16 NATURAL HAZARDS

Summary

RPS objective

- To avoid or mitigate the adverse effects of natural hazards by minimising and where practicable, avoiding the risk to life and damage to property, infrastructural services and other aspects of the environment, from natural hazard events.

Natural hazards affecting Northland

- Flooding and other weather-related hazards are the most widespread and common natural hazards in Northland. Otherwise the levels of natural hazards that Northland region is exposed to are relatively low.
- Of the weather-related hazards, Northland is more frequently at risk from severe convection storms generated by warm moist air masses, some being ex-tropical cyclones, which produce heavy rain and sometimes strong winds.
- Of the other potential natural hazards, landslide and debris avalanches are the most significant for Northland.

Response

- A broad scale review of natural hazards facing the region and more detailed coastal hazard assessments have been completed.
- Flooding hazard assessments have been carried out for some rivers, such as the Awanui River. However, this work is ongoing and there is a substantial amount of detailed survey and modelling work still to be done throughout the region, so that the Regional and District Councils and communities can better understand flood risks and in turn assess risk reduction options.
- Development and implementation of the Awanui River Flood Management Plan, including significant channel works to restore the capacity of the scheme, hydraulic modelling, and installation of telemetry water level and rainfall gauges to provide a better warning system.
- The Regional Council operates a hydrometric network, which includes 54 telemetered sites throughout Northland. These sites provide real-time data, which is used to monitor river levels and provide flood warnings where possible, during periods of extreme rainfall.
- The Northland Civil Defence Emergency Management (CDEM) Group is working well towards reducing the potential effects of hazards and promoting community and Council readiness to respond to and recover from emergencies.

- Working with communities to develop community response plans to ensure that communities collectively understand how they will manage in any future event that threatens the community, particularly by identifying roles, responsibilities and resources before an event occurs. Approximately 40 communities in Northland would benefit from a community response plan, for which about half have been started or completed.

16.1 Introduction

Northland is subject to a number of natural events, which, because of the pattern of development within the region, may place human life, property and/or economic production at risk.

Natural hazards include flooding and other weather hazards, earthquakes, landslides, mine subsidence, fire, tsunami and volcanic activity. Natural hazards that occur in the coastal environment are covered in the coastal hazards chapter.

Regional Policy Statement objective

The Regional Policy Statement (NRC 2002) contains the following objective:

- To avoid or mitigate the adverse effects of natural hazards by minimising and where practicable, avoiding the risk to life and damage to property, infrastructural services and other aspects of the environment, from natural hazard events.

Environmental results anticipated

The following is the anticipated environmental results after the implementation of the natural hazards policies in the Regional Policy Statement:

- Increased public awareness of the risks of natural hazards and their exposure to them.
- A reduction in the damage caused to the environment by significant natural hazards.
- A reduction in the damage caused to the environment by inappropriate protection works.

16.2 Natural Hazards affecting Northland

The types and extent of natural hazards that could potentially affect Northland has not changed in the last five years. A summary of the main natural hazards that could affect Northland is included below. For more detailed information refer to the natural hazards chapter of the 2002 State of the Environment (SOE) Report (NRC 2002), available on the Regional Council website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Environmental-Monitoring/State-of-the-Environment-Monitoring/2002-State-of-the-Environment-Report/

Since the 2002 SOE report there has been a review of the information available on natural hazards for Northland. From this review three reports on coastal, weather and natural hazards have been produced and are available on the Regional Council website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Hazards/

This review found that Northland's level of exposure to natural hazards is relatively low, except for flooding and climatic events related to ex-tropical cyclones and severe convection storms (Gray 2003). Landslides are the most significant of the other potential natural hazards identified. Others include volcanic, earthquake, tsunami and mine subsidence hazards (Beetham et al. 2004).

Weather hazards

Ex-tropical cyclones have the potential to cause damage through extreme winds and heavy rain such as in cyclones Bola and Fergus (Gray 2003). Northland has, on average, one ex-tropical cyclone pass nearby every year, putting it more at risk from ex-tropical storms than the rest of New Zealand.

Severe convection storms tend to cause localised damage but they can catch communities unaware as the events are often not well forecast (Gray 2003). They can also be widespread, causing regional flooding such as what occurred on 27 March 2003 and twice in 2007.

The main risks associated with weather hazards are flooding from intense rainfall, which is covered in the surface water quantity chapter, and storm surges (coastal inundation), which is covered in the coastal hazards chapter.

Flooding

Flooding is the most common risk to Northland, threatening human life, disrupting communications and access, damaging property and reducing primary production. There is detailed information on flooding and the environmental effects of flooding in the 2002 SOE report.

Northland was hit with two significant storm events in 2007, causing severe flooding throughout the region. The first was in March and the second was in July. For more information on these floods refer to Case Study 1: Flood event 29 March 2007 in the surface water quantity chapter or the detailed NIWA and MetService reports available on the Regional Council website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Research-and-reports/Natural-hazards/

Coastal hazards

A tsunami is a natural phenomenon that results when a large volume of water is displaced causing a series of waves to be generated, most commonly due to earthquakes causing sea floor displacement. Tsunamis can devastate coastal communities causing inundation, strong currents, contamination and other effects.

The post-historic record shows that New Zealand has been affected by more than 40 tsunami in the last 150 years. Four moderate tsunami inundation events have impacted on Northland's east coast in the last 150 years. The prehistoric record indicates at least one large event, or a series of large closely-spaced events, have affected Northland's coast in the last 600 years, plus others.

Tsunami hazard is considered a significant risk for Northland, especially among coastal communities. A generalised tsunami hazard-risk model for Northland indicates that a moderate hazard and risk exists for most of the northwest and east coast, a high hazard and moderate risk for the north, and a low hazard and risk for the west. The hazard is largely a function of tsunami source, intensity and return period. For more information, refer to the coastal hazards chapter of this report.

Fire

Wildfires are generally seen as a greater threat in other parts of New Zealand but they are a growing problem in Northland. From June 2001 to June 2006 the number of wildfires attended by Northland's Fire Brigades and Rural Fire Forces increased from 265 to 411, a 55% increase. There are a number of possible factors contributing to this increase, including a growing population along with supporting buildings and infrastructure, an increase in malicious fire starts and drier weather patterns.

The east coast of Northland from North Cape to Mangawhai is particularly vulnerable due to the predominant vegetation types, larger and denser population and the traditionally lower rainfall. Also of particular significance are the Pouto, Aupouri and Karikari Peninsulas with large amounts of flammable vegetation – such as mānuka, gorse and exotic pine forests – lower rainfall and growing populations.

Land instability

Landslides can be a threat to life and property, with one fatality in Dargaville in 1998 and significant damage to property every year. In Northland the dominant trigger is intense or prolonged rainfall which initiates many landslides annually (Beetham et al. 2004). Earthquake-induced landslides represent less than 1% of the total landslide damage occurring in Northland.

There have been 17 significant (newsworthy) landslides in Northland between 1996 and 2003 (Beetham et al. 2004). These have resulted in one death, evacuation of houses and hundreds of thousands of dollars damage. There are four main types of landslide hazards in Northland: Debris avalanche, earth flows, greywacke slips and unstable mudstone. For more information on land instability, refer to the land and soils chapter.

Volcanic

There are two areas of past local volcanic activity in Northland, one the Puhipuhi-Whangarei area and the other the Kaikohe-Bay of Islands area. Eruption centres of the Puhipuhi-Whangarei volcanic field are spread across the Whangarei District. The most recent eruptions in this field occurred more than 250,000 years ago and there is some doubt as to whether or not it should be considered active. The Kaikohe-Bay of Islands field may have been re-activated in late Quaternary times (up to 700,000 years ago) and could be considered as still active. An eruption from either of these Northland volcanic fields is likely to produce lava flows, scoria and ash fall.

The other volcanic hazard for Northland to consider is the effects of ash fall from a distant volcano, with the main threat being renewed activity within the Taupo Volcanic Zone and/or Taranaki volcano. There are several impacts from ash fall even when it is less than 1 mm thick such as irritation to lungs and eyes, visibility hazard (leading to airport closures) and possible contamination of water supplies.

Mine subsidence

Mine subsidence is included as a natural hazard event though it is clearly caused by human activity. Coal has been mined at several places in Northland Region, mainly at Kamo, Kiripaka, Hikurangi, Kawakawa and Avoca (near Dargaville) coalfields. The risk of surface subsidence due to historical underground coal mining is recognised and well studied at Kamo and Hikurangi but not at the other areas. The most significant risk is the sudden collapse of an old mine shaft. There is evidence of such collapsing near Kawakawa.

Earthquakes (Seismic hazard)

Earthquake risk in Northland is low with no active faults mapped and generally regarded as tectonically stable (Beetham et al. 2004). There have been about 12 earthquakes in the Northland region over the last 100 years, all of a Richter magnitude of less than five. There is a proven risk of small earthquakes that have caused slight damage in Northland. However the risk is lower than the rest of New Zealand (Beetham et al. 2004).

There is an estimated mean return period of 1000 years for an earthquake of six on the Modified Mercalli (MM) scale of intensities and 7000 years for an earthquake of seven on the MM scale in Whangarei, compared with nine and 42 years respectively for Wellington (Beetham et al. 2004). Intensities of six or more are those which may cause damage to some buildings.

16.3 What is being done?

Currently civil defence emergency management in New Zealand follows the four "R" framework of 'Reduction, Readiness, Response and Recovery'. The Regional and District Councils, other organisations and communities in Northland are carrying out the following in line with the four "R" framework:

Reduction

A broad scale review of natural hazards facing the region has been done. The resulting reports are available on the Councils website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Hazards/

There has been several detailed coastal hazard assessments completed in the last 20 years. See the coastal hazard chapter for more information.

Flooding hazard assessments have been carried out for some rivers such as the Awanui River. This work is ongoing, with a substantial amount of detailed river survey and modelling work still to be done to accurately identify the risks of flooding hazards in Northland. This information can then be used by the Regional and District Councils and communities to better understand flood risks and in turn assess risk reduction options.

Flooding

Flooding is the most common hazard in Northland, with several settlements and important farming areas located in flood plains. The Northland River Management Policy (NRC 2006) provides an integrated approach to flood hazard management, including:

- Hazard identification and risk assessment:
- Risk avoidance by controlling development on flood-prone land, or authorising only development that can withstand flooding;
- Risk reduction by undertaking flood mitigation works;
- Site and event-specific emergency management plans to assist communities to cope with greater-than-design events;
- Disaster recovery plans for communities that are at risk.

Under the River Management Policy, the Regional Council is actively involved in a number of river management schemes to reduce the incidence, frequency and duration of flooding, particularly where human life and property is at risk. To view the Northland River Management Policy on the Regional Council website click on the following link:

http://www.nrc.govt.nz/upload/4180/Northland%20River%20Management%20Policy%20(web).pdf

The Awanui River Flood Management Scheme became the Regional Council's responsibility in 2005. After extensive consultation the Awanui River Flood Management Plan was formally adopted by the Council in April 2005. For more information on the Awanui River Flood Management Scheme and Plan, refer to case study 1.

During 2006, the Council also assumed responsibility for management of the Kaihu River. After extensive consultation, the Interim Kaihu River Management Plan was formally adopted on 18 October 2006. The Interim Kaihu River Management Plan is available on the Regional Council website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Hazards/

Draft River Management Plans have also been prepared for Waima, Waimamaku and Mangakahia Rivers, and Otaika and Mangatara Streams (Otaua). These Draft Plans have not yet gone through a public consultation process or been finally adopted by the Council. However, these waterways are currently being managed according to these Draft Plans.

The NRC operates a hydrometric network consisting of 60 sites throughout Northland, which collect continuous river level or rainfall data. Of these 60 sites, 54 are part of a telemetry system, which provide a real-time picture of the state of the region's water resources. During periods of extreme rainfall, the telemetered sites play an important role, in monitoring river levels and providing flood warnings, where possible. The network also includes a telemetered tidal station at Marsden Point, which is part of the Pacific Rim tsunami-monitoring network.

For more information on the Regional Council hydrometric network refer to the surface water quantity chapter.

Coastal hazards

The Regional Council has carried out several coastal hazard assessments over the last 20 years to determine coastal hazard zones. Coastal hazard zones are included in District Plans, which enable the District Councils to avoid or mitigate inappropriate development in areas subject to coastal hazards. For more information, refer to the coastal hazards chapter of this report.

Fire

The whole of Northland is provided with firefighting cover by one paid Fire Brigade, 27 Volunteer Fire Brigades, two Rural Fire Parties and 20 Rural Fire Forces along with additional firefighting capability maintained by the Territorial Authorities, the Department of Conservation and major forestry companies. These organisations work alongside each other to ensure that there are sufficient trained personnel and adequate equipment available to suppress any wildfires that may start. These authorities also work together to monitor the weather and the fire indices and regulate fire seasons by putting fire restrictions in place when deemed necessary.

Land instability

In most cases, the best way to avoid land instability is to identify the areas at risk and then avoid siting buildings and infrastructure in these areas.

Mine subsidence

There has been extensive mine subsidence assessment carried out for the old Kamo coal mine and the Hikurangi coal field. The Whangarei District Plan recognises mining subsidence as a natural hazard in mined areas, has requirements that must be met before a new building can be approved for construction and zones the mine subsidence hazard areas (Beetham et al. 2004).

Readiness

The Civil Defence Emergency Management Act 2002 sets out how civil defence should be managed around New Zealand. The Northland Civil Defence Emergency Management Group is legally required under the Act to develop and implement plans to reduce the risks associated with hazards.

Civil Defence Emergency Management Group

In Northland, the Civil Defence Emergency Management (CDEM) Group is a partnership between the local authorities of the region together with the emergency services and other agencies, formed to ensure the effective delivery of civil defence. Political representatives sit on the CDEM Group which is effectively a governance body. The CDEM Group works together to:

- Reduce the potential effects of hazards.
- Promote community and Council readiness (preparedness) and ability to respond to emergencies.
- Help the community to recover after an event.

More information on the CDEM Group and its sub-groups is available on the Regional Council website at the following link:

http://www.nrc.govt.nz/civildefence/Civil-Defence-Emergency-Management-Group/

Training and exercises

The CDEM Group is responsible for ensuring the provision and coordination of training. In recent years the focus for training has been on Coordinated Incident Management Systems (CIMS), which is recognised nationally as the standard operating procedure when agencies work together to respond to a major incident. Every year more than 100 people from a variety of emergency response organisations across the region participate in the CIMS training.

The group also coordinates and provides other specialist training courses for controllers, recovery managers and other specialists and participates in regular local, regional and national exercises. For example in early 2008 the Northland CDEM Group was to be involved in responding to a national emergency scenario centred on a volcanic hazard in the Auckland region.

Northland Civil Defence Emergency Plan

The Northland CDEM Group has prepared the Northland Civil Defence Emergency Management Group Plan, which provides the context and strategic direction for civil defence emergency management in the region. This plan includes a process for:

- The identification of hazards.
- Risk reduction or avoidance.
- Readiness for major hazard events.
- An ability to respond.
- After the event, an ability for affected communities to recover.

This plan can be viewed on the Regional Council website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Civil-Defence/

Response

In the event of a civil defence emergency, the Northland Regional Council has the responsibility for providing the Northland CDEM Group Emergency Operations Centre (GEOC) in Whangarei. The GEOC coordinates the regional civil defence emergency response and may be activated to monitor a potential emergency or to respond to or recover from an emergency situation that is occurring or has occurred. The photograph (right) shows staff in the GEOC during the March 2007 flooding event.

A major role of the GEOC is the collation and dissemination of important information such as areas affected and damage to infrastructure, including road closures, power and telecommunications outages, disruption to water supplies and planning for the recovery phase. The following link is an example of the information made available through the Regional Council website during the July 2007 storm:

http://www.nrc.govt.nz/civildefence/Weather-warning/

Each of the District Councils also may activate and operate an Emergency Operations Centre to provide direct coordination and control of civil defence operations within their District.

Recovery

The CDEM Group also helps the community to recover from natural hazard events. The process of recovery is to re-establish the quality of life of the community following an emergency. Recovery starts as soon as possible in the local community and addresses the social, economic, natural and built environment.

There was severe damage to agricultural and horticultural land, homes and infrastructure following the March and July 2007 floods. The Council, together with other organisations, assisted recovery by meeting with community groups, seeking financial support from central government and coordinating recovery activities such as the clean-up work of the Enhanced Task Force Green crews.

16.4 Where to from here?

The following are key areas to reduce and manage the risks associated with natural hazards in Northland:

- Continue with River Management Plan development and implementation as set out in the Long Term Community Council Plan (NRC 2006).

- Prioritise flood and erosion management for all river and significant stream catchments in Northland. Assess factors such as threats to human life, buildings, access, infrastructure and farming for each of the identified waterways, and give them suitable weighting to be able to establish a final ranking for the prioritisation of river management work in Northland. This prioritised ranking will be presented to the Environmental Management Committee of the Regional Council and will be made available to the public for comment in 2008.

- Collection and storage of landslide and meteorological data to enable accurate identification of the landslide hazard and associated risk in Northland.

- Further work to improve volcanic hazard assessment in Northland such as age testing of Northland volcanic fields.

- Evaluation of the current status of all mine shafts and drives, with their locations marked in District Plans. The risk of mine subsidence in other areas of Northland other than Kamo and Hikurangi needs to be carried out.

- Work with communities to develop community response plans to ensure that communities collectively understand how they will manage in any future event, particularly by identifying roles, responsibilities and resources before an event occurs. Approximately 40 communities in Northland would benefit from a community response plan, for which about half have been started or completed. Effort will be placed on finishing the community response plans for all communities that have been identified as benefiting from one.

16.5 What can you do to help?

Be prepared

There are four key steps (R's) to help you be prepared: Reduction, Readiness, Response and Recovery. Refer to the following Regional Council webpage for more information:

http://www.nrc.govt.nz/civildefence/Be-prepared/Practical-steps-to-help-you-be-prepared/

While organisations can help in an emergency, individuals are ultimately responsible for protecting themselves and their property from the effects of disasters. For more information refer to the following link on the Regional Council website:

http://www.nrc.govt.nz/civildefence/Be-prepared/

Or refer to the information on the Ministry of Civil Defence's "Get Ready, Get Thru" website at the following link:

www.getthru.govt.nz

Text message alerts

Northlanders can now be warned of impending flood, tsunami or other civil defence emergencies via text message. More information is available on the Regional Council website at the following link:

http://www.nrc.govt.nz/civildefence/Text-message-alerts/

Be aware

You should be aware of any hazard zones when purchasing or developing property. Check in District Plans and on LIM, Engineers' and Building reports for hazard zones and maps, risk of mass land movements and flood areas.

16.6 Case study 1 – Awanui River Flood Management Plan

The Awanui River Flood Management Plan has been developed over many years. Works in the early 1900s focused on bringing land near the harbour into production by preventing tidal flooding by salt water. Stopbanks and floodgates gradually extended upstream to provide flood management for more productive floodplain land. The flood of 1958, which flowed through urban Kaitaia, prompted a comprehensive upgrade to the scheme. Stopbanks were constructed around Kaitaia and the Whangatane Spillway was enlarged.

In 2005 the responsibility for the scheme shifted from the Far North District Council to NRC. At this time, the flood control scheme provided protection to the urban areas of Kaitaia and Awanui from an estimated one in 30-year flood.

After extensive consultation, the Awanui River Flood Management Plan was formally adopted by the Council in April 2005. This Plan is available on the Regional Council website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Hazards/

As part of this Plan, the Council intends to restore the scheme to its “as built” (1976) state over the next six years, restoring flood protection levels to a one in 100-year flood for the urban areas of Kaitaia and Awanui, and to a one in 20-year flood for the rural areas downstream of Kaitaia.

Since then, significant channel works have been undertaken to increase the capacity of the scheme, hydraulic modelling of the scheme has commenced, and telemetry water level and rainfall gauges have been installed to provide a better warning system for events affecting the scheme.

Large areas of highly productive land and the Kaitaia and Awanui townships now benefit from a significant level of reduction to the flood hazard present on the Awanui River flood plain.

For more information on the Awanui River Flood Management Scheme, refer to Case Study 2 in the surface water quantity chapter.

16.7 References

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http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Hazards/

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