</li> </ul>

<sup>17</sup> Recommendation NH14

<sup>18</sup> Recommendation NH14

<sup>19</sup> Recommendation NH15





		<a href="#">those areas</a> . <sup>19</sup>	
By 2017, people will be more aware of the risks of natural hazards in the Region and how to <a href="#">prepare for and cope</a> with them than they were before this Plan became operative.	Natural Hazards Policies: <sup>20</sup> 10-1, 10-2, <a href="#">10-3</a> and <a href="#">10-3-4</a> . <sup>20</sup> Methods: <a href="#">10-1</a> , <a href="#">10-2</a> , <a href="#">10-3</a> and <a href="#">10-4</a> . <sup>20</sup>	<ul style="list-style-type: none"> <li>• Public perception</li> <li>• Number of requests for information</li> </ul>	<ul style="list-style-type: none"> <li>• Customer surveys</li> <li>• SED database</li> </ul>

## 10.7 Explanations and Principal Reasons

Objective 10-1, Policies 10-1 to 10-6 and the methods above set out a regional framework for avoiding or mitigating the adverse effects of natural hazard events on communities, infrastructure\* and the natural environment.

Policy 10-1 clarifies the respective roles of the Regional Council and Territorial Authorities as required by s62 RMA. Policy 10-1 largely continues the delineation of responsibilities under the former Regional Policy Statement. The Regional Council has taken on the role of setting a regional framework for natural hazard management, while allowing decisions on most land-use activities to be made by Territorial Authorities.

Policy 10-2 targets floodways and floodable areas, as flooding is the most significant natural hazard in the Region. Floodable areas are defined as those areas that would be inundated by a 0.5% annual exceedence probability flood event. This is a change from the previously used standard for delineating floodable areas of a 1% annual exceedence probability flood event, in order to take into account the likely effects of climate change. Policy 10-2 generally seeks to avoid residential development and other new activities in areas likely to be affected by flooding, due to the risks to human life and property. It is recognised, however, that some activities have a functional constraint to be located in floodable areas (Policy 10-[32](#))<sup>21</sup>, or that measures, [taking into account residual risk](#)<sup>21</sup> for dwellings and other activities, (for example, access outside of floodable area and building design) can be put in place to avoid any increase in impacts of floods (Policy 10-2).

Policy 10-[54](#)<sup>21</sup> sets up the general management regime for other types of natural hazards. Hazard avoidance is preferred to hazard mitigation because of the impacts on human life, property and infrastructure\*. Avoiding all hazards is difficult, however, because of their infrequency and the widespread nature of their effects.

Policies 10-2, 10-3 and 10-[54](#)<sup>21</sup> also include provisions seeking to ensure that the effectiveness of existing hazard mitigation measures is not undermined by future activities.

Policy 10-[43](#)<sup>21</sup> seeks to ensure that critical infrastructure\* is not disabled by natural hazard events, by avoiding the placement of critical infrastructure in areas prone to natural hazards. The policy recognises that in some cases this is unavoidable – for example, roading and gas supplies in coastal area regardless of tsunami risk, and infrastructure in settlements located on liquefaction zones.

Policy 10-[65](#)<sup>21</sup> seeks to ensure that the implications of climate change are considered as appropriate.

<sup>20</sup> Recommendation NH16

<sup>21</sup> Recommendation NH17

