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## **Risk Profile Section**

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### **INTRODUCTION**

The purpose of the Risk Profile section of this plan is to provide an evidence base for prioritisation of risk treatments in the region, in order to focus resources and efforts in CDEM planning. This section also provides a broad context for risk management allowing the CDEM group to adequately manage risks in its communities.

A clear understanding of the Group risk profile is fundamental to guiding the level of activity and effort applied across the 4Rs (readiness, reduction, response and recovery) and is the foundation on which the 4Rs are built. Effective preparation and response to risks is essential in knowing what can happen, what hazards and risks are most important and what risks should be managed as priorities.

The risk profile has been developed at the local level utilising local knowledge particularly from the plan review team to assess the diversity of hazards and communities within the region.

The risk profile provides:

- ▶ A comprehensive summary of the natural, social, built and economic environments in the Gisborne Group area
- ▶ Descriptions of all hazards that could impact upon the region and characterisation of their likelihood and consequences
- ▶ An assessment of the risks in the area
- ▶ Prioritisation of risks in terms of their severity of impact and community aspirations, taking into consideration the four environments (social, built, economic and natural), and expressed as seriousness of consequences, manageability of risk, probability of occurrence and degree of community exposure to the risk.

The risk management process used to rank the hazards are contained in Annex J.

### **PURPOSE OF THE RISK PROFILE SECTION**

To provide a comprehensive summary of the hazards in the region, as well as the physical, social and economic environments within the Group area, and then demonstrate the process of risk analysis and evaluation, the criteria for risk prioritisation and, finally, provide a list of priority risks that the Group plans to address.

### **REGIONAL FEATURES**

Gisborne region has a number of physical features that potentially put it at risk from a wide range of natural disasters and a range of technology associated disasters. Important threats are further identified as significant hazards in the risk profile.

These features require careful consideration when planning for Civil Defence Emergency Management:

- ▶ The coastline is 30 kilometres from a boundary between two of the earths crustal plates.

- ▶ The landmass is being uplifted at 4 mm/year resulting in complex folding and faulting of soft, easily weathered sedimentary rock types.
- ▶ Extensive deforestation has contributed to accelerated soil erosion with significant associated impacts notably debris inundation flooding.
- ▶ Highly versatile alluvial flats located on the floodplain are closely settled.
- ▶ The region lies within the influence of the central North Island's volcanoes.
- ▶ Coastal areas are prone to distant and local tsunami events generated from unstable geology of the sea floor from the coast to the fault boundary.
- ▶ Decaying tropical cyclones and storms from the south cause or contribute to flooding, coastal erosion and general land instability.
- ▶ The region is isolated from the rest of the North Island.

In recent times the region has experienced several significant storm events:

- ▶ 1948, 1977, 1982, 1985 and one of New Zealand's most significant natural disasters, Cyclone Bola in 1988.
- ▶ Earthquake events in 1966, 1993 and 2007.
- ▶ A significant technical disaster in the stranding of the Jody F Millennium in 2002.

### MAJOR CONSEQUENCES OF HAZARDS

A threat is any event, either natural or resulting from human intervention that may occur or is capable of causing large scale loss of life, casualties, widespread distress, social and economic disruption and significant damage to property and services.

All the events listed in table 8 have the potential to result in a state of local emergency, with most posing a threat to life or property. There are effects or consequences common to all hazards, namely:

- ▶ Loss of services, including power, gas, fuel, sewage systems and telecommunications.
- ▶ Loss of transport services: road, air, shipping and rail.
- ▶ Loss of accommodation.
- ▶ Over extension of emergency services.
- ▶ Access to food providers and suppliers.

The effect on social and economic well-being of communities arising from these losses and reliance on them is likely to be significant.

### DEVELOPMENT OF THE RISK PROFILE

There is no standard process for assessment (analysis and evaluation) of risks. In this Plan a process recommended by the Ministry of Civil Defence & Emergency Management (see Risk Profile Template CDEM Group Plan Review: Director's Guidelines) was used.

Information incorporated into the risk profile was drawn on from the current CDEM Group Plan and incorporated results obtained from workshops with the plan review team. Information

relating to the hazards and loss of key infrastructure, their impacts and 4Rs management, that were used in the process are contained in a separate documents.

The risk profile template has been pivotal in developing the information included in the profile. The plan review team has used the templates in assessing hazards and risks providing a thorough robust approach.

The process used in developing the profile has included significant regional input from personnel with a wide range of Civil Defence and emergency management related backgrounds. This involvement has included a series of workshops to identify an exhaustive list of hazards followed by analysis and evaluation of risks associated with each hazard. (see Annex J)

## REGIONAL ENVIRONMENTS

The following information provides essential background in regard to the region's social, built, economic and natural environments.

## SOCIAL ENVIRONMENTS

### Population

The Gisborne region's population is 44,499 people (2006 census) with 29,500 (66%) living in the Gisborne Urban area and a further 4,000 (9%) on the adjoining Poverty Bay Flats and Wainui Beach immediately northeast of the city. Most of the remaining population lives in the townships of Tolaga Bay, Tokomaru Bay, Te Puia Springs, Ruatoria, Tikitiki, Te Araroa, Te Karaka and Matawai.

**Table 1:** The following are figures provided from the 2006 census.

Area	Population	Dwellings
East Cape	2,703	882
Ruatoria	753	225
Tokomaru Bay	447	165
Tarndale-Rakauroa	1,653	558
Te Karaka	564	171
Patutahi	378	120
Makaraka	1,044	378
Matokitoki	465	165
Wainui	1,515	579
Wharekaka	1,914	681
Tiniroto	2,112	741
Manutuke	600	201
Tolaga Bay	831	294
Mangapapa	4,266	1,536
Te Hapara	4,281	1,662
Gisborne Airport	2,742	948
Whataupoko	3,696	1,428
Gisborne Central	3,117	1,296
Kaiti North	2,046	732

**Table 2**

Age (in years)	Persons	Percentage
0-4	3,651	8
5-9	3,852	9
10-14	4,149	9
15-19	3,459	8
20-24	2,292	5
25-29	2,271	5
30-34	2,718	6
35-39	2,979	7
40-44	3,231	7
45-49	3,264	7
50-54	2,913	7
55-59	2,466	6
60-64	1,878	4
65 +	5,337	12

As detailed in Table 2, 17% of the population is less than 10 years of age and 16% of the population is greater than 60 years of age.

### **Social Infrastructures**

This includes hospitals, schools, churches, marae and other community facilities including town halls and sports clubs where people can be safely accommodated during emergency events.

These social assets will need to be carefully considered in a context of public safety, accessibility during emergency events and location in comparison to other essential services. Assets which may be isolated by floods or at threat from coastal erosion may be of limited value as social infrastructures during an emergency event.

### **Vulnerable Groups**

The vulnerability of groups will be dependent on the type and extent of the event. During a flood people located within known flood risk areas and communities which become isolated by a specific flood event are vulnerable.

In all emergency events, particular groups of the population will be more vulnerable than others no matter what their location. This includes the aged, whether located in rest homes or their own homes, people with physical and mental disabilities and the young; particularly during an event that occurs when early childhood premises and primary schools are operating.

Measures to reduce vulnerability such as consideration of hazards during building and infrastructure design are critical to minimising impacts.

### **Ethnic Diversity**

The Gisborne region includes 47.3% of the population identifying with a Maori ethnic background compared to 14.6% nationally.

New immigrants are settling in the Gisborne region. Immigrants are likely to be unfamiliar with hazards and risks with language being a major barrier. Education in emergency management of minority groups is required.

### **Tangata Whenua**

Māori and Tangata Whenua, as a specific community group, have been identified in legislation for particular attention and involvement in public sector governance and management.

When undertaking its role and functions, CDEM have a direct role and responsibility to ensure that Tangata Whenua and Māori issues are dealt with appropriately.

All the activities of the Māori Liaison Office of Council are in the main a support for Council's statutory responsibilities and a duty of Council to make available mechanisms for better community relations and integration. CDEM can call, as appropriate, for the advice and guidance of the Māori Liaison Office to assist it to manage any engagements CDEM may be required to have with Tangata Whenua and Māori.

## **NATURAL ENVIRONMENTS**

### **Geology**

The region has a complex geology including a range of lithologies shaped by extensive folding and faulting of sedimentary materials. Two tephra layers of volcanic ash are derived from older Waihi-Whakatane ash showers in areas north of Tolaga Bay and more recent Kaharoa and Taupo ash showers in areas south and west of Tolaga Bay.

Older rocks of the Raukumara Ranges consist of moderately to well indurated (hardened) steep, stable slopes with thin soils. As a result water quality is high and in-stream values are sensitive. Much of the catchment drainage is to the Bay of Plenty region. A band of steep stable Matakaoa Volcanic Basalt is a feature along the northern coastline between Hicks Bay and Lottin Point.

In western areas older rocks have been subjected to tectonic activity and are fractured and crushed. Highly erodible slopes result in significant volumes of bed load material entering watercourses resulting in aggradation problems downstream.

Further east and towards the coast there are soft, younger sedimentary rocks ranging in texture from fine clay mudstones, which readily erode and contribute suspended sediment to watercourses, to coarser sandstones with slip prone skeletal soils which contribute very little sediment to the region's waterways.

The highly fertile alluvial flats have formed as a result of hill country erosion accentuated in recent times by accelerated erosion due to deforestation.

### **Topography**

The region is 92% hill country. Soil erosion is well documented including the extent of severely eroding pastoral hill country. The region occupies only 8% of the North Island but based on a 1975 land use capability survey included 26% of the North Island's severe to extreme erosion.

While only 8% of the region's area comprises alluvial flats this land is home to a large proportion of the region's population and associated infrastructure and generates a significant portion of the regional income from intensive agricultural and horticultural land uses.

A major consideration in advocating conservation plantings on erosion prone hill country are the impacts of flooding and inundation on the flats.

### **Drainage Pattern**

The western fringe of the region supporting predominantly indigenous bush includes headwater tributaries of the Waioeka, Motu and Raukokere Rivers which flow to the Bay of Plenty region.

The southwestern fringe supporting both indigenous bush and pasture drains to the Hangaroa River, a major tributary of the Wairoa River.

A large portion of the region is drained by the Waipaoa, Waiapu and Awatere Rivers and their tributaries. All have been largely cleared of indigenous bush other than western areas within or bounding the Raukumara Forest Park. Reliable rainfall in the western hill country ensures reliable river flows in other than very dry summer conditions.

Irrigation takes are confined almost exclusively to the Waipaoa River and its associated groundwater aquifers.

A number of small coastal watercourses, the largest being the Uawa River, drain eastern areas with lower annual rainfalls resulting in less reliable flows particularly during dry summers.

### **Climate**

Annual rainfall varies from 1000 mm in the southern coastal area adjoining the Waipaoa River floodplain, increasing to 2500 mm along the western fringe bounding the Bay of Plenty region. Rainfall is concentrated in the autumn and winter months with hot dry summer conditions and drought being a regular occurrence along the coastal margin of the region.

Future changes in temperature for Gisborne are likely to be smallest in the spring. The annual mean temperature is expected to rise by about 0.9 °C by 2040 and by 2.1 °C by 2090. There are likely to be more high temperature episodes.

Average annual rainfall is expected to decrease in the Gisborne region. During the autumn and particularly the summer months reduced westerlies are predicted which could result in an increased summer rainfall of 10% by 2090 along with a decrease in moisture loss from reduced evapo-transpiration during the summer months. Autumn rainfall is predicted to increase by 5 to 7% by 2090. Winter and spring rainfall may be 10% less than the 1990 scenario.

Heavier and/or more frequent extreme rainfall events are predicted with "moderate confidence". It is expected that mid-altitude storms or ex-tropical cyclones may increase in intensity. Possible changes to storm tracks and whether New Zealand will be more vulnerable to such events are as yet unknown.

Council already has procedures in place to deal with the effects of extreme climate events. It is not necessary to develop new procedures but rather consider new climate information as it becomes available in order to continuously review responses.

## Vegetation

Steep slopes of the Raukumara Ranges have traditionally supported indigenous bush. Significant soil erosion has occurred in recent cyclonic events contributing large volumes of debris to the region's waterways.

East of the ranges little indigenous cover was left subsequent to wholesale land clearing for pastoral farming which commenced in the 1880's. Accelerated soil erosion has had a significant effect. Large scale exotic forestry planting commenced in the 1960's with the initial New Zealand Forest Service plantings. Protection and plantation forestry plantings now equate to 157,000 ha, or 19% of the region in 2007 (MAF, 2007).

Conservation works on pastoral land, afforestation and managed reversion are addressing a major environmental issue in the region's hill country with significant benefits to downstream assets, settlements and intensive lowland activities.

## BUILT ENVIRONMENTS

### Residential

The Gisborne urban area contains a significant number of residential dwellings. Properties alongside the city's rivers and in low-lying areas are prone to flood events. Coastal areas are at risk from tsunamis while some older subdivisions on hill slopes within the urban area are prone to soil erosion.

### Commercial

Several commercial zones are designated in the Combined Regional Land and District Plan including Inner Commercial, Outer Commercial, Fringe, Commercial and Amenity Commercial in the city centre and Suburban Commercial throughout the city and adjoining settlements. Rural commercial designations are located in rural townships.

Commercial designations in the central city contain the majority of older two and multi-storey buildings in the Gisborne urban area. This area suffered considerable damage during the 1967 and 2007 earthquakes.

The impact of a major earthquake during business hours when large numbers of people are in the central business area could result in a significant number of casualties.

### Industrial and Agricultural Infrastructure

Gisborne's industries are based on primary production. Processing plants for agricultural, horticultural and forestry industries are located in industrial areas within the city and western industrial designations in the Awapuni and Matawhero areas. These areas are prone to flooding during significant rainfall events with potential disruption to access while floodwaters may have effects on processing plants and adjoining areas.

The rural sector has a strong support base of servicing industries located in the urban industrial zones

## KEY LIFELINES

The CDEM Act 2002 (schedule 1) defines lifelines as:

### **Specific Entities:**

- ▶ Radio NZ Ltd and Television NZ Ltd.
- ▶ The entity operating Gisborne Airport.
- ▶ The entity operating the Gisborne Port.

### **Entities Carrying on Certain Businesses**

- ▶ Production, supply and distribution of manufactured or natural gas.
- ▶ Generation and distribution of electricity through a network.
- ▶ Supply and distribution of water
- ▶ Provision of wastewater and stormwater.
- ▶ Provision of the telecommunication network
- ▶ Roading network, including the state highway.
- ▶ Production, processing and distribution of petroleum products
- ▶ Provision of a rail network.

### **Radio NZ Ltd and Television NZ Ltd**

Radio is a key means of disseminating information to the public during a Civil Defence emergency.

The Group carries out this function in association with the Radio Network (Classic Hits 90.9 FM and Newstalk ZB 945 AM) and Media Works Radio (More FM 98.9 and Radio Live 94.8FM).

Television will be used to convey messages to the public during events through media releases or by direct interview when crews are deployed into the area.

### **Gisborne Airport**

Eastland Infrastructure Ltd manages and operates Gisborne Airport. The airport is leased from Gisborne District Council. Regular passenger services connect Gisborne with predominantly Auckland and Wellington.

Significant disruption to the airport runway is possible during a major earthquake event. Access to and from the airport is located within an Area Liable to Flooding (F4) designation which could disrupt access during a major flood event.

Aviation fuel storage is limited and could be severely curtailed should the state highway be disrupted due to any medium to long term emergency event.

The airport could be a vital inlet for emergency relief should the state highway and rail networks become impassable.

### **Gisborne Port**

Eastland Port is owned by the Eastland Group. Activities include exporting timber products, squash, kiwifruit and other primary produce. The port includes an inner harbour marina for pleasure craft and a commercial fishing fleet.

The port is very much an alternative point of access should long term road, rail and air transport be disrupted. The port area is at risk from tsunamis, and in the long term from sea level rise. Earthquake damage is a threat to port infrastructure and adjoining assets.

### **Production, Supply and Distribution of Manufactured or Natural Gas**

Natural Gas is supplied to the region by Vectors Gas Pipeline which enters the region from the Bay of Plenty alongside SH2 at the base of Trafford's Hill.

The major threat to gas supply to the region is from disruption to supply outside the region from events such as a significant earthquake in the Bay of Plenty or volcanic activity in Taranaki.

During a significant event, such as an earthquake, maintaining the gas pipeline network in a safe state is very important in protecting the population.

### **Generation and Distribution of Electricity: Eastland Network**

Power is supplied to the region by a single 110kV line connecting Tuai, at Lake Waikaremoana, with Gisborne City.

Eastland Network provides electricity to the region. A 110 kV line links Gisborne to Tokomaru Bay providing electricity to the East Coast. Eastland Network has a network of 50kV lines providing electricity elsewhere in the region. Disruption from flooding within the Poverty Bay Flats and hill country erosion during a range of emergency event can curtail electrical supply to the network.

While lines have been established on stable land damage to lines from slope movement during significant rainfall events is a possibility.

Eastland Network has diesel powered generators at Te Araroa, Ruatoria and Tokomaru Bay.

### **Supply and Distribution of Water**

The Gisborne District Council provides water to the Gisborne urban area. Water is provided from three dams at Mangapoike and a bush catchment in the upper Waingake Catchment, all southwest of the city. After treatment, water is piped 30 kilometres down the Waingake Valley across the Poverty Bay Flats to the city. Water pipes are vulnerable to damage from slope movement and disruption at stream crossings from the dams and bush catchment to the treatment plant and from the treatment plant down the Waingake Valley.

City supply can also be provided from the Waipaoa Augmentation Plant located at Bushmere.

The city water pipe conveys water across the Waipaoa River by way of the Matawhero Bridge. Water reticulation providing specific areas of the city with water are also reliant on pipes being conveyed on city bridges. Two major reservoirs, on Hospital Hill and Knob Hill service part of the city. Both reservoirs are vulnerable to earthquake damage and a significant event could create major disruption to the domestic water supply.

### **Provision of Wastewater and Stormwater**

#### Wastewater

Gisborne District Council provides reticulation, treatment and disposal of wastewater within the Gisborne City urban area. Milli-screened wastewater is currently discharged from a pump station at the seaward end of Stanley Road by an 1800 metre long ocean outfall offshore of Midway Beach. A wastewater treatment plant based on a biological trickling filter followed by ultraviolet disinfection is to be commissioned by the end of 2010 and located in Banks Street in the city's industrial subdivision.

The city reticulation system includes pipes crossing the city's rivers and streams. Pipes are attached to bridges in some instances and submerged below the bed in others. Failure of pipes on bridge crossings will not only result in problems upstream of any failure but potential health issues from direct flow of raw wastewater into the city's streams and rivers.

Te Karaka has a reticulated wastewater system. An oxidation pond provides secondary treatment prior to discharge to the Waipaoa River.

The remainder of the region is dependent on on-site wastewater systems.

### Stormwater

The city area has a stormwater system with multiple outlets to the city's rivers, streams and the ocean.

Stormwater systems have been installed in rural townships including: Hicks Bay, Makaraka, Manutuke, Matawai, Muriwai, Patutahi, Ruatoria, Te Araroa, Te Karaka, Te Puia Springs, Tikitiki, Tokomaru Bay and Tolaga Bay.

These systems provide design, rather than absolute levels of protection hence flooding and ponding during large rainfall events can still occur.

### **Provision of the Telecommunication Network**

Gisborne region is serviced by both Telecom and Vodaphone. Telecom has recently installed a fibre-optic cable from Napier to Gisborne while both companies have micro-wave connections. Rural areas are now predominantly supplied by micro-wave connections. These systems are at threat from power cuts, failure of generators, battery failures and earthquake impacts on micro-wave dishes.

The major threat to telecommunications in the region is overloading during a Civil Defence emergency.

### **Roading Network, including the State Highway**

The roading system, both state highway and Council's network are extremely vulnerable to any natural hazards. The roading network inclusive of bridges and major culverts are prone to disruption from flooding in low-lying areas and where roads are located river valleys throughout the region. Hill country roads are prone to erosion during high intensity rainfall events and prolonged periods of wet weather. Roding networks are vital for restoration of other lifelines and maintaining fuel supplies. Reinstatement is a priority.

The region includes two State Highways:

SH 2 enters the region from Wairoa and Hawke's Bay in the south in the Whararata Ranges. The road continues through the ranges to the southern end of the Poverty Bay Flats to Muriwai and Manutuke before crossing the Waipaoa River at the Matawhero Bridge. The road continues north east to Makaraka and then in a northwesterly direction across the Poverty Flats through Waerenga-a-Hika, Ormond, Kaiteratahi (where it crosses the Kaiteratahi Bridge over the Waipaoa River) and Te Karaka. The highway continues westwards in the Waikohu and Waihuka River valleys and onto Matawai in the Upper Motu catchment. SH 2 leaves the Gisborne region after crossing Trafford's Hill and continues down the Waioeka Gorge to Opotiki.

SH 35 begins at the Matawhero intersection with SH 2, then passes through Gisborne City and northwards along the East Coast through the settlements of Tolaga Bay, Tokomaru Bay, Te Puia Springs, Tikitiki, Te Araroa and Hicks Bay before entering the Bay of Plenty region immediately west of Potaka. SH 35 continues along the Bay Of Plenty coast to Opotiki where it intersects with SH 2.

Tiniroto Road, formerly SH 36 is now administered by Gisborne District Council. Tiniroto Road commences at the Matawhero Roundabout intersection with SH 2 heading west across the Poverty Bay Flats and then a southwesterly direction through hill country and the rural settlements of Waerenga-o-Kuri, Tiniroto and Te Reinga before leaving the District into the Hawke's Bay region.

### **Production, Processing and Distribution of Petroleum Products**

Supply of fuel to the region is very vulnerable. Fuel is delivered by road from Hawke's Bay averaging 34 trucks per week or 1,770 truck movements per annum. Volumes are expected to increase with increased forestry activity.

Under normal demand conditions few outlets have more than five to six day's storage. In a panic buying scenario this declines to two days of storage.

Aviation fuel is supplied by road with four vehicle movements per month from three suppliers.

### **Provision of a Rail Network**

The Palmerston North-Gisborne Railway services and terminates in Gisborne City. The line is operated by Ontrack. The railway enters the region in the Wharerata Ranges and crosses the Poverty Bay Flats including the Waipaoa River before entering the city.

The railway is vulnerable to all natural hazards and reinstatement may well not be an option. Even should reinstatement occur there may be significant time delays. The rail link is not considered a strategic asset during times of emergency. The exception to this is in an event where the road links are curtailed to such an extent that only rail access may be available to provide access outside the region.

The railway bridge across the Waipaoa River was seriously damaged during Cyclone Bola and took some time to repair.

### **FLOOD CONTROL SCHEMES**

The Gisborne District Council administers three flood control schemes:

- ▶ Waipaoa River Flood Control Scheme (WRFCS), built between 1953 and the mid-1960s.
- ▶ Te Karaka Flood Control Scheme (TKFCS), built in 1987-1988.
- ▶ Turanganui-Taruheru Rivers Scheme (TTRS), built in 1998-2002.

These schemes consist of 67 kilometres of stop banks. The gradual loss of capacity due to aggradation of the river bed and berms means there is an increasing risk over time of overtopping in events of lesser rainfall. A review of the scheme is currently underway with a view to increasing stop bank heights from around 2012.

## ECONOMIC ENVIRONMENTS

### Regional Economy

The regional economy is very dependent on primary production. With greater than 90% of the region being hill country traditional land use has been sheep and beef pastoral farming. Plantation forestry has been a significant land use since the 1960's increasing in area to just less than 20% of the region's total area.

The region's arable land makes up less than 10% of the total land area. Soils of the Poverty Bay Flats are very versatile and are intensively utilised to provide a range of highly valuable crops. The flats are closely settled and provide a disproportionate level of income and employment in comparison to their area.

The flats of the Waipaoa and Uawa Rivers are very vulnerable to flooding and inundation during significant rainfall events.

### Growth

Population in the Gisborne urban area is projected to increase by an average of 60 people per annum during the period 2006 to 2026 inclusive and remain stable thereafter.

For the remainder of the region the population is expected to decline by about 1000 people in the period 2006 to 2031 and then stabilise.

Notable projected changes in the population include:

- ▶ An increase in the population aged 65 years and over from 12% in 2006 to 23% in 2031.
- ▶ A decrease between the period 2006 to 2031 in the number of people less than 20 years of age from 34% to 28% of the population.
- ▶ A decrease in the working population aged 20 to 64 from 54% to 49%.
- ▶ As household size decreases, the number of households in the Gisborne urban area is projected to increase by about 100 households per year from 2006 to 2021. An average annual increase of about nine households per year is expected elsewhere in the region.

### Employment

Statistics from March 2008 (Quarterly Review) indicated employment in the Gisborne region at 21,000 employees although there was no breakdown as to full time or part time and seasonal employment.

**Table 3:** The major industries employ the following components of the workforce:

Industry	Employees	Percentage of Total Workforce
Agriculture, Forestry and Fishing	5,720	25.1
Manufacturing	2,320	11.0
Retail Trade	2,310	11.0
Health and Community Services	2,230	10.6
Construction	1,500	7.1

Unemployment in the Gisborne and Hawke's Bay region's equates to 4.5% of the workforce in 2007 and 5.4% of the workforce in 2008. This compares with national percentages of 4.2 % for 2007 and 4.1% for 2008. These figures are the highest regional unemployment percentages in New Zealand.

### Income

Average Hourly Incomes for 2008 are less than the national average for both male and female employees.

**Table 4:** average hourly income - 2008

Average Hourly Incomes for 2008		
	Male	Female
<b>Gisborne</b>	\$21.38	\$20.63
<b>New Zealand</b>	\$25.04	\$21.91

Average weekly incomes were less than the national average for the Gisborne and Hawke's Bay region's during 2006 and 2007.

**Table 5:** average hourly income 2006-2007

	2006	2007	Percentage Change
<b>Gisborne/Hawke's Bay</b>	\$568	\$588	3.5
<b>New Zealand</b>	\$610	\$667	9.3

### Tourism

Tourists are attracted to the region by the summer weather and associated surfing, swimming and diving opportunities.

The many small undeveloped coastal settlements with wild landscapes and secluded beaches attract visitors to the East Coast.

The area has a rich Maori culture evident in all small settlements and Gisborne city.

Gisborne is well known for its wineries and a well known destination for several annual events including Rhythm and Vines at New Year and the Gisborne Wine and Food Festival at Labour Weekend.

Accommodation is available throughout the region particularly in Gisborne city with a number of hotels, numerous motels and two major motor camps. Restaurants and cafes abound throughout Gisborne city.

The seasonal population increase is an important consideration for the Group. Many tourists will be unfamiliar with local hazards and risks.

Education and notification of risks can be provided to tourism operators for distribution to visitors. Provision of strategically placed signs is important in making visitors aware of hazards and risks.

## SIGNIFICANT HAZARDS

### Note: Hazard Probabilities

To avoid the potentially misleading conception created by using terms such as a 1:100 year event to describe event frequency, the hazard descriptions below use the chance (the annual probability) of the event occurring in any one year. To help put these statistics into perspective the following example compares the likelihood of winning the lower divisions of lotto.

4 <sup>th</sup> division	0.013%
5 <sup>th</sup> division	0.206%
6 <sup>th</sup> division	0.275%

### Tsunami

The entire coastline of the Gisborne District is subject to tsunami from a distant or local source. The only credible threats arise from a distant event originating from the west coast of South America, (Chile or Peru) or from a local event generated within 60 to 90 kilometres of the coastline.

There have been twenty-five 'hits' on the East Coast since 1832. Eleven of these have been local and 14 from distant events. Highest known wave heights include local events of up to 10 metres and distant events of about 1–2 metres.

None of these events were seriously damaging although at least 3 of them could have been if they had occurred at different times of day or year or coincided with a high tide.

The mechanisms for causing tsunami are large earthquakes, slow earthquakes, volcanic events, undersea landslides, mud volcanoes and certain meteorological conditions.

For the purpose of developing evacuation plans worst case credible events, that is a maximum run-up at high-tide, a large event is taken as 10 metres in height along the coast and 6 metres in height within Poverty Bay.

It is critical that everyone understands the difference in management requirements for distant and local events. A locally generated event has the potential to cause a significant number of casualties. Such an event could occur very soon after an earthquake, consequently the earthquake itself is the only warning of a potential event and self evacuation is the only option. Whereas a distant event will give between 11 and 14 hours warning and allow sufficient time to formally evacuate those in potential risk areas.

The available data indicates there is a 5% annual probability of a hit by a wave of unknown height, but it is unlikely to be more than a few centimetres. There is a 0.125% chance in any one year of a six metre event in Poverty Bay, however the worst case impacts would occur at high-tide so the chance of significant inundation is further reduced. The annual probability of a 10 metre event is unknown on the coast but it falls within the range of 1.0% to 0.02% a year.

### Drought

The present region's climate trends towards seasonal droughts rather than long-term conditions that cause severe problems.

The current threat of drought in the Gisborne District is more one of inconvenience than of widespread disruption. There is an expectation that dry years may be more frequent in the

future. The decline in pasture production on the East Coast may be less than for other eastern region's due to more rain being predicted during the summer months.

The Eco climate team predicted that pasture production on the East Coast north of Napier would increase over summer.

The changing distribution of rainfall with a reduction of 10% in winter and spring rainfall followed by a predicted increase in summer and autumn rainfall may enable more supplementary summer feed crops to be grown for use over the autumn and winter.

The chance of a drought in any one year is currently 5% but this is expected to rise to 10% by 2030.

### **Flooding/Ponding**

The East Cape has a history of "hits" from decaying tropical cyclones causing widespread disruption and flooding. There are also other events that are more localised and result from weather systems dumping large volumes of rain over a small area. A recent study showed that there is a declining trend in the frequency of these events but the magnitude of such events is increased as more rain is likely to fall.

Most areas north of Ruatoria have a higher average rainfall than the south of the District and can cope with higher rainfall events. The Waikura Valley for example can have 200 millimetres in a 24 hour period with little adverse effect.

The populated areas likely to be worst affected in a large rainfall event are the Poverty Bay Flats, Te Karaka and the area immediately north of Tolaga Bay. More intense localised events such as the Ngatapa Flood in 1985, the Glenroy Flood in 1977 and the Muriwai event of 2002 can also cause substantial local damage.

During a major flood event, when the Waipaoa River and Te Karaka Flood Control Schemes fail, a significant area of the Poverty Bay Flats is subject to ponding. After the water recedes layers of sediment may cause major disruption to crops and infrastructure.

In the city a number of river bank properties are at risk. The extent of flooding depends on the tides, potential overflow from the Waipaoa, storm surges and the flood peak of the Taruheru and Waimata Rivers.

The stop banks at Te Karaka have been raised to protect the township up to an event of 0.5% exceedance. Evacuation of Te Karaka is still an essential consideration as the community can be isolated by flood waters. Immediately west of Te Karaka several tributaries of the Waipaoa River form the main Waipaoa River. These tributaries drain a large area of land and a large intensive event has devastating potential to Te Karaka, the Poverty Bay Flats and Gisborne City.

Upgrading of the Waipaoa River Flood Control Scheme ("WRFCS") is due to start in 2012 with funding included in the Long Term Council Community Plan ("LTCCP").

A major rainfall event is expected somewhere in the District every 10 to 15 years. The return period for an event requiring a Civil Defence declaration is likely to be less than 20 years.

The Cyclone Bola flood in the Waipaoa River has a 1.4% annual probability. The likelihood of such an event increases with ongoing aggradation of debris within the river bed.

## Volcanic Activity

Ash fallout has the potential to be the most disruptive disaster in the District. A 700 year Okataina event could erupt ash intermittently over a three year period. Past ash falls have ranged from millimetres to half a metre in depth. Wind direction and speed could bring ash to this District in less than two hours.

**Table 6:** expected ashfall thickness and annual probability

Source	Thickness (mm)	Frequency (annual probability (%))
Okataina	1 - 150	0.14% - 0.02%
Okataina	1 - 1500	0.14% - 0.33%
White Island	1 - 10	0.1% - 0.02%
Ruapehu	1 - 5	1% - 0.2%
Taupo	1 - 5	0.77% - 0.63%
Taupo	1 - 50	0.77% - 0.63%
Taupo	1 - 600	0.4% - 0.02%
Taupo	100 - 4000	0.02% - 0.01%
Egmont	1 - 2	0.77% - 0.63%

There has not been a significant event from Okataina for about 700 years (10-50mm of ash) or any event from Taupo for about 1,850 years. The last volcanic event to affect the Gisborne District was in 1995 when one to two millimetres of ash fell from Ruapehu. For the purpose of this exercise we would plan for a 15 to 30 millimetre event. There is a 0.5% chance in any one year of an event of such magnitude occurring.

Volcanic activity outside of the District that does not result in ash being deposited locally, especially in the Auckland field, could still have a significant affect on the District through economic and distribution disruption.

## Earthquake

The Gisborne District is in close proximity to a major tectonic plate boundary. This boundary runs parallel to the coast about 60 to 90 kilometres offshore.

The Pacific Plate (eastern) is subducting beneath the Australian Plate (western) which leaves the District susceptible to large earthquakes, although how large these events may be is unknown. The subsequent movement of the plates causes uplift of the East Cape area. This activity has caused many faults to develop both offshore and onshore.

Identification of these faults has come from research but many remain unknown. It is possible that many will only be identified when they next rupture as there is no visible evidence of their existence. These are commonly called blind faults.

Both onshore and offshore earthquakes have the potential to cause tsunamis.

A Modified Mercalli Intensity Scale ("MM") MM8 event occurring at certain times of the day will potentially cause large numbers of casualties and will severely test the ability of emergency

services. This type of event is likely at the limit of what the organisation can plan for. Mitigation through building codes and prudent hazard planning will likely limit the number of casualties.

Liquefaction is a significant effect resulting from an earthquake. Much of the city area and Poverty Bay Flats are susceptible. During an earthquake groundwater mixes with certain soil types resulting in reduced soil strength and toppling of heavy structures and deformation of land and infrastructure.

**Table 7:** return period for earthquakes across the Gisborne District include:

<b>Event</b>	<b>Annual Probability (%)</b>
MM6 Felt by all Objects fall from shelves Slight damage to buildings Loose material may be dislodged from sloping ground	40% - 12%
MM7 General alarm, difficulty standing Furniture moves on smooth floors Trees and bushes shake Some fine cracks appear on sloping ground	8% – 2.4%
MM8 Alarm may approach panic Steering of cars greatly affected Houses not secured to foundations may move Cracks appear on steep slopes	1.7% – 0.6%
MM9 Cracking of ground conspicuous Houses not secured to foundations shifted Land sliding general on steep slopes Liquefaction effects intensified, Lateral spreading and flow sliding nears streams	0.5% – 0.2%
MM10 Land sliding very widespread, large rock masses displaced Liquefaction effects widespread and severe	0.14% - 0.04%

There have been 5 MM7's and 7 MM8's events in the last 90 years. A MM9 event did affect the top of the East Cape in 1914.

A significant earthquake event would be a MM8 event occurring during daylight with school operating and the CBD is busy, or any event greater than MM8.

### **Erosion**

The Gisborne District is geologically unstable and, apart from earthquake impacts, intensive rainfall can cause landslip and deep-seated erosion. Prolonged periods of wet weather can result in gradual slump and earthflow movement as experienced regularly at Busby's Hill. Populated areas notably at Te Puia Springs, Waimata riverbank, Tokomaru Bay, Tuahine Point, Wainui Beach, Makorori Headland, Kaiti Hill and Hospital Hill are at risk. There will also be widespread surface slipping and deep-seated movement on hill country. Land and assets can be severely damaged reducing land use options.

Large volumes of debris contribute sediment to watercourses and inundation of valuable alluvial flats downstream. Reduced flood capacity due to inundation can accentuate the effects of future rainfall events. Locating buildings, assets and infrastructure on the most stable land available will mitigate effects; however damage is inevitable in extreme events and regular occurrences during prolonged wet weather.

It is not practical to predict the annual probability of a large erosion event. The probability of large scale disruption increases with more development being allowed on slopes in close proximity to the city. Strategic planting of forest species, conservation planting and managed reversion will assist in minimising soil erosion, inundation and flooding.

### **Biosecurity**

Pest organisms arriving in the region may impact on economic, environmental, socio-cultural and human health values.

Introduction of pests that damage horticultural production or affect animal health can have direct effects on production and may severely impact on exports from the region. There is a potential for this to occur and further challenges as climate change creates conditions conducive to new pest species.

Ministry of Agriculture and Forestry Biosecurity New Zealand ("MAFBNZ") leads and co-ordinates responses to pest animal organisms and the Ministry of Health in situations where human health is at risk.

### **Human Pandemic Epidemic**

There is a significant difference between normal influenza pandemics and epidemics. Hundreds can die globally in any one year through natural flu pandemics. An epidemic is more significant because of its virulence, mortality rates and the numbers of people affected. It is generally more difficult to control.

A pandemic influenza epidemic is likely to cause the most significant community disruption. This scenario is potentially the most disruptive emergency scenario the Group could face due to local impacts, but also the potential for the epidemic to have wider national and international impacts leaving the local response without support. The District's isolation may mean a disease does not reach the region, however ease of modern travel does minimise the potential to prevent a disease arriving. However, there is also the potential for an event to spread globally before any response is possible as witnessed in the swine flu in 2009.

Other viral, bacterial or influenza pandemics may trigger an emergency response.

### **Information Systems Failure**

The primary reason for Information Technology ('IT') failure is power loss. This can affect phones, computers with all their associated functions such as eftpos, hubs, wireless links and modems. Failures are also possible due to viruses, hackers, hardware failure and operating system failures. Most IT failures are isolated to individual organisations but can be widespread under some scenarios.

The most probable scenarios for a major IT failure causing widespread disruption is a loss of Telecommunications to emergency responders, utility providers, or businesses (all at the same time) or a widespread power outage of more than 2 to 3 days duration.

Society is becoming increasingly dependent on technology. When failures occur disruption can occur quickly resulting in disruption in a very short time.

### **Financial Crisis**

Recent global events suggest there is still potential for a financial crisis to occur. However modern technology allows instant coordination and response between nations that are acutely aware of the need to survive. It is unlikely that impacts could become as severe as they did in the depressions of the 1920s and 30s

### **RISK ANALYSIS**

The risk analysis workshops identified and developed the consequences of significant hazards on the social, built, economic and physical environments using the risk profile template. This analysis assessed the likelihood, consequences and rating of local risks and ranked these risks prior to an actual risk evaluation.

Likelihood of hazard occurrence was considered from a range of the criteria from “almost certain” to “rare” as detailed in Annex J.

Analysis of consequences was considered from a range of criteria from ‘insignificant’ to ‘catastrophic’ and as outlined in Annex J.

These factors are used to determine qualitative risk in a risk analysis matrix. The matrix as outlined in Annex J has six rating levels ranging from ‘insignificant’ to ‘extreme’. These results rate each hazard.

### **SIGNIFICANT RISKS**

The following table outlines the hazards that rated the highest in the risk analysis process and will be the focus of further work according to its significance for the region.

An exception is volcanic ash falling within the District, a scenario of 30 millimetres or greater, for which most of the response and recovery activities will be planned just prior to and ‘on the day’. There are no practical reduction or readiness activities that can occur prior to an event, except there is a Volcanic Contingency Plan to provide guidance as to actions prior to ash falling.

The following table outlines the risks in the region that rated the highest in the risk analysis process. The Gisborne CDEM Group sees those risks as the focus of its activities during the period of this Plan.

**Table 8:** significant ranked hazards

<b>Event</b>	<b>Score</b>
Ashfall - within Group Area	15.5
Flooding	13.3
Local - Tsunami	13
Ponding	12.5
Animal Epidemic	12.05



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<b>Event</b>	<b>Score</b>
Plant & Animal Pests/disease	12.05
Drought	12
Human Pandemic	11.9
Erosion	11.25
Financial crisis	10.7
Earthquake	10.3
Liquefaction	10.3
Ashfall - external to Group	9.85
Information systems failure	9.15