7 COASTAL 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.

Pressures

- Existing coastal development with inadequate provisions for mitigation of natural hazards resulting in the modification of natural coastal systems and increased natural hazard pressures.
- Development intensification, subdivision and redevelopment within areas subject to coastal hazards.
- Modification to natural coastal systems, such as dunes and saltmarsh, reducing the natural hazard buffering capacity of these features.
- Climate change and the effects of sea-level rise and potential for increased intense tropical cyclone activity.
- Cyclicity in global climate systems, such as El Niño Southern Oscillation (ENSO), and the effects on natural coastal hazards such as erosion.

State

- Northland's west coast beaches mostly display a long-term state of shoreline stability and in some locations accretion. However, there are several embayed harbour beaches that are eroding due to low sediment supply and shoreline modification, notably Omapere Beach on the west coast.
- The long-term state of east coast beaches is more varied. While many display a trend of shoreline stability, there are a significant number of eroding beaches proportional, in part, to the extent of man-made shoreline modification.
- Over the past five years conditions for east coast beaches have favoured beach building, with beaches tending to accumulate sand and dunes repairing and prograding seaward.
- A number of Northland coastal communities are at potential risk from erosion, flooding and tsunami hazard largely due to historic development when knowledge of hazards and mitigation requirements were less well understood.
- Coastal hazard zones, usually for erosion and flooding hazards, have been derived for more than 24 coastal communities.
- More than 630 dwellings and 1090 properties are located within or partially within identified coastal hazard zones. The total capital value of these properties in 2006 was approximately $450 million.

Doing well

- At least nine coastal hazard assessments have been undertaken for Northland, many of which have delineated coastal hazard zones.
- Coastal hazard assessment is ongoing, with current focus on better understanding tsunami hazards for the region.
- Beach profile monitoring is undertaken regularly to better understand shoreline dynamics and an accurate lidar topographic dataset is currently being undertaken for most coastal communities.
- Coast care restoration and enhancement of dune systems, hazard zone delineation and rules and submissions on resource consent applications for activities in areas likely to be subject to coastal hazards are assisting in achieving coastal hazard management objectives.

Areas for improvement

- Preparedness for and understanding of tsunami hazards and the implications of climate change and sea level rise for Northland.
- Revise coastal hazard zones and methodologies used, particularly for further defining the coastal inundation hazard and the integration of information on inundation, flooding and erosion coastal hazards.
- Engagement of the community with coastal hazard preparedness and measures to increase awareness of natural processes and hazards.
- Promote a consistent and coordinated approach towards coastal hazard management throughout Northland.
- Integrate the management of the coastal marine area and land margins to make sure activities do not exacerbate coastal hazards.

7.1 Introduction

Coastal hazards are natural physical processes with the potential to cause loss of life or property. Northland's coast is at risk from a number of coastal hazards, including:

- Erosion
- Flooding from storm surge and wave run-up
- Tsunami
- Land instability, including cliff erosion
- Sand drift inundation

There are a number of pressures that exacerbate coastal hazards, including inappropriately sited development and subdivision within coastal areas, alteration to natural coastal processes, climate change and variability in global climate cycles.

Coastal hazard assessments have been carried out for many settlements in Northland to determine areas likely to be prone to hazards. However, no risk assessment has been undertaken to assess the consequence of coastal hazards occurring.

A number of initiatives have been undertaken, or are ongoing, in response to coastal hazards. These include coastal hazard assessments, regional and district plan requirements, coast care and others.

Foreshore erosion at Ahipara, December 2005 (left) and storm surge flooding at Kissing Point boatsheds, Whangarei Harbour in 1999 (right).

Tsunami damage to Berghan store in Ahipara, around 1910 (left), photograph courtesy of Far North Regional Museum, and cliff erosion at Hihi in 2005 (right).

Regional Policy Statement objective

The Regional Policy Statement 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.

Other legislation

Civil Defence and Emergency Management Act

The Civil Defence Emergency Management Act 2002 (CDEM Act 2002) was enacted to repeal and replace the Civil Defence Act 1983. The Act is supported by the vision "Resilient New Zealand - strong communities, understanding and managing their hazards". Prior to the CDEM Act, the need to manage the risks posed by natural hazards has not gone unnoticed by New Zealanders' legislature.

Management of natural hazards is legislated for in the Resource Management Act 1991, Soil Conservation and Rivers Control Act 1941, Building Act 1991, Earthquake Commission Act 1993, and even the Land Drainage Act 1908.

A key aim of the CDEM Act is to increase the role and functions of civil defence organisations, and make clear the responsibilities of government departments, lifeline utilities and emergency services in reducing hazard risk. The traditional focus of civil defence activities (waiting for a disaster to happen) has been expanded to encompass the four R’s of Reduction, Readiness, Response and Recovery. It is expected that reduction requirements identified as part of this process will be implemented mostly through regional and district plans.

Building Act

Coastal hazards are also addressed through section 72 of the Building Act 2004 which relates to the granting of building consents, and provides that councils may refuse to grant building consent if land is subject to natural hazard or is likely to accelerate or worsen or cause a natural hazard on that land.

7.2 What are the pressures on coastal hazards?

Coastal development

The coastal development boom that has occurred since the 1950s has resulted in a number of coastal subdivisions with inadequate setback distances or having been developed within the 'active' dune system. As a consequence many properties are now at risk from erosion or flooding, or are supported by erosion protection works that can adversely affect natural coastal processes.

Increasing subdivision and intensification of coastal development is increasing the risks and potential costs of coastal hazards. For example existing lots with a house are further subdivided and sold for development, reducing the options for managing coastal hazards, such as the landward relocation of dwellings that are at risk from erosion.

Development of the Ahipara foreshore from 1950 (left) to 2004 (right) with inadequate setback to allow for natural variability in the position of the shoreline.

Damage to natural systems

Natural systems, such as dunes and salt marsh wetlands, can play a critical role in mitigating the effects of erosion and coastal flooding hazards.

Dune systems act as a buffer between the land and the sea. Dunes erode during periods of storminess and grow seaward during calmer periods. However, the extensive modification of many of Northland's dune systems has resulted in many dunes losing this buffering capacity.

The main pressures affecting dune systems are:

- Removal of native sand-binding vegetation (*Pingao* sp. and *Spinifex* sp.) through grazing, burning, vehicle use and other such factors.
- Structures, such as roads, sea walls and revetments, that lock up the sand reservoir of the dune system.
- Building development on the active dune system.
- Modification to estuarine margins and saltmarsh wetlands, particularly through drainage and development, increases potential for erosion and flooding hazards.
- Removal of shoreline vegetation increases potential for erosion from waves and the drainage or reclamation of saltmarsh wetland reduces the buffering capacity of these systems for flooding events, such as storm surge.

Omapere boat ramp (left), an example of a coastal structure causing increased erosion of the foreshore, and Whangaumu (Wellingtons) Bay (right) with development within the active dune complex, interrupting the natural movement of sand.

Global climate change

Global climate change is likely to increase coastal hazards due to sea level rise and changes in weather patterns. The mean global sea level rise from 1961 to 2003 was 1.8 mm per year, which equates to 75.6 mm over this 42-year period, as shown in table 1 (below). The mean rate for the more recent 10-year period from 1993 to 2003 is much higher at 3.1 mm per year, therefore 31 mm of the 75.6 mm has occurred in this more recent 10-year period.

Table 1: Mean global sea-level rise.

Period	1961 - 2003	1993 - 2003
Mean rate of sea level rise	1.8 mm p/a	3.1 mm p/a

Predicted rates of sea-level rise as shown in table 2 (below) are likely to lead to increased incidences of coastal flooding, and in some cases, increased coastal erosion. Changes in climate may also increase tropical cyclone activity, with larger peak wind speeds, and increased incidence of extreme high sea levels. Extra-tropical storm tracks are also projected to move further poleward, which may have the potential to increase the frequency of damaging coastal erosion and inundation events for Northland.

Table 2: Sea level rise for 20th century and future sea level rise projections under the different emission scenarios modelled (IPCC 2007).

Period	Total estimated for 20th Century	Projections to end of 21st Century	
		Low-end range projection	High-end range projection
Sea level rise	0.17 m	0.18 m to 0.26 m	0.38 m to 0.59 m

Note: The above projections to the end of the 21st century exclude future rapid dynamical changes in ice flow.

ENSO – La Nina/El Nino

Cyclicity in global climate systems can induce differing levels of pressure for Northland's east and west coast from coastal hazards, primarily in response to the El Niño Southern Oscillation (ENSO). There are two extremes to the ENSO cycle: El Niño and La Niña.

For Northland La Niña conditions increase the potential for erosion of east coast beaches, due to the setup of storm waves from onshore wind conditions. West coast beaches become vulnerable to the same type of waves during El Niño conditions. Over the past five years there has been a predominance of weak to moderate El Niño conditions. For the east coast this has resulted in predominately beach and dune system rebuilding, following the significant erosion caused by the easterly storms in 2000.

7.3 What is the state of coastal hazards?

Natural shoreline dynamics

Shoreline 'state', that is the trend in the location of the shoreline, can generally be classified into three categories:

- Eroding (shoreline is retreating landward)
- Equilibrium (shoreline is generally stable)
- Accreting (shoreline is extending seaward)

These three states are related to five key factors, namely, sediment supply to the beach, wave energy, sea-level change, location of shoreline and man-made modification to shoreline (i.e. dune system). Twenty-four beaches throughout Northland are monitored on a regular basis, as shown in figure 1 (below). An estimation of their long-term shoreline state is presented in table 3 (below).

Northland's west coast beaches generally display a long-term trend for equilibrium or accretion, with high to moderate sediment supply, high wave energy and largely unmodified shorelines. There are exceptions to this, such as embayed harbour beaches like Omapere which display a long-term trend for erosion, due to variability in sediment supply and extensive man-made modification to the shoreline.

The state of Northland's east coast beaches is more diverse, due to the greater shoreline complexity and more extensive shoreline modification. The majority of east coast beaches tend to be in an equilibrium state, for example Oakura, Taipa and Taupo Bay. There are also a number of eroding east coast beaches, including Tauranga Bay and Pataua South. Erosion of these systems appears to be largely a function of natural fluctuations in sediment supply coupled with extensive modification of the foredune system.

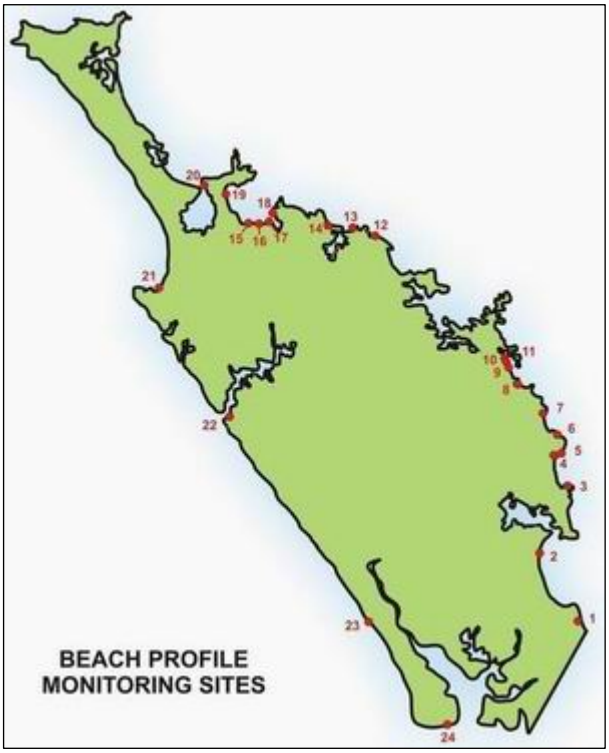

Figure 1: Beaches included in the beach profile monitoring programme.

Table 3: Beaches monitored as part of the beach profile monitoring programme, with their estimated long-term shoreline state. Note: Numbers correspond to those in figure 1.

Number in figure 1	Beach	Record commenced	Generalised shoreline state
1	Mangawhai spit	2000	Equilibrium
2	Bream Bay	1976	Accreting
3	Pataua South	1998	Eroding
4	Wellingtons (Whangaumu)	1998	Eroding
5	Ngunguru spit	1998	Equilibrium
6	Matapouri	1998	Eroding
7	Whananaki spit	1998	Equilibrium
8	Te Mimiha (Helena)	1999	Equilibrium
9	Teal (Ngawai)	1999	Equilibrium
10	Oakura	1998	Equilibrium
11	Ohawini	1998	Equilibrium
12	Te Ngaire	2002	Equilibrium
13	Tauranga	2002	Eroding
14	Taupo	1999	Equilibrium
15	Hihi	1999	Eroding
16	Coopers Beach	2003	Equilibrium
17	Cable Bay	2003	Equilibrium
18	Taipa	1990	Equilibrium
19	Tokerau	1990	Equilibrium
20	Rangiputa	1999	Eroding
21	Ahipara	1999	Equilibrium
22	Omapere	2002	Eroding
23	Glinks	1994	Accreting
24	Pouto	1989	Equilibrium

Note: The above are indicative observations only. Shorelines may display several states (i.e. erosion and accretion) in different sections of the shoreline.

Recent shoreline dynamics

In the period following the damaging easterly storms of July 2000, the majority of Northland's east coast beaches have been in an accretionary phase. This is consistent with the moderate to weak El Nino conditions that have predominated over the past five years. This phase has enabled dune systems to rebuild and grow seaward under the existence of favourable 'dune building' conditions, as shown for Ruakaka Beach in figure 2 (below).

Those areas where the foredune complex and native vegetation have been extensively modified are an exception to this trend. In these areas modification of the foredune significantly reduces the ability of the dune to retain sand and grow seaward during accretion phases. As a result the erosion dominates over accretion, causing a long-term trend for shoreline erosion.

Erosion scarp to Whananaki North beach in July 2000 following erosion (left) and same location in March 2006 following the predominance of weak El Nino conditions demonstrating beach and dune rebuilding (right).

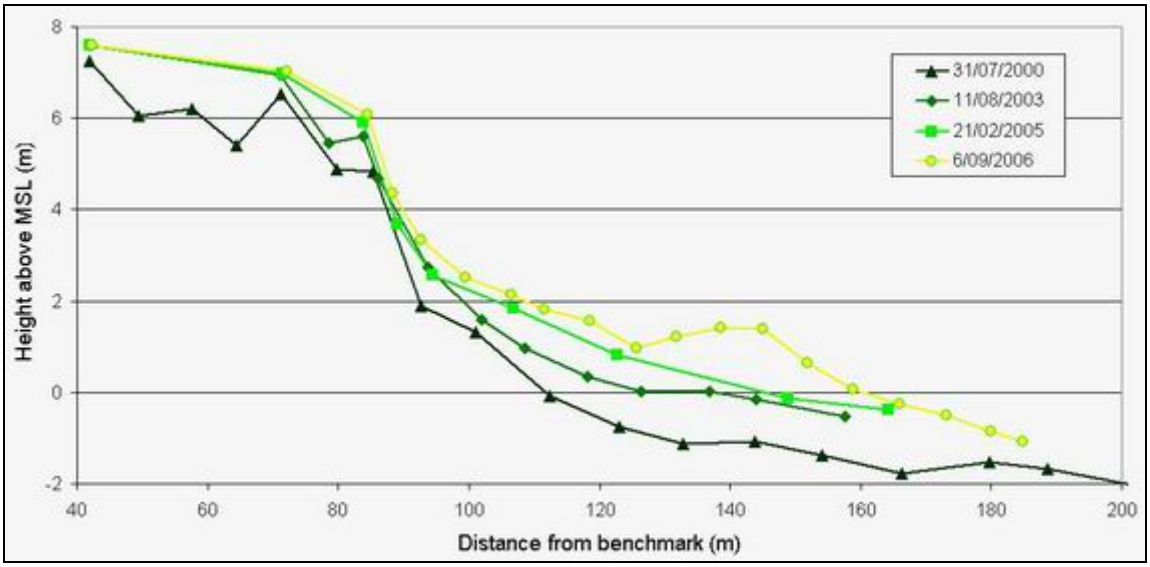

Figure 2: Beach profile survey data for Ruakaka Beach, Bream Bay. The extent of beach rebuilding is apparent in the surveys following the damaging easterly storms of July 2000.

Coastal flooding

Wave-assisted coastal flooding occurs when high tides coincide with intense low-pressure weather systems causing storm surge and wave run-up to temporarily inundate low-lying coastal hinterlands.

Many factors contribute to the potential risk of coastal inundation, including extent of low-lying land, degree of exposure, beach slope, near-shore sea-bed shape among others. A number of Northland coastal communities are exposed to coastal flooding. Projected sea-level rise associated with climate change to year 2100 is likely to substantially increase the extent of areas subject to inundation. This is particularly the case for locations with low topography, particularly low-lying barrier-spit systems and progradational coastal lowlands.

Moderate storm surge event in Ngunguru Estuary in July 2007 (left), photo courtesy of Gloria Bruni, and debris from storm wave run-up causing temporary inundation of low-lying properties at Teal Bay in August 1989 (right).

Tsunami Hazard

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 seafloor displacement. Tsunami can devastate coastal communities causing inundation, strong currents, contamination and other effects. Tsunami generally occur as a large, broken low wave or mass of water.

The post-historic record shows that New Zealand has been affected by more than 40 tsunami in the last 150 years. Of these, four moderate tsunami inundated Northland's east coast. One of these events is documented in figure 3 (below). 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.

Tidal Waves Pound North Coast Following Quake In Chile; Cottage At Ngunguru Swamped

Had To Make Detour

Wool Firm

ROAD CLOSED

Figure 3: Newspaper article following the moderate 1960 Chile tsunami, sourced from The Northern Advocate.

Tsunami hazard is considered a significant risk for Northland and could affect a number of Northland's 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.

Sources from near the South American coast are the most likely to cause a moderate event that would affect most of Northland's east coast, as shown in figure 4 (below), with an annual exceedance probability of around 1 – 2 %.

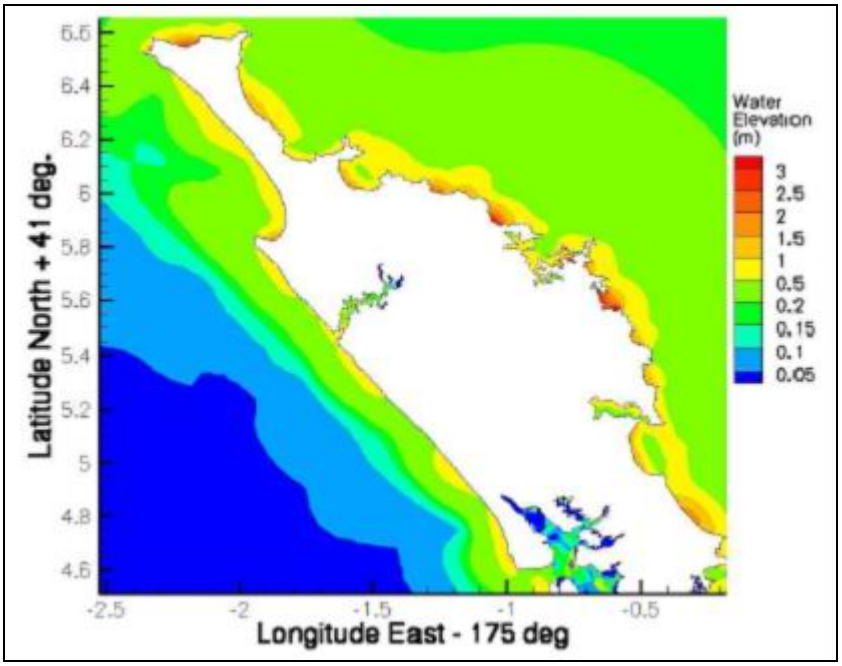

Figure 4: Maximum water surface elevations modelled for a tsunami generated from a magnitude 9.0 earthquake located near the Chilean coast (Image courtesy of NIWA).

Hazard zones

Coastal hazard zones (CHZ) identify areas of coast that may be subject to coastal hazards, usually erosion and/or coastal flooding. CHZ enable local authorities to better plan and manage coastal development in areas susceptible to coastal hazards by providing for building set back and/or restrictions on the type of development that is permitted. CHZ have been derived for more than 24 coastal settlements in Northland and incorporated in the district planning maps.

To assess the state of coastal hazards, based on the amount of property and development within CHZ, a GIS-based analysis was undertaken of coastal communities within the zones to determine:

- The number of properties and dwellings in coastal hazard zones.
- The capital values of properties in coastal hazard zones.
- The setback distance from the coastline of each dwelling located in a coastal hazard zone.

Approximately 638 dwellings are located within or partially within identified coastal hazard zones, indicating a probability of exposure to risk from coastal hazards (i.e. erosion and/or coastal flooding) within a timeframe of the next 50 to 100 years.

Mean setback distances of dwellings within hazard zones range from 11 metres at Matapouri Beach to a maximum of 89 metres at Tokerau Bay shown in table 4 and figure 5 (below).

Table 4: Summary of setback distances and number of dwellings within identified coastal hazard zones.

Community	Mean setback of dwellings from shoreline (m)	Number of dwellings in CHZ 1	Number of dwellings in CHZ 2	Total number of dwellings in CHZ's
Teal Bay	11	8	10	18
Matapouri	12	18	1	19
Tauranga Bay	13	4	2	6
Cable Bay	14	2	0	2
Taiharuru	17	7	1	8
Ohawini	18	7	8	15
Pataua Estuary	20	22	28	50
Taupo Bay	21	30	5	35
Te Ngaire	21	13	3	16
Oakura	23	48	33	81
Whangaumu	25	3	12	15
Omapere	26	17	15	32
Pataua North	35	22	15	37
Taipa	36	0	28	28
Langs Beach	38	4	0	4
Rangiputa	38	16	25	41
Coopers Beach	39	21	14	35
Opononi	41	0	21	21
Ahipara	45	25	11	36
Bland Bay	53	0	4	4
Helena Bay	59	2	2	4
Hihi	68	1	16	17
Ruakaka	77	1	5	6
Tokerau	89	1	107	108
Totals		**272**	**366**	**638**

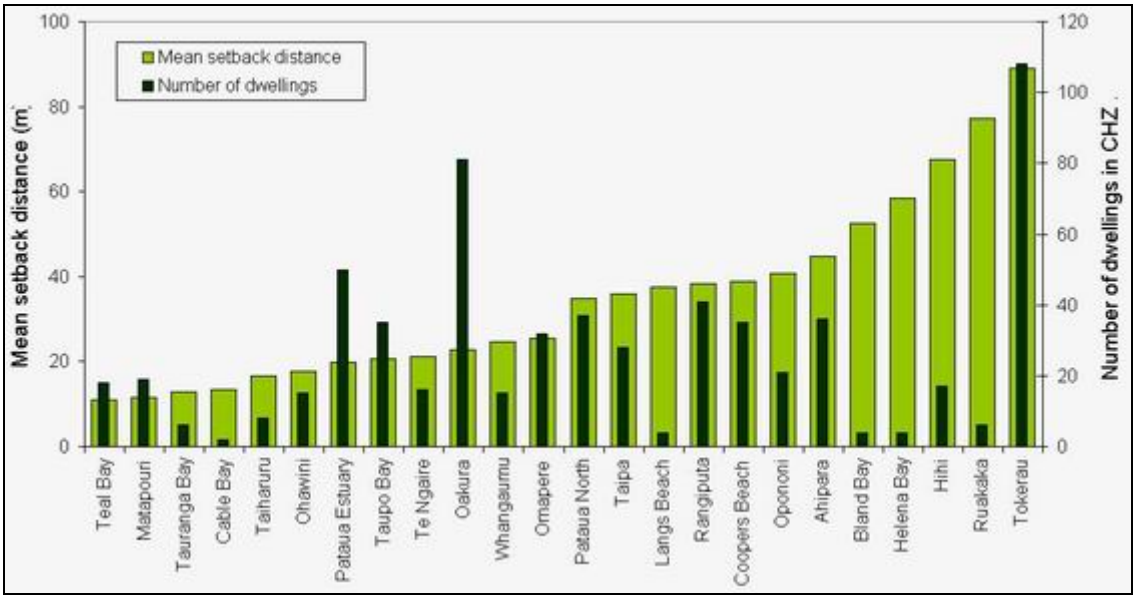

Figure 5: Mean setback distances of dwellings from high tide within designated coastal hazard zones and total number of dwellings within coastal hazard zones.

Approximately 1,092 properties are located within, or partially within, identified coastal hazard zones. The total capital value of these properties is approximately $453 million. The market value of these properties is likely to be much higher.

Total capital values of properties for communities within identified coastal hazard zones ranged from $1.2 million at Helena Bay to $49.9 million at Oakura Bay shown in figure 6 and table 5 (below).

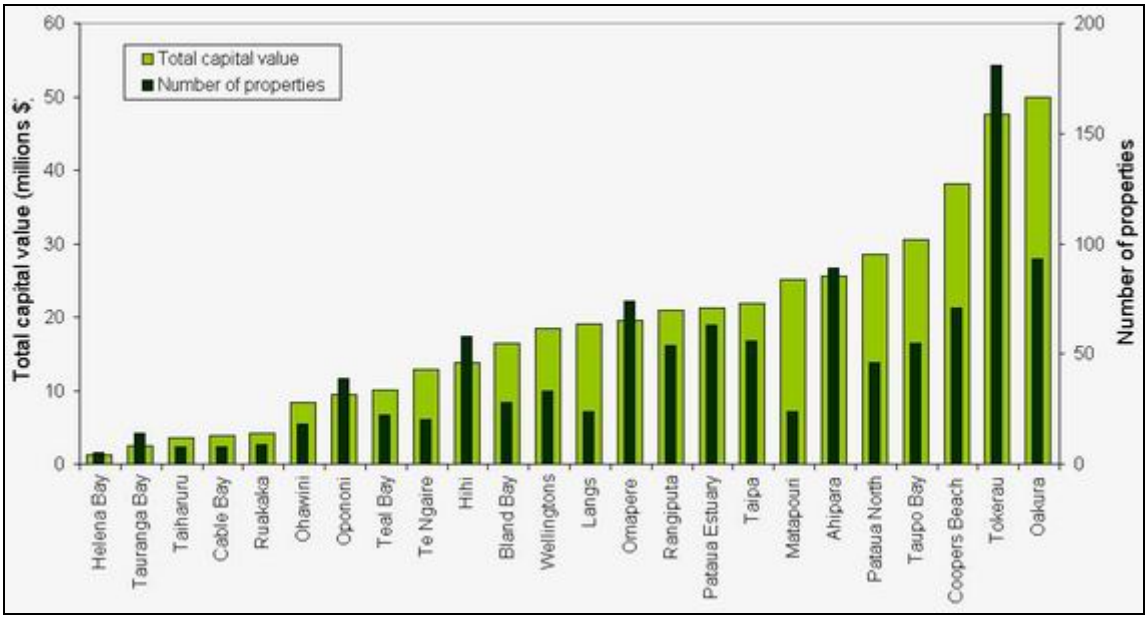

Figure 6: Total capital values (based on 2006 data) of properties within hazard zones and number of properties within coastal hazard zones.

Table 5: Capital value of property located within coastal hazard zones.

Community	Property count	Total capital value ($)	Mean capital value ($)
Helena Bay	5	1,181,500	236,300
Tauranga Bay	14	2,480,000	177,143
Taiharuru	8	3,590,000	448,750
Cable Bay	8	3,929,400	491,175
Ruakaka	9	4,254,000	472,667
Ohawini	18	8,422,000	467,889
Opononi	39	9,401,000	241,051
Teal Bay	22	10,020,000	455,455
Te Ngaire	20	12,817,000	640,850
Hihi	58	13,729,500	236,716
Bland Bay	28	16,475,000	588,393
Wellingtons	33	18,459,000	559,364
Langs	24	19,136,000	797,333
Omapere	74	19,471,000	263,122
Rangiputa	54	20,891,200	386,874
Pataua Estuary	63	21,270,000	337,619
Taipa	56	21,827,000	389,768
Matapouri	24	25,054,000	715,829
Ahipara	89	25,576,900	287,381
Pataua North	46	28,545,000	620,543
Taupo Bay	55	30,506,500	554,664
Coopers Beach	71	38,203,000	538,070
Tokerau	181	47,612,500	263,052
Oakura	93	49,860,000	536,129
Sum	**1092**	**$452,711,500**	

7.4 What is being done?

Policy documents

The Regional Policy Statement for Northland (NRC 2002) provides an overview of resource management issues in Northland, including those with regard to coastal natural hazards. It contains objectives, policies and methods to achieve integrated management of Northland's environment.

The objective of the Regional Policy Statement, related to natural hazards, seeks 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.

The Regional Coastal Plan for Northland also contains objectives and policies for the management of the coastal resource relating to natural hazards. These aim to minimise or avoid the effects of natural hazards on people, property, and other aspects of the environment, consistent with the Regional Policy Statement for Northland.

New Zealand Coastal Policy Statement

The New Zealand Coastal Policy Statement (NZCPS) (DOC 1994) sets the national priorities for activities within the coastal environment that may affect coastal hazards.

The key policies of the NZCPS, relating to coastal hazard management state that Councils should:

- Identify where natural hazards exist.
- Recognise sea-level rise.
- Recognise and enhance the ability of natural features to protect development.
- Recognise that natural features may migrate inland.
- Locate and design development so that hazard protection works are avoided.
- Only permit coastal protection works where it is the best practical option.

Hazard assessments

Coastal hazard assessments are undertaken to determine coastal hazard zones (CHZ). CHZ delineate areas of coast that may be subject to natural coastal hazards. This zoning enables authorities to better plan and manage coastal development in areas susceptible to coastal hazards by providing building setbacks and/or restrictions on the type of development.

Coastal hazard assessments have been undertaken to delineate 'coastal hazard zones' for over 24 Northland coastal settlements. The Northland Regional Council is also currently assessing tsunami hazard for the region, which may lead to the identification of tsunami hazard zones. The Northland Regional Council has commissioned several coastal hazard assessment reports over the last 20 years, shown in table 6 (below).

Table 6: Coastal hazard reports commissioned by the Regional Council

Coastal Hazard Report	Date, Author
Coastal hazard identification Whangarei county.	*1988, NRC.*
Urban capability classification and coastal hazard identification, Omapere-Opononi Area.	*1991, NRC.*
Coastal hazard identification in former Mangonui county area.	*1991, NRC.*
Review of coastal hazard zones for 11 selected beaches in Whangarei District, Northland Region.	*1998, CMCL.*
Identification of coastal hazard zones at nine selected Northland beaches.	*2002, Geomarine International Ltd.*
Overview of weather and coastal hazards in the Northland region – Part 2: coastal hazards	*2003, NIWA*
Coastal inundation hazard assessment for selected Far North settlements.	*2005, NRC.*
Tsunami source study.	*2006, NIWA.*
Tsunami hazard baseline assessment for the Northland Region.	*2006, NIWA/NRC.*

District plans and coastal hazard zones

Coastal hazard zones, derived from the coastal hazard assessments, are included in District Plans. These lines are used to avoid or mitigate inappropriate development in areas subject to coastal hazards.

District plans also have minimum setback requirements for development adjacent to the coastal marine area, which helps avoid development in areas subject to natural hazards. Some district plans also have minimum coastal floor levels, which are designed to mitigate coastal flooding of dwellings.

Beach profile monitoring

A beach-profile monitoring programme is undertaken to assess changes in the shape and position of the shoreline at selected coastal areas.

The programme involves surveying the position of the toe of the foredune with a differential global positioning system and surveying one or more cross-sectional profiles of the foreshore and foredune complex at each beach. For example, the results from Ruakaka Beach are shown in figure 7 (below).

The programme was designed to provide coverage of a number of key ‘monitor’ beaches in the region. This monitoring is carried out every six months, during summer and winter, at nine beaches throughout Northland. A further 15 beaches are surveyed once every two years or after events that cause substantial changes to the position of the shoreline such as storms and landslides.

Data gathered from this programme is necessary to better understand the dynamics of Northland’s coastline. This data assists in assessing the suitability of developments in coastal areas and is also used in the delineation of coastal hazard zones.

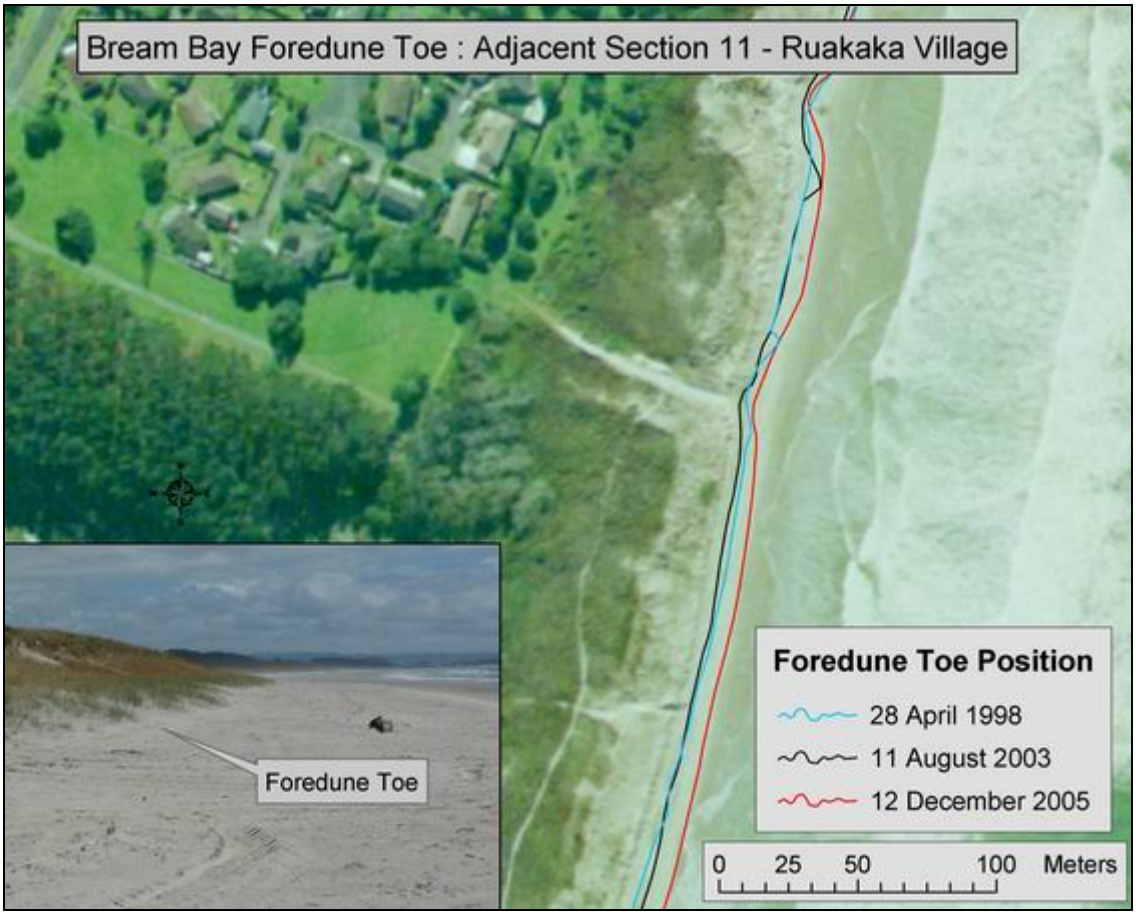

Figure 7: Foredune toe profile survey results near Ruakaka, Bream Bay.

Other responses

Submissions on resource consent applications

The Northland Regional Council reviews applications made to District Councils for activities, such as subdivision, land use and development and building, in areas subject to coastal hazards. The Northland Regional Council makes comments or submissions on these applications and suggests measures for mitigating or avoiding the enhancement of natural hazards. These measures may include undertaking detailed assessments of the natural hazards, building setbacks, requirement for relocatable dwellings and raised floor levels or avoiding the hazard area entirely.

Natural system restoration

The Northland Regional Council has a full time Coast Care Coordinator and an active coast care programme aimed at facilitating community-based restoration of dune systems. This programme provides for the mitigation of natural hazards, as well as restoring natural character and biodiversity of dunes.

Refer to case study 1 of the Coastal Management chapter of this report for more information on coast care.

7.5 Where to from here?

The following are key points towards implementing improved future management of coastal hazards in Northland:

- Continue to monitor shoreline movements and undertake coastal hazard assessments and make this information available for use.
- Increase preparedness for and our understanding of tsunami hazards and the effects of climate change and sea level rise.
- Revise coastal hazard zones and methodologies used, particularly for further defining the coastal inundation hazard and the integration of coastal hazards.
- Assess adequacy of regional and district plan rules in response to coastal development intensification and subdivision pressure, and develop tools to monitor trends in development of coastal areas subject to hazards.
- Engage the community about coastal hazards and measures to increase awareness of natural processes and hazard preparedness.
- Better integrate the management of the coastal marine area and adjoining land margins to better manage effects of activities, particularly coastal protection works, and avoid activities that exacerbate coastal hazards.
- Promote a consistent and coordinated approach towards coastal hazard management throughout Northland.
- Identify, protect and restore natural systems that are a natural defence to coastal hazards.

Coastal margin management

A plan change to the Regional Water and Soil Plan for Northland (NRC 2007) is being prepared to regulate land use in the coastal margins, preventing land disturbance activities from being adversely affected by marine processes or exacerbating the effects of these processes on other properties. There are also a number of natural, social and cultural values which may be affected by land disturbance activities undertaken in the coastal margin. These are being considered in the development of the plan change.

7.6 What can you do to help?

The following are some key ways you can be involved in reducing the risk of coastal hazards to yourself and others.

Coastal hazard zones

Contact the relevant District Council or the Regional Council before purchasing or developing on a coastal property. Check out where the property is located with respect to the coastal hazard zones in District plans.

Coast care

Help protect our coast by sticking to Northland's CoastCare code. For more information refer to the 'Caring For Our Coast' brochure available on the Regional Council website at the following link:

http://www.nrc.govt.nz/upload/2229/Caring%20for%20our%20Coast.pdf

If you want to make a real difference, become involved in the work of a local coast care group or establish a coast care group in your area and join in at a community planting day near you. For more information on coast care groups refer to the coastal management chapter of this report or contact the Coast Care coordinator on 0800 002 004.

Vehicles on beaches

Inappropriate vehicle use on beaches can exacerbate erosion of the foreshore. For more information refer to the 'Driving On The Beach' brochure on the Regional Council website at the following link:

http://www.nrc.govt.nz/upload/1779/Driving%20on%20the%20Beach%20(Reprint%20Mar%2007).pdf

Be prepared

Be prepared for a coastal hazard, especially if you live near the coast. For more information on hazard preparation, refer to the Natural Hazards chapter of this report or seek advice on the Ministry for Civil Defence and Emergency Management's website at the following link:

http://www.civildefence.govt.nz/memwebsite.nsf/wpg_URL/Being-Prepared-Index?OpenDocument&menuexpand=beingprepared

7.7 Case study 1: Living in a hazard zone, September 2005 storm

During 17 to 19 September 2005 a moderately intense low-pressure weather system (pressure at Dargaville was recorded at 983 hPa, where mean pressure is 1014 hPa), with mean peak winds and maximum gusts of 48 km/hr and 105 km/hr respectively, coincided with large perigean-spring tides (predicted to be 3.9 metres at Port Taranaki, where MHWS is 3.5 metres).

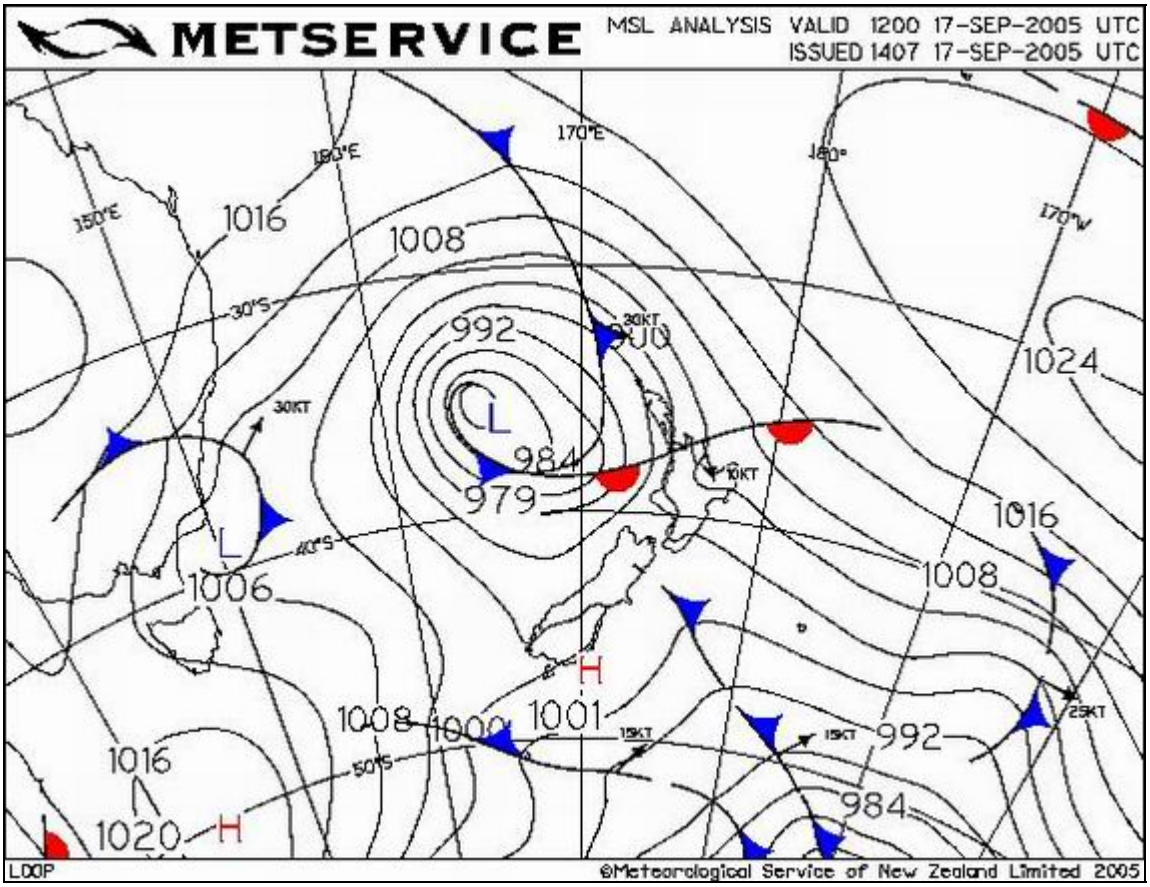

Figure 8: The low-pressure system approaching New Zealand at midday 17 September 2007.

The combination of low pressure, as shown in figure 8 (above) and wind caused a moderate storm surge, which resulted in areas of localised coastal inundation. Offshore significant wave heights (the mean height of the largest third of wave heights) in excess of seven metres, as shown in figure 9 (below), were associated with the event and these caused substantial erosion of the foreshore on a number of west coast beaches.

Ahipara during the storm (left) and erosion to the foreshore, following the storm event (right).

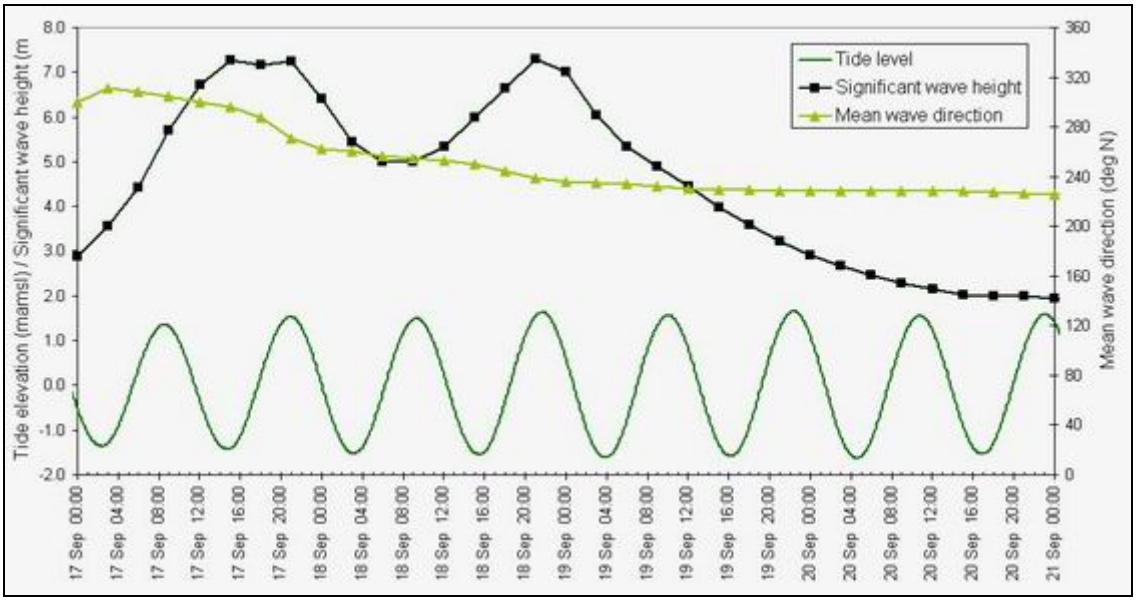

Figure 9: Tide and offshore wave conditions modelled for the event, at the entrance to the Hokianga Harbour (Data courtesy of NIWA).

Substantial erosion occurred to the Ahipara foreshore north of the Wairoa Stream, of between five to 10 metres. Localised coastal inundation also caused temporary flooding of the road and low-lying properties.

Substantial erosion also affected the Omapere foreshore, with differential erosion of between one to four metres. At least one dwelling was put at direct risk of failure from this event, with the concrete foundation overhanging the edge of the erosion scarp.

Erosion threatening dwelling at Omapere Beach following the storm event (left) and coastal inundation of land bordering the Hokianga Harbour (right).

So what is the Council doing about it?

Following the storm several meetings were organised with local communities to discuss the erosion and potential management options.

A public meeting, organised by the NRC, was held in Omapere on 25 October 2005 to discuss the erosion of the Omapere foreshore and management options. The meeting was well attended by a representative cross-section of 80 people from the local community. A presentation outlining what we know about the Omapere Beach system,

examples of management options, an explanation of rules and regulations was given and attendees were invited to discuss ‘where to from here’ with management of the beach. The community voiced a number of differing opinions as to what management actions should be implemented.

From this meeting a society, comprised mostly of local community members, was set up by the community to consider options for managing the erosion of the foreshore. The society has continued to meet on a regular basis, with support from the NRC, and is currently in the position of investigating the most appropriate short-term and long-term management options for the foreshore. Data is being collected from within the harbour to determine the best solution to manage the coastal erosion.

A similar meeting, although on a smaller scale, was held at Ahipara on 18 October 2005 to discuss management options for those properties affected by erosion near the Wairoa Stream. The meeting was well attended by the affected beachfront property owners. The outcome from the meeting was that the affected beachfront community wished to implement a ‘low impact’ solution to the erosion, with also some consideration to the reconstruction of a groyne to train the stream. The NRC has continued to liaise with a number of the affected property owners over the management of the foreshore in this area, with management options currently being discussed.

7.8 Case Study 2: Matapouri dune restoration

The Whangarei District Council has undertaken a restoration project to reinstate a dune system which had been compromised through the introduction of exotic plant species and damage due to pedestrians accessing Matapouri Beach. The lack of dune vegetation had led to blow outs which resulted in large quantities of the sand being blown into the carpark, house sections and on to the road during prolonged easterly winds.

Diggers were used to remove inappropriate vegetation, soil and any rubble. The site was then recontoured to a more natural profile with a bulldozer, fenced into sections and board walks constructed. Finally pingao was mass planted and fertilised and signs erected to ask visitors to keep out of the fenced areas to give the plants a chance to grow.

Matapouri Beach before restoration (left) and after restoration (right).

There has also been so much sand accumulation that the fences installed at the ocean side of the dunes are near to being completely buried and a small new dune has formed. The restoration project was such a huge success that the WDC has gained consent to continue the project down the entire beach.

7.9 References

CDEM Act. (2002). *Civil Defence and Emergency Act 2002.* More information on the Ministry of Civil Defence and Emergency Management's website at the following link:

http://www.civildefence.govt.nz/memwebsite.nsf/wpg_URL/For-the-CDEM-Sector-CDEM-Act-2002-Index?OpenDocument&ExpandView

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http://www.mfe.govt.nz/rma/central/nps/coastal.html

IPCC. (2007). *The Physical Science Basis: Summary for policy makers*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel On Climate Change. Report available on the Intergovernmental Panel on Climate Change's website at the following link:

http://ipcc-wg1.ucar.edu/wg1/wg1-report.html

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http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Regional-Policy-Statement/Regional-Policy-Statement/

NRC. (2002b). *State of the Environment Report*. Published by Northland Regional Council. Available on the Regional Council's 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/

NRC. (2003). *Regional Air Quality Plan for Northland.* Published by Northland Regional Council. Latest version and current plan changes are available on the Regional Council's website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Regional-plans/Regional-Air-Quality-Plan/

NRC. (2004). *Regional Coastal Plan for Northland.* Produced by the Northland Regional Council. Latest version and current plan changes are available on the Regional Council's website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Regional-plans/Regional-Coastal-Plan/

NRC. (2007). *Regional Water and Soil Plan for Northland.* Produced by the Northland Regional Council. Latest version and current plan changes are available on the Regional Council's website at the following link:

http://www.nrc.govt.nz/Resource-Library-Summary/Plans-and-Policies/Regional-plans/Regional-Water-and-Soil-Plan/