Chapter One

INTRODUCTION

1.1 INTRODUCTION

The New Zealand coast is 18 200 km in length (Rouse *et al*, 2003) and due to New Zealanders' love of the ocean (Stewart *et al*, 2005), and the fact that a large percentage of the New Zealand population lives close to the coast (Rouse *et al*, 2003), there are high numbers of people at any one time located within the coastal area. Hence, New Zealanders are vulnerable to coastal hazards. Hazards such as coastal erosion, flooding, storms/cyclones, and tsunami can all have damaging effects on life and property within the coastal zone. The impact a coastal hazard may have on a community is dependant upon the community's proximity to the coastal zone and, because the world's coastal areas are more heavily populated than inland areas (Small *et al*, 2000), coastal hazards can have a devastating effect on a number of communities.

The Indian Ocean tsunami on 26 December 2004 led many New Zealanders to become more aware of the devastating affects that a tsunami can have on coastal communities (Webb, 2005), and highlighted the need for people living in the coastal zone to be prepared for natural hazard events.

This research looks at community understanding of and preparedness for tsunami hazard in the eastern North Island, New Zealand. In order to achieve this, it is important to consider the following questions:

- Does the public have sufficient knowledge of tsunami hazards in their community?
- Is there adequate information on tsunamis available to the public?
- Does the public have an understanding of tsunami warnings - both natural warnings and human generated warning systems?
- Is the public aware of the correct actions to take in the event of a tsunami warning being issued?
- How prepared are staff in hotels/motels for dealing with natural hazards in the Hawke's Bay tourism sector?

1.2 RESEARCH AIMS AND OBJECTIVES

The principal aim of this investigation was to analyse community understanding of and preparedness for tsunami hazard. This was established by:

1) Surveying visitor understanding of tsunami hazards and warning systems at selected camping grounds along the Hawke's Bay coastline.

2) Surveying staff in hotels/motels on their preparedness for managing natural hazard events in the Hawke's Bay tourism sector.

3) Comparing community understanding of tsunami hazards and warning systems before and after the 2004 Indian Ocean tsunami by resurveying Hawke's Bay and Gisborne residents who participated in the 2003 National Coastal survey.

1.3 STUDY AREA

Hawke's Bay and Gisborne, on the east coast of the North Island, New Zealand were the focus areas for this research. The east coast of New Zealand is at high risk from both local and distantly generated tsunami (Berryman, 2005), and Gisborne and Napier/Hastings have been identified among the most at risk areas in the country (Berryman, 2005).

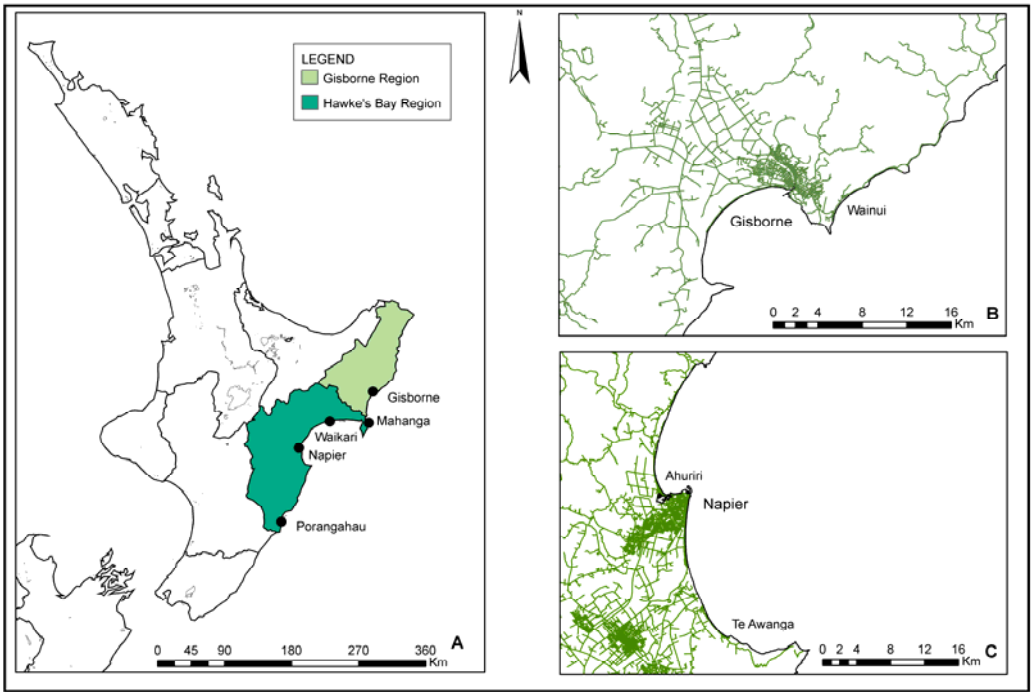


Figure 1: Location of Gisborne (B) and Hawke's Bay (C) on the east coast of the North Island of New Zealand (A).

1.3.1 Hawke's Bay

Hawke's Bay is located on the east coast of the North Island of New Zealand. The city of Napier is the main city of the Hawke's Bay region and at the time of the 2001 census the usual resident population count for Napier city totaled 53,661 (Statistics New Zealand, 2006).

The Hawke's Bay coastline stretches from approximately 5km north of Mahanga beach in northern Hawke's Bay through to approximately 13km south of Porangahau in southern Hawke's Bay, totaling 350km in length (Stevens and Robertson, 2005).

Due to its setting in one of New Zealand's most earthquake prone zones, Hawke's Bay is subjected to a high incidence of earthquakes, and the area is at high risk from both local tsunami, which have been generated from earthquakes associated with the Hikurangi Trench, and from distant source tsunami that have been generated from earthquakes off the coast of South America (Ministry of Civil Defence and Emergency Management, 2005). Between 1840 and 1982 a total of 5 significant tsunamis (>1m) were recorded in Hawke's Bay (de Lange and Healy,

1986). The largest tsunami to affect this region was a 15m tsunami which occurred on 3 February 1931. This was a locally generated tsunami caused by a rotational slump into the Waikari estuary in Northern Hawke's Bay which occurred following the Napier earthquake of 3 February 1931 (de Lange and Healy, 1986). The most damaging tsunami to affect Hawke's Bay in recent times was the tsunami of 22 May 1960. This was a distant source tsunami generated by an earthquake off the coast of South America. It caused considerable damage at Ahuriri and Te Awanga. At Ahuriri a footbridge over the Ahuriri Channel had a 40m gap torn into it and a gas main was damaged in the process. Approximately 17 000m^3 of sand was scoured from the boat harbour. At the Te Awanga camping ground people were swept from their tents and elsewhere in Te Awanga dinghies were swept inland by the waves (de Lange and Healy, 1986; Johnston *et al*, submitted).

Hawke's Bay is a year-round holiday destination popular for its high sunshine hours, the Art Deco architecture, and activities based around the many vineyards and wineries in the region. Visitors to an area often have a significantly lower understanding of tsunami hazard compared with local residents (Johnston *et al*, 2005). This lack of knowledge increases the vulnerability of these people and reinforces the need to educate the general population about tsunami warnings, and how to prepare for, and cope with the effects of a tsunami in Hawke's Bay.

1.3.2 Gisborne

Gisborne is located to the north of Hawke's Bay. In 2001 the usual resident population count for the Gisborne district totaled 43,971 (Statistics New Zealand, 2006) and at this time the Gisborne urban area accounted for 72.1 percent of the entire Gisborne regions population (McDonald and Patterson, 2003). The Gisborne coastline is approximately 712 kilometres in length (Gisborne District Council, 2006) and the location of the Gisborne coast to the west of the Hikurangi subduction zone means that it is at risk from locally generated tsunami. As well as the risk from locally generated tsunami, Gisborne is also at risk from distant tsunami that may occur following an earthquake, volcanic eruption or landslide in other areas of the Pacific Ocean. Since the 1830s the Gisborne region has been impacted on by a total of 11 tsunamis (>1m), 3 of which have been locally generated and 8 which have been distantly generated (Berryman, 2005). In March

and May of 1947 two separate local tsunamis occurred near Gisborne following earthquakes off the east coast of the North Island causing waves up to 10m (Eiby, 1982a). The Gisborne region has been identified as likely to have the highest number of deaths for a 500 year return period tsunami of any area in New Zealand (Berryman, 2005). This makes it vital that the public understand tsunami warnings and know the correct actions to take in the event of a possible local source, or distant source tsunami.

1.4 STUDY APPROACH

This research is broken into three separate studies in order to achieve the objectives outlined above. Chapter 2 gives some background information and presents information on tsunami sources, tsunami in New Zealand, information on hazard vulnerability and people's preparedness for dealing with natural hazards, as well as information on tsunami warnings and evacuation in New Zealand. The camping ground visitor surveys have been presented in Chapter 3. Chapter 4 presents the tourism survey, which looks into the Napier tourism sector's preparedness for managing natural hazard events, and also discusses comparisons between a study conducted in Ocean Shores, Washington State, USA during 2005, and the findings of the 2006 Napier tourism survey. The findings of the 2006 National Coastal survey and a comparison between the 2003 National Coastal survey and the 2006 survey are presented in Chapter 5. Chapter 6 summarises the findings of the three studies in relation to community understanding of, and preparedness for tsunami risk in the eastern North Island, New Zealand, and makes some recommendations.

Chapter Two

BACKGROUND INFORMATION

2.1 INTRODUCTION

In 2003, a national survey of people living in and visiting coastal communities around New Zealand was conducted in order to determine people's awareness and perceptions of natural hazards, and their preparedness to deal with them (Johnston *et al*, 2003). This survey had a special focus on coastal erosion and tsunami. Following the devastating Indian Ocean Tsunami on 26 December 2004, tsunami have received considerable attention in New Zealand and in December 2005 two reports were released by the Ministry of Civil Defence and Emergency Management; providing information on New Zealand's risk from tsunami hazard and the preparedness of New Zealanders to deal with these often devastating events (Berryman, 2005; Webb, 2005).

This chapter presents a general overview of the two reports, information on tsunami sources, tsunami in New Zealand, some background information on hazard vulnerability and people's preparedness for dealing with natural hazards, tsunami warnings and evacuation.

2.2 THE TSUNAMI REPORTS

In January 2005 the New Zealand Government requested more information on New Zealand's risk from tsunami and the preparedness of New Zealanders to deal with such a hazard (Berryman, 2005). The Ministry of Civil Defence and Emergency Management (MCDEM) commissioned the Institute of Geological & Nuclear Sciences (GNS) to provide two reports. The first report known as the Science Report summarizes the current state of knowledge of tsunami in New Zealand and uses that knowledge to assess the varying levels of risk at both a national and a regional level (Berryman, 2005). The second report, known as the Preparedness Report looks at the current tsunami warning arrangements in New Zealand at both national and regional levels, compares these arrangements with the levels of risk derived from the Science Report, and makes recommendations for improving the management of tsunami risk at both a national and a regional level (Webb, 2005). The preparedness report by Berryman (2005) estimated that Gisborne will have the highest number of deaths for

a 500-year return period tsunami event out of 10 centres (Gisborne, Napier/Hastings, Christchurch, Wellington region, Dunedin, Auckland region, Whakatane, Tauranga, Timaru, and Nelson). Gisborne is closely followed by Napier/Hastings, Christchurch, and the Wellington region. These results can be viewed in table 2.1.

Table 2.1: Ranking of losses (mortality) and tsunami sources for a 500 year return period (10% probability in 50 years). (Source: Berryman, 2005).

ranking of 10 centres	estimated deaths			
according to mortality	low	median	high	predominant tsunami sources
Gisborne	110	440	2100	global ≈ local
Napier/Hastings	69	320	1300	local > global
Christchurch	60	280	1500	global » local
Wellington region	15	188	1678	local » global
Dunedin	16	160	920	global » local
Auckland region	24	122	519	almost entirely global
Whakatane	20	74	210	global » local
Tauranga	11	51	260	global » local
Timaru	8	24	76	almost entirely global
Nelson	5	10	27	local » global
National	**2900**	**5500**	**10,000**	**global > local » regional**

It is important to note that these values assume that no warning has been issued of the impending tsunami, and are based on night-time population data (Berryman, 2005). This high risk indicates that it is important for people located in coastal communities around New Zealand to be aware of, and to be educated about the tsunami risk in their area in order to adequately prepare for a tsunami.

2.3 TSUNAMI

Tsunami is the Japanese word for harbour wave or waves (Dudley and Lee, 1988; Alexander, 1993; Bryant, 2001). A tsunami is a long period gravity wave (Ridgeway, 1984; de Lange and Healy, 2001), which occurs when a large volume of water is rapidly displaced. Tsunamis are generated from disturbances of the ocean floor (Intergovernmental Oceanographic Commission, 1987; Hume *et al*, 1992; de Lange, 1998) which cause the entire water column from the sea bed to the ocean surface to be affected (Berryman, 2005). The main sources of tsunami generation are large submarine or coastal earthquakes, volcanic eruptions, submarine landslides,

landslides from adjoining cliffs, and meteor impact (Bryant, 2001; Berryman, 2005). The initial disturbance of the sea floor can create a series of waves which radiate outwards until the waves either collide with the coast or are dissipated (Ridgeway, 1984; Berryman, 2005). A tsunami behaves as a shallow water wave in all water depths and has a deep water wave height, a period and a wave length (Bryant, 2005). Tsunamis have a wave period between 6-60 minutes (de Lange, 2003). As the water depth that the wave is traveling in decreases, the wavelength also decreases and the height of the wave increases (de Lange, 2003). This increase in wave height occurs because as the wave travels into shallower water depths the energy in the wave is being concentrated into a smaller volume of water (Ridgeway, 1984). Tsunamis have a maximum wave height of < 0.5m in the deep ocean, but this can increase to > 30m as the wave enters shallow water (de Lange, 2003).

2.3.1 Tsunami sources

Tsunamis can be categorized as distant, regional, or local source. Berryman (2005) defines a distant source tsunami as a tsunami that is generated more than 3 hrs travel time from New Zealand, a regional source tsunami as a tsunami that has a travel time between 1 and 3 hours from New Zealand, and a local source tsunami as a tsunami that originated between 0-60 minutes travel time from the New Zealand coast.

Tsunamis reaching the New Zealand coast from distant sources have generally traveled from areas in the Pacific Ocean such as off the west coast of South America, or less frequently from the Tonga-Kermadec region (Eiby, 1982b). Regional source tsunami originate from earthquakes or volcanoes in the tectonically active regions north of New Zealand (e.g. Vanuatu, Tonga, and the Kermadec Islands), and from areas to the south of New Zealand between 50-60°S (Berryman, 2005). Local source tsunamis are the most common tsunami to impact on the New Zealand coast (de Lange and Healy, 1986). Most local tsunami events in New Zealand have been associated with earthquakes (de Lange and Healy, 1986). A number of locally generated tsunamis have occurred along the New Zealand coast in the past with the most well-observed local source tsunamis in New Zealand occurring near Gisborne during March and May 1947 (Eiby, 1982b). The highest tsunami waves to reach the New Zealand coast have all been generated from local sources (de Lange and Healy,

1986) which increases the risk to coastal communities around New Zealand because to date there are no warning systems in place in New Zealand for locally generated tsunami.

2.3.2 Historical Tsunami in New Zealand

Historically New Zealand has been impacted on by a number of tsunami. De Lange and Healy (1986) identified 32 tsunami events which impacted on the New Zealand coast between 1840 and 1982, however this has since been updated to 44 between the 1820's and May 2006 (Unpublished GNS Tsunami database, 2006), and Goff and Chagué-Goff (2001) discuss evidence of a number of paleotsunami events dating back as far as 6300BP. In the past the east coast of the North Island has been subjected to a number of both locally and distantly generated tsunami (de Lange and Healy, 1986). Most coastal regions of New Zealand have experienced some impact from tsunami. However, most tsunami have impacted only on the east coast of the country. This region is one of the most seismically active regions around New Zealand due to its location approximately 150 km to the west of the subduction boundary between the Pacific and Australian plates (Chagué-Goff *et al*, 2002), and the exposure of the country to tsunami of pan-pacific origins (de Lange and Healy, 1986). New Zealand earthquakes rarely cause significant tsunamis (Gusiakov, 2005). However, several tsunamis in the New Zealand historical record have been caused by local earthquakes. The 1855 Wairarapa earthquake generated a tsunami with maximum wave run-up of 10m in eastern Palliser Bay and 4-5m at locations in the Wellington region and along the northern Marlborough coast (Eiby, 1982a), the Napier earthquake of 3 February 1931 caused a rotational slump into the Waikari estuary in northern Hawke's Bay which caused a local tsunami with a recorded estimated run-up of 15.2m (Bryant, 2001) and in 1947 two separate local tsunamis with maximum wave heights of approximately 10m occurred near Gisborne following earthquakes off the east coast of the North Island during March and May 1947 (Eiby, 1982a). Figure 2.1 shows damage caused by the March, 1947 event near Gisborne.

Figure 2.1: Debris at Turihara north of Gisborne following a local source tsunami on 26 March 1947 (Source: Hawke's Bay Regional Council, 2006).

The two largest distant source tsunami to arrive at the New Zealand coast followed earthquakes off the coast of Chile in 1868 and 1960 (Walters *et al*, 2006; de Lange and Healy, 1986). Figure 2.2 shows damage to the Ahuriri footbridge in Napier following the 1960 Chilean tsunami. Of the 32 historical tsunamis identified by de Lange and Healy (1986), one fatality has been recorded. This fatality occurred on the Chatham Islands during the tsunami of 15 August 1868 where it has been reported that one person drowned (Laing, 1954; Eiby, 1968).

Figure 2.2: Damage to the Ahuriri footbridge in Napier following the 1960 Chilean tsunami. (Source: The Daily Telegraph, 1960).

2.3.3 Tsunami Risk in New Zealand

Risk can be calculated as the outcome of the probability of an event occurring and a measure of the consequences of an event (Centre for Advanced Engineering, 1997). The risk of a tsunami is present for all coastal areas of New Zealand (Eiby, 1968). Berryman (2005) found that New Zealand is subject to relatively high levels of risk from a tsunami, and this risk is still present even if tsunami warning systems are in place. The impact that a tsunami will have on our coastlines increases each year with increasing development along our coastal margins, and it can be expected that future tsunamis worldwide will have a greater impact (both social and economic impacts) on coastal communities than tsunami have done in the past (Intergovernmental Oceanographic Commission, 1987; Paras-Carayannis, 1988; de Lange, 2003).

2.4 RISK PERCEPTION

How people perceive risk is important in predicting how members of a community will prepare for hazards and respond in the face of a hazard (Drabek, 1996; Peacock *et al*, 2005). However, following a natural disaster a community's collective memory will fade following long periods with no hazard occurring (Woo, 1999). The behavior of individuals in the face of a hazard is governed by their perception of risk. Previous experience, cultural conditioning, and personal traits are all likely to affect and influence an individual's perceived risk (Drabek, 1996; Espiner, 1999; Anderson-Berry, 2003), however it is only when a person perceives a hazard as critical that the hazard is likely to motivate them into taking protective behaviour (Paton, 2003).

Risk is related to vulnerability (Papathoma *et al*, 2003), and the way in which people perceive risk and the fact that people often perceive risk in different ways than other members of the same community, can mean that some people can become more vulnerable to natural hazard events than other members of the community who are facing the same ordeal (Twigg, 2003).

2.5 HAZARD VULNERABILITY

Vulnerability can be defined as a person or group of people's ability to predict, resist, cope with, and recover from the impact of a natural hazard (Blaikie *et al*, 1994). People in coastal communities are vulnerable to the threat of tsunami because of their close proximity to the ocean. Visitors to an area generally have little knowledge of hazards associated with the area they are visiting compared to resident populations, hence, they become more vulnerable in the face of a hazard event (Drabek, 1994). Wisner (2004) identifies a number of groups who are typically vulnerable in any hazard situation in any given location. These groups include residents of group accommodation (people living in apartment blocks or hostels where emergency evacuation can be hindered due to the number of people trying to evacuate the building), the elderly (particularly the frail), physically or mentally disabled people, ethnic minorities (due to language barriers), large concentrations of children (such as kindergartens or schools), homeless people, and tourists. Preparation and education can help to reduce community vulnerability.

2.6 TSUNAMI PREPAREDNESS

In order to reduce community vulnerability and increase resilience, it is necessary for community members as well as central and local government authorities to be adequately prepared to deal with a hazard. The false-alarm tsunami warning for the east coast of New Zealand following an earthquake off Tonga on 4 May 2006 raised concerns over New Zealanders' level of preparedness (The Gisborne Herald, 6 May 2006 p. 1) and less than a fortnight after this event a report by Chen, Palmer and Partners was released (Neville, 2006), which called for immediate changes to be made to the Governments emergency management plan. The report labeled the New Zealand government's emergency planning as "unlawful, unclear, and insufficient" (Neville, 2006). On 17 May 2006 an international exercise- 'Exercise Pacific Wave '06' was conducted for all countries surrounding the Pacific Ocean in order to evaluate communication links for message dissemination. This was the first international Pacific-wide tsunami warning test conducted, and 40 countries from around the Pacific took part (ICG-PTWS, 2006). The exercise placed all countries in

the Pacific Basin in a distant source tsunami warning situation. In New Zealand the exercise was led and coordinated by the Ministry of Civil Defence and Emergency Management (MCDEM). Local Civil Defence Emergency Management (CDEM) groups and other organizations (NZ Police, NZFS, MoH, GNS Science, NIWA, NELC, University of Waikato, and Auckland University) participated in the format and the aims and objectives of the exercise. The scenario for New Zealand focused on a magnitude 9.2 earthquake off the central Chilean coast. For all countries that participated in the exercise the time scale was compressed by a factor of 4, meaning that each hour in real time covered 4 hours in scenario time, however CDEM groups around New Zealand decided that the compressed time factor of 4 was not practical to achieve the New Zealand objectives and it was therefore decided to run the scenario in real time for the first 4 hours, and then revert to a compressed time factor of 2. This allowed for the scenario 15 hour wave approach period to occur within a time frame of 9 hours (Ministry of Civil Defence & Emergency Management, 2006). At a regional level CDEM groups received National advisories/warnings and information from MCDEM who had received the information from the PTWC. CDEM groups then activated the appropriate regional management groups, and following interaction with the MCDEM, considered and assessed all of the available information. It had been decided that the exercise would not involve the public and therefore no public warning systems would be issued (Ministry of Civil Defence & Emergency Management, 2006). Overall the exercise was reported a success, with 80% of the national CDEM participating in the exercise. The National report claims that only positive comments from participants were received in relation to conducting the exercise. However, the scientific advisors disagree with this and found that their input was largely ignored, and the resulting decisions were poor (de Lange, W. 2007, pers. comm..; 2 February). The national report found that it was also felt that compressing the scenario time frame had a negative impact on the quality of the information that was produced. Therefore, it was recommended that future exercises must as far as possible be conducted in real time (Ministry of Civil Defence & Emergency Management, 2006).

Previous studies of a communities' tsunami preparedness include Johnston *et al*, (2003) and Johnston *et al,* (2005). The National Coastal Community Survey in 2003

was one of the first of its kind in New Zealand in which residents from 42 New Zealand coastal communities were surveyed in order to build a picture into the social dynamics at work in coastal communities, and community members' perceptions of, and preparedness for managing coastal hazards. In 2005 a survey of over 300 residents and non-residents along the west coast of Washington State was conducted to determine respondents' perceptions of tsunami risk. This study found that levels of tsunami preparedness amongst members of the community was low to moderate, although hazard education has been relatively successful in terms of promoting awareness of tsunamis and residents of coastal Washington have good access to information on tsunami hazards.

In recent years New Zealand has begun to prepare more effectively for natural disasters through the introduction of the Civil Defence and Emergency Mangement Act 2002 (Webb, 2005), and the release of the tsunami reviews in 2005. In June 2006 New Zealand television began to screen advertisements advising the public on how to prepare for a natural disaster, which will hopefully lead to higher levels of understanding and preparedness amongst the public in the event of a natural hazard event in New Zealand. In October 2006 a new online database, 'Readynet' was launched for Lower Hutt City that could help communities respond in the face of an emergency. The database collects information from community groups, schools and resthomes for emergency services to access, and during a disaster will send mass text alerts to the public with details and advice (Watt, 2006). Many other similar initiatives have been undertaken by CDEM groups over the past four years to improve community resilience (Johnston, D, 2007, pers. comm., 2 February).

2.7 TSUNAMI WARNINGS

Warning systems are vital in order to reduce the risk to life and damage to property from the devastating effects of a tsunami. Tsunami warnings allow for potentially devastating effects of wave inundation at coastal communities to be mitigated by action by hazard managers and local authorities. The more accurate the warnings are, the more effective emergency actions can be and therefore, more lives and property can be saved (Titov *et al*, 2005). Until the event of the Indian Ocean Boxing Day

2004 tsunami, the most devastating ocean-wide tsunamis of the previous 200 years had all occurred in the Pacific Ocean (Bryant, 2001). Following the Alaskan tsunami of 1946, a tsunami warning system for the Pacific was established by the United States government. This warning system was initially known as the Seismic Sea Wave Warning System; however by 1948 this had evolved into the Pacific Tsunami Warning Centre (PTWC). These warnings were initially issued only for the United States and Hawaiian regions, but following the Chilean earthquake of 22 May 1960, the warnings were extended to include all countries around the Pacific Ocean (Bryant, 2005). The PTWC is designed to provide rapid notification of any tsunami threat to members of the International Tsunami Warning System for the Pacific (ITSU) (Rabinovich and Stephenson, 2004).

On 26 December 2004, the PTWC issued an earthquake bulletin following the Sumatran earthquake. Initial data put the magnitude of the earthquake at 8.0, and it wasn't until new data arrived that the magnitude of the quake was revised to 8.5 and a tentative local tsunami warning was issued. This warning was issued almost an hour after the initial quake had occurred. At the time there were no established protocols in place to communicate this warning to authorities in the affected countries, and a lack of wave instrumentation in the Indian Ocean (such as the Deep Ocean Assessment and Reporting Tsunami (DART) buoys, or tidal gauges with telemetry), which operate in the Pacific Ocean, meant that the PTWC was unaware of the exact characteristics of the wave. It was not until Internet news reports arrived that the suspected tsunami was confirmed (King, 2005).

Ideally warning systems detect impending disaster and pass this information to people at risk, allowing them to make decisions and take action in the face of disaster (Sorenson, 2000). At present early tsunami warning systems in New Zealand are only in place for distant source tsunami (Webb, 2005). There is not always time for warnings to be issued following a possible tsunami generating earthquake. If an earthquake occurs locally the first tsunami waves could occur within as little time as 30 minutes following the earthquake (Washington Military Department, 2006). It is therefore important that members of the public are made aware of what the natural signs that a tsunami may have been generated are.

2.7.1 Natural tsunami warning signs

Natural signs of tsunami help to provide warning of an impending tsunami in areas where no official tsunami warning system exists, or for local source tsunamis where there is no time for an official tsunami warning to be issued (Gregg *et al*, 2007). Natural signs that a tsunami may have been generated include ground shaking from an earthquake, unusual sounds, unusual wave forms, and unusual sea-level variations (e.g. a receding of the shoreline) (Gregg *et al*, 2006). In many instances natural signs may be the only warning that occurs. Therefore, it is necessary that the public are adequately educated about what these natural warning signs are and act accordingly.

2.8 EVACUATION

The term evacuation can be used to describe the mass departure of people from a certain area because of a real or anticipated threat or hazard (Vogt and Sorensen, 1992). In the event of an impending natural hazard not all people in a community will evacuate. Evacuation research indicates that whether or not a person evacuates from an area in the event of a hazard depends on a number of factors including perception of risk, previous experience of a natural hazard (Peacock *et al*, 2005), the severity of the threat, and whether or not a warning had been received and understood (Baker, 1991). There has been very little research conducted into evacuation of visitors from areas where a hazard has occurred (Drabek, 1996).

2.8.1 Evacuation in New Zealand

There have been two incidents in the past of the New Zealand public evacuating following official tsunami warnings. The first occurred in May 1960 and the second in March 1964 (de Lange, W.P. 2006, pers. comm., 14 December). The most well remembered evacuations occurred following the May 1960 official warning, and the unofficial tsunami warning which occurred following the Tongan earthquake on 4 May, 2006.

Evacuation following the 1960 Chilean Earthquake and tsunami

On 22 May 1960 at 19.11 UT (Universal Time) an earthquake occurred in southern Chile (Johnston *et al*, Submitted). The magnitude of the earthquake was estimated to be about 8.5 (Dudley and Lee, 1988), but has since been revised to 9.5 (de Lange,

W.P. 2007, pers. comm.., 2 February). This earthquake generated a tsunami that swept across the Pacific Ocean and caused major loss of life in Chile, Hawaii and Japan. The tsunami arrived in New Zealand without warning on the evening of 23 May 1960 (NZST) and caused widespread damage in a number of coastal communities. Fortunately no loss of life occurred (Johnston *et al*, In Press). Three days later (NZST) on 26 May 1960 a large aftershock occurred in Chile and fears following the earlier tsunami led to the broadcasting over radio of a nationwide tsunami warning in New Zealand. This warning resulted in a number of East Coast communities evacuating to higher ground. Also some schools in low-lying areas were closed and the children either sent home or to higher ground (Johnston *et al*, Submitted). Along with those who evacuated to safe areas, there are also reports of 'sightseeing' in a number of coastal communities with members of the public moving into risky areas to observe the approaching tsunami (Johnston *et al*, Submitted). Figure 2.3 shows residents gathering at the Napier wharf to watch the expected tsunami.

Figure 2.3: Residents of the Napier community gathering at the Napier wharf to await the arrival of the expected tsunami following an aftershock earthquake in Chile, May 1960

Evacuation following the unofficial tsunami warning on 4 May, 2006

At 3.27am (NZST) on Thursday 4 May 2006 an earthquake occurred off the coast of Tonga. Initially the earthquake was reported as having a magnitude of Mw 8.1 on the which lead to the Pacific Tsunami Warning Centre in Hawaii issuing a tsunami warning for the east coast of New Zealand approximately 15 minutes after the earthquake. Just over an hour after the earthquake, the PTWC issued a second bulletin revising the earthquake magnitude down to magnitude 7.8 (Downes *et al*, 2006) and at this stage the warning for New Zealand was cancelled (Waikato Times, 4 May 2006, p. 1).

The devastating tsunami of 26 December 2004 and related media coverage possibly made people more aware of the effects a tsunami can have on a region- and may have contributed to some people in the Gisborne and Hawke's Bay areas self-evacuating following early information issued by the BBC and CNN news channels that a tsunami had been generated. Several hundred people did move to high ground (Figure 2.4) or inland that morning (Waikato Times, 4 May 2006, p. 1; The Gisborne Herald, 6 May 2006 p. 1). However, it appears that many people did not respond in the correct way and instead headed to the beach (Waikato Times, 4 May 2006, p. 1).

A phone survey of Gisborne and Napier/Hastings residents was conducted over the following 2 weeks in order to establish what percentage of the population heard about the warnings and self-evacuated following the media warnings, and to establish the different sources that information came from, and what led to people making the decisions they made on that morning. Initial findings show that approximately 2% of Gisborne residents who were surveyed reported some form of evacuation behaviour (one person evacuated to a nearby hill, and another person started to collect together supplies but then heard that the warning had been cancelled and stopped). No one from the Napier/Hastings area reported any form of evacuation behaviour. In Gisborne, 61% of those surveyed reported receiving information about the warning, with 31% giving phone calls as the first source of information. This contrasts with only 16% of those surveyed in Napier/Hastings who reported receiving information about the warning, with 7% of Napier/Hastings surveyed residents reporting that

phone calls were their first source of information (Leonard, G. 2006, pers. comm., 4 October).

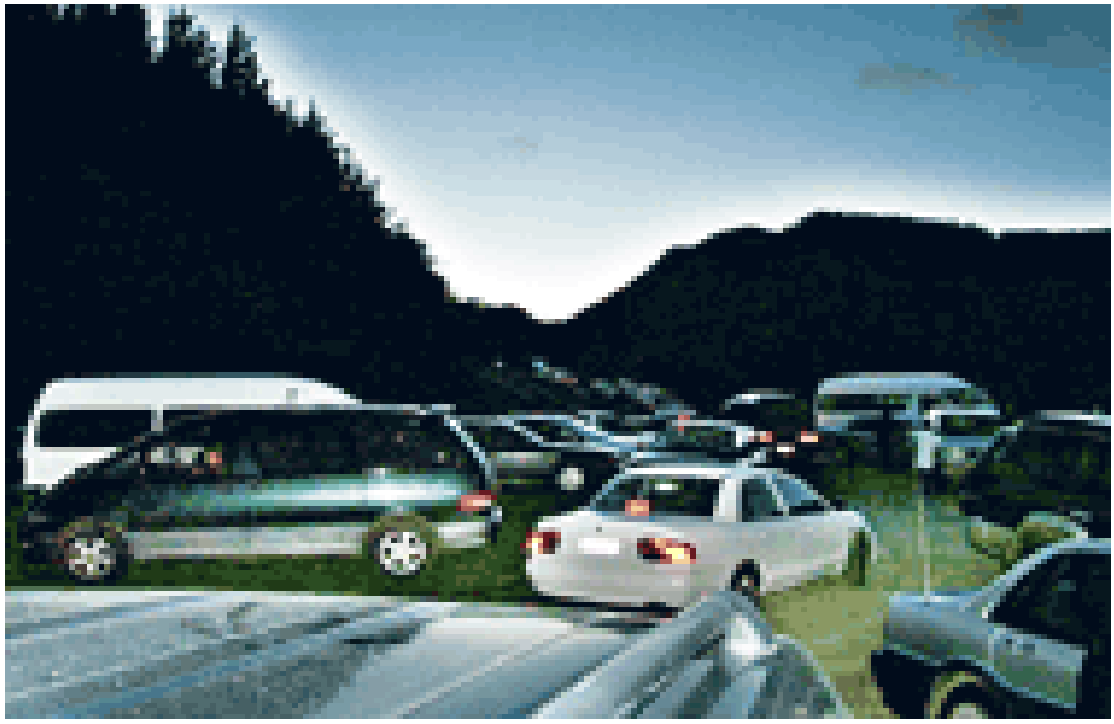


Figure 2.4: A number of Gisborne residents gather on Waimata Valley Hill following news of an approaching tsunami on the morning of Thursday 4 May 2006. Source: The Gisborne Herald, 6 May 2006 p.1.

2.9 SUMMARY

Hawke's Bay and Gisborne are among the most at risk areas from tsunami inundation in the country (Berryman, 2005), and are at risk from both locally generated and distant source tsunami (Eiby, 1982a; de Lange and Healy, 1986; Berryman, 2005). The following chapters present three separate surveys conducted in Gisborne and Hawke's Bay during 2006. These studies examine community understanding of, and preparedness for tsunami hazard.

Chapter Three

CAMPING GROUND VISITOR SURVEYS

3.1 THE CAMPING GROUND SURVEYS

It is likely that visitors to a region have little understanding of natural hazard events in the area they are visiting. Therefore, they are made vulnerable because they have not been informed of potential hazards in the region, or what actions to take should a natural hazard occur.

The camping ground survey was designed to obtain information on how visitors to camping grounds in Hawke's Bay understand tsunami risk in the area. It looks at specific aspects associated with visitor understanding of tsunami hazard such as understanding of warnings (both natural warning signs and official warning systems), what actions to take in the event of a tsunami warning, and who they feel is responsible for issuing official tsunami warnings. The survey also looks at how peoples' perceptions may have changed following the Sumatran earthquake and consequent tsunami on 26 December 2004.

The results of this survey can be used by GNS Science and the Hawke's Bay Regional Council to gain an understanding of visitor perceptions of tsunami risk in Hawke's Bay.

3.1.2 Site description of the camping grounds

The five camping grounds used for the survey are Bay View Snapper Holiday Park, Westshore Holiday Park, Kennedy Park Motor Camp, Te Awanga camping ground, and Clifton Motor Camp. Figure 3.1 shows the location of each site.

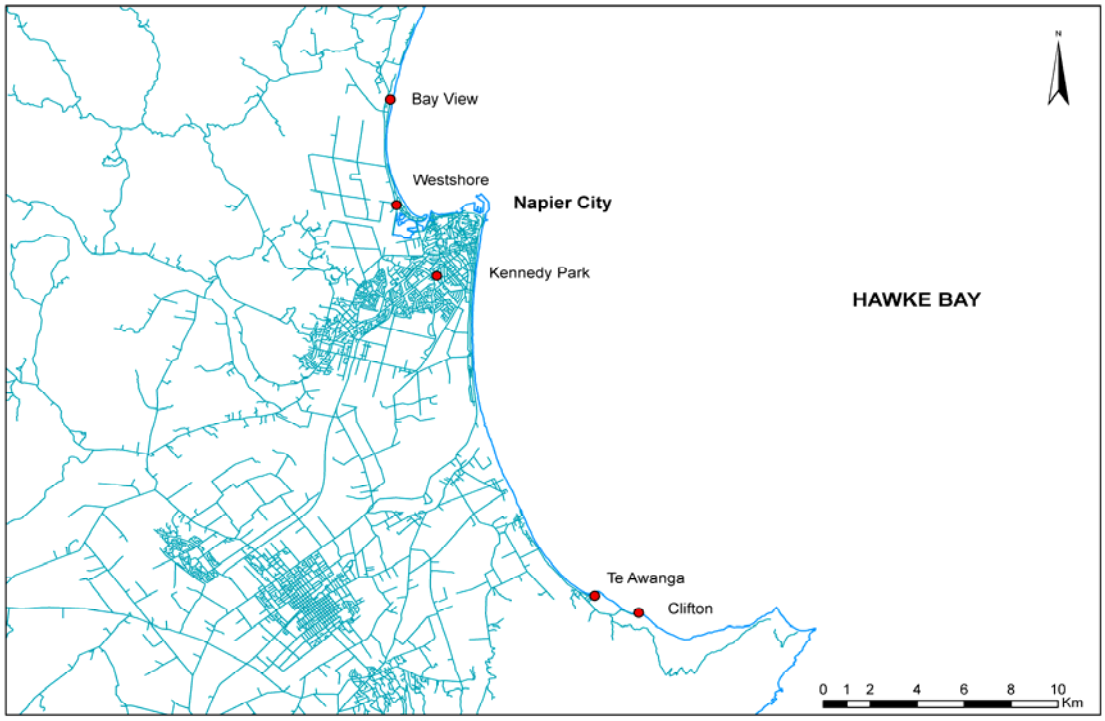


Figure 3.1: Location of camping grounds in Hawke's Bay.

3.2 METHODS

The specific objectives of the camping ground visitor survey were (1) to assess visitors knowledge of tsunami risk in the area they are visiting; (2) to assess how prepared visitors are to deal with tsunami events; (3) to assess visitor understanding of tsunami warnings in Hawke's Bay; (4) to assess what actions visitors would take in the event of a tsunami warning, and what their understanding of tsunami travel times is; and (5) to assess how visitors perceptions of tsunami may have changed following the Sumatran earthquake and tsunami on 26 December 2004.

Specific questions were drawn up to address these objectives and the draft was subjected to a consultation process. The finalized questionnaire was completed in December 2005 and consisted of a total of 26 questions addressing the set objectives. A copy of the camping ground visitor survey can be seen in appendix A.

110 interviews were conducted at 5 camping grounds in the Napier, Hawke's Bay area between January and March 2006. Visitors were randomly selected from people

present in the camping grounds. Interviews were face-to-face and each survey took approximately 10-15 minutes to complete. The questions in the survey were separated into 5 categories: personal information; knowledge of risk; preparation and warnings; during a tsunami; and changes in perception.

Following completion of the interviews each survey question was coded and the data were entered and analysed using SPSS version 13.

3.3 RESULTS FOR THE CAMPING GROUND SURVEYS

This section presents the results for the camping ground surveys. Except where stated, the results have been presented as a total for all camping grounds. Tabulated results for the camping grounds can be seen in Appendix B. The results are drawn from the responses of 110 individuals at 5 camping grounds within Hawke's Bay.

The results section is divided in five broad categories for ease of interpretation. The first section describes the sample in terms of personal information such as visitor type, number of days on average they spend visiting the camping ground, number of years on average they have been visiting for, where they originate from, gender, age, and whether they have had any previous tsunami experience. The following sections examine knowledge of risk, preparation and warnings, what actions visitors would take in the event of a tsunami, and how perceptions have changed since the Indian Ocean tsunami on 26 December 2006.

3.3.1 PERSONAL INFORMATION

Visitor type

Visitor types have been separated into 4 distinct groups: overnight visitors (e.g. those respondents who spend at least one night at the camping ground), day visitors (those respondents who are visiting the camping ground for the day only), permanent residents and employees. The majority (80.9%) of respondents at all camping grounds were overnight visitors, 3.6% were day visitors, 10% were permanent

residents and 5.5% were employees.

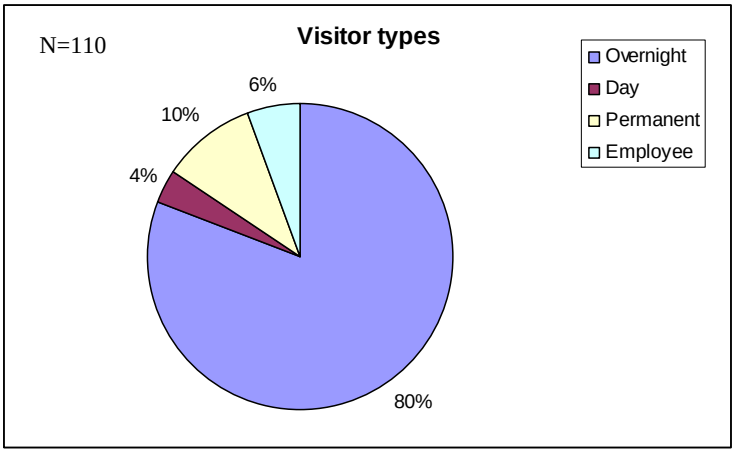


Figure 3.2: Percentage of each visitor type.

Number of days on average spent at the camping ground

Overnight visitors spend an average of 19.4 days per year at the camping grounds. Day visitors spend an average of 1 day per year visiting. As can be expected permanent residents and employees spend considerably more days per year visiting, the average number of days permanent residents spend at the camping grounds is 292 days, and employees spend an average of 279 days per year.

Number of years visiting

On average overnight visitors have been visiting the camping grounds for 6.6yrs (range1-13 years), day visitors have been visiting for 0.6 years (range 1-2 years), permanent residents 4.8 years (range 3-9 years), and employees 6.4 years (range 1-20 years).

Visitor origin

Most respondents (49.1%) originated from elsewhere in New Zealand. However, a large proportion (46.4%) live in the Hawke's Bay region. Only 4.5% of those surveyed were from abroad. These results can be further broken down by respondent type. 100% of respondents who originated from abroad were overnight visitors as opposed to being day visitors, permanent residents or employees. Of those respondents who originated from elsewhere in New Zealand the majority (87%) were

overnight visitors, 5.6% were day visitors, and 5.6% were employees. 72.5% of respondents from the Hawke's Bay region were overnight visitors, 2% were day visitors, 21.2% were permanent residents, and 5.9% were employees.

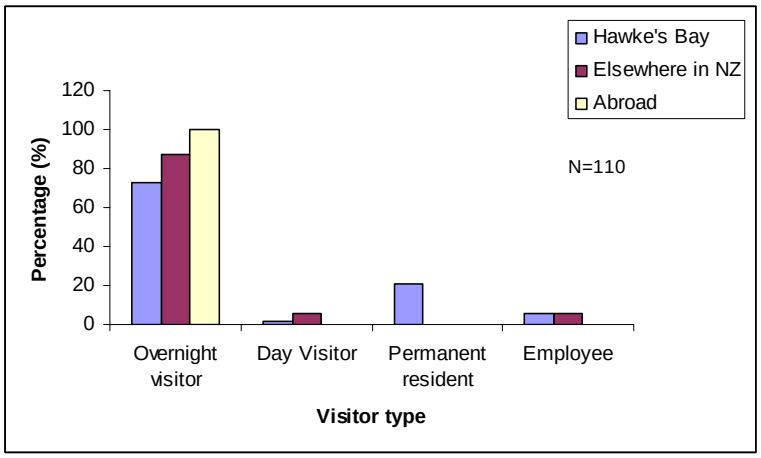


Figure 3.3: Percentage of where visitors originate from.

Gender

There was a relatively even spread of males and females surveyed. 55.5% of respondents were male compared to 44.5% who were female.

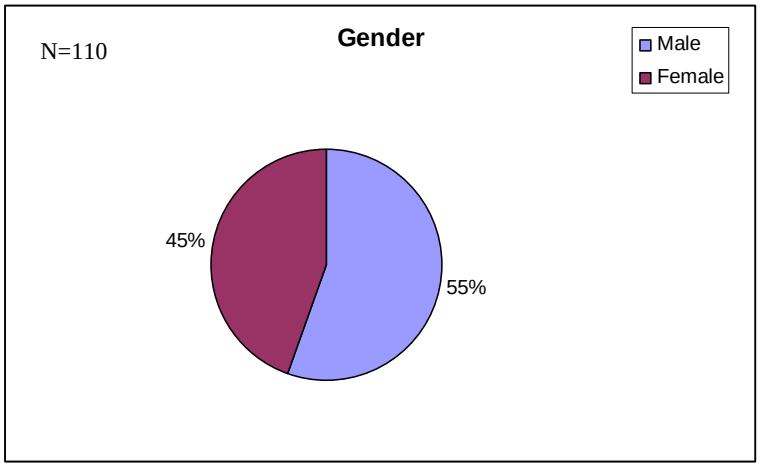


Figure 3.4: Percentage of males and females

Age

The majority (51.8%) of respondents were in the 51+ age group. 2.7% were aged 18-20 years, 11.8% 21-30 years, 16.4% 31-40 years, and 17.3% were aged 40-50.

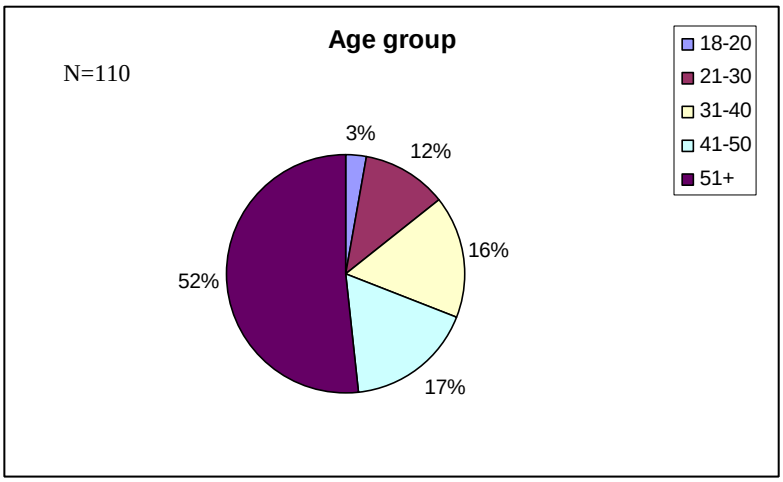


Figure 3.5: Percentage of respondents in each age group.

Previous tsunami experience

When asked whether they had had previous tsunami experience the majority of respondents (91.8%) answered 'no'. It is interesting to compare age group with those respondents who answered 'yes' (3.6%) or said that they had experienced a false tsunami warning (4.5%). It was found that all respondents who answered that they had had some previous tsunami experience were in the 51+ age group. All respondents who answered that they had had previous tsunami experience indicated that this related to the 1960 Chilean tsunami.

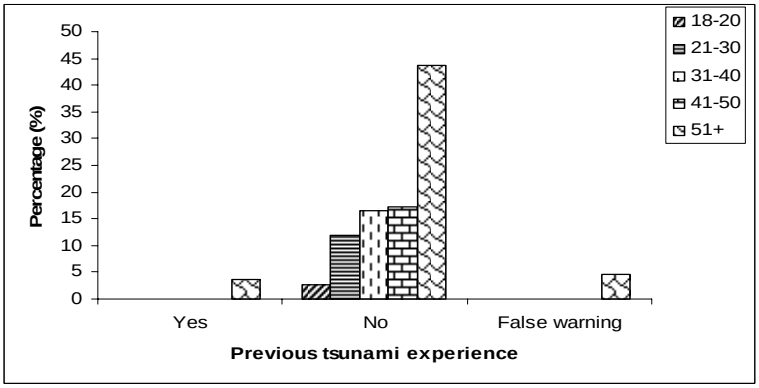


Figure 3.6: Comparison of age group versus previous tsunami experience.

3.3.2 KNOWLEDGE OF TSUNAMI RISK

This section investigates respondent's knowledge of tsunami risk in relation to the camping ground they are visiting, their understanding of when the last tsunami that caused damage in Hawke's Bay occurred, and their perception of when they think the next tsunami will occur in Hawke's Bay.

Visitor perception of how likely tsunami are to affect the camping ground

Westshore camping ground had the highest percentage (78.5%) of respondents who thought that a tsunami was likely to affect the area. This was closely followed by Bay View camping ground (72.7%), and Kennedy Park camping ground (71.4%). Of the respondents at Clifton camping ground only 69% of respondents thought that a tsunami was likely to affect the area, while at Te Awanga camping ground only 57.1% thought that a tsunami was likely to occur. It is interesting to further separate the responses by visitor type at each camping ground. Table 3.1 shows the percentage of each visitor type at each camping ground who thought that a tsunami would be likely to affect the area.

Table 3.1: Percentage of each visitor type who thought a tsunami would be likely to affect the camping ground

		Visitor type				
		Overnight visitor	Day visitor	Permanent resident	Employee	Total
Kennedy Park	N	9	1	0	0	10
	% within Location	90.0%	10.0%	.0%	.0%	100.0%
	% of Total	11.5%	1.3%	.0%	.0%	12.8%
Te Awanga	N	3	0	1	0	4
	% within Location	75.0%	.0%	25.0%	.0%	100.0%
	% of Total	3.8%	.0%	1.3%	.0%	5.1%
Bay View	N	19	0	4	1	24
	% within Location	79.2%	.0%	16.7%	4.2%	100.0%
	% of Total	24.4%	.0%	5.1%	1.3%	30.8%
Westshore	N	6	3	1	1	11
	% within Location	54.5%	27.3%	9.1%	9.1%	100.0%
	% of Total	7.7%	3.8%	1.3%	1.3%	14.1%
Clifton	N	24	0	2	3	29
	% within Location	82.8%	.0%	6.9%	10.3%	100.0%
	% of Total	30.8%	.0%	2.6%	3.8%	37.2%
Total	N	61	4	8	5	78
	% within Location	78.2%	5.1%	10.3%	6.4%	100.0%
	% of Total	78.2%	5.1%	10.3%	6.4%	100.0%

Last damaging tsunami that occurred in Hawke's Bay

Respondents at each of the 5 camping grounds were asked when they thought the last tsunami that caused damage in Hawke's Bay occurred. 4.5% of respondents thought that a damaging tsunami had never occurred in Hawke's Bay, 0.9% thought in the last 1-10 years, 30% thought in the last 10-100 years, 0.9% thought in the last 100-1000 years, and 63.6% of respondents indicated that they did not know when the last damaging tsunami had occurred in Hawke's Bay. Table 3.2 shows the separation of responses by each visitor type.

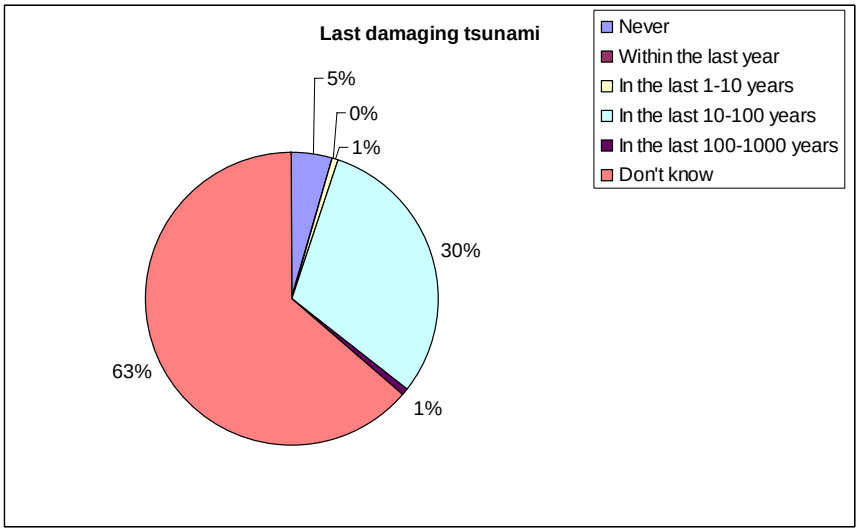


Figure 3.7: Visitor understanding of when the last damaging tsunami occurred in Hawke's Bay

Table 3.2: Responses of when each visitor type thought that the last damaging tsunami occurred in Hawke's Bay

	Visitor type									
	Overnight visitor		Day visitor		Permanent resident		Employee		Total	
	N	%	N	%	N	%	N	%	N	%
Never	4	4.5%	0	.0%	0	.0%	1	16.7%	5	4.5%
Within the last year	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
In the last 1-10 years	1	1.1%	0	.0%	0	.0%	0	.0%	1	.9%
In the last 10-100 yea	26	29.2%	2	50.0%	3	27.3%	2	33.3%	33	30.0%
In the last 100-1000 y	1	1.1%	0	.0%	0	.0%	0	.0%	1	.9%
Don't know	57	64.0%	2	50.0%	8	72.7%	3	50.0%	70	63.6%
Total	89	100.0%	4	100.0%	11	100.0%	6	100.0%	110	100.0%

Timeframe in which a tsunami could occur in Hawke's Bay

When asked when the next tsunami could occur in Hawke's Bay 26.4% of respondents answered that it could occur while they are visiting, 1.8% answered within the year, 30% thought in the next 1-10 years, 32.7% thought in the next 10-100 years, 6.4% answered not within 100 years, and 2.7% answered that a tsunami will never occur in Hawke's Bay.

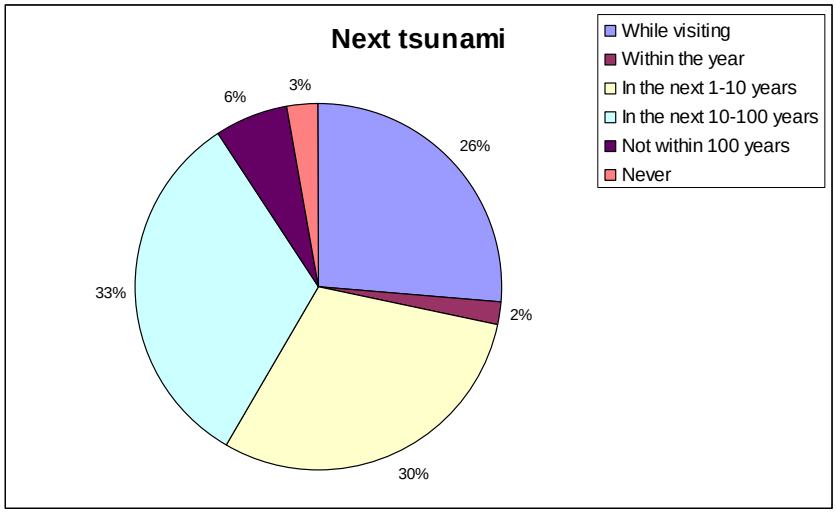


Figure 3.8: Timeframe in which camping ground visitors think that the next tsunami might occur.

Table 3.3 gives a breakdown of when each of the different visitor types thinks that the next tsunami might occur in Hawke's Bay. This is useful, as by separating the respondent types it is possible to gain an understanding into how permanent residents and employees responses may differ from visitors' responses. This may help to determine levels of understanding of employees, which can help in determining the preparedness of camping ground staff for managing possible tsunami events in the future.

Table 3.3: Responses of when each visitor type thinks that the next tsunami might occur in Hawke's Bay

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
While visiting	26	29.2%	1	25.0%	1	9.1%	1	16.7%
Within the year	2	2.2%	0	.0%	0	.0%	0	.0%
In the next 1-10 years	23	25.8%	3	75.0%	4	36.4%	3	50.0%
In the next 10-100 years	30	33.7%	0	.0%	5	45.5%	1	16.7%
Not within 100 years	5	5.6%	0	.0%	1	9.1%	1	16.7%
Never	3	3.4%	0	.0%	0	.0%	0	.0%
Total	89	100.0%	4	100.0%	11	100.0%	6	100.0%

3.3.3 PREPARATION AND WARNINGS

This section looks at respondents' preparedness for tsunami hazard and their understanding of tsunami warnings. It investigates from where respondents may have actively sought information, or heard or received information about tsunamis from,

where they think New Zealand tsunami come from, who they think is responsible for issuing tsunami warnings (both locally generated tsunami warnings and distantly generated tsunami warnings), whether they think that New Zealand has a tsunami warning system, what they think the New Zealand tsunami public notification system consists of, what they think is the most effective way of delivering a tsunami warning to the public, if they know what the natural signs of a tsunami or signs that a tsunami may have been generated are, and the order in which they would prefer to receive a tsunami warning.

Actively sought information on tsunamis

Only a very small percentage (7.3%) of respondents had actively sought information on tsunamis. Figure 3.9 shows where respondents had actively sought information on tsunamis from.

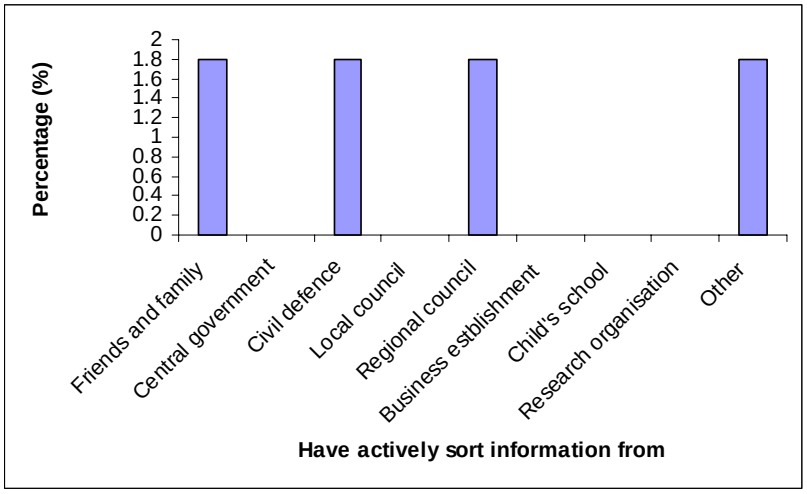


Figure 3.9: Sources from which camping ground visitors have actively sought information about tsunamis from.

It is interesting to note (Table 3.4) that very few overnight visitors had sought information on tsunamis, and permanent residents had not sought any information on tsunamis. Only 2 employees had actively sought information on tsunamis which causes some concern as employees would be the first contact point for many people visiting camping grounds.

Table 3.4: Breakdown of responses into where respondents had actively sought information on tsunamis from by visitor type

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Friends/Family	2	2.2%	0	.0%	0	.0%	0	.0%
Central Government	0	.0%	0	.0%	0	.0%	0	.0%
Civil Defence	0	.0%	1	25.0%	0	.0%	1	16.7%
Local Council	0	.0%	0	.0%	0	.0%	0	.0%
Regional Council	1	1.1%	0	.0%	0	.0%	1	16.7%
Business establishmen	0	.0%	0	.0%	0	.0%	0	.0%
Child's school	0	.0%	0	.0%	0	.0%	0	.0%
Research organisation	0	.0%	0	.0%	0	.0%	0	.0%
Other source	2	2.2%	0	.0%	0	.0%	0	.0%

Heard or received information on tsunamis from

28.1% of visitors had heard or received information about tsunamis from some source. Figure 3.10 shows from what sources respondents had heard or received information on tsunamis from. Other sources that visitors had heard or received information on tsunamis from were the media, campground staff, EQC, and the Hawke's Bay Aquarium.

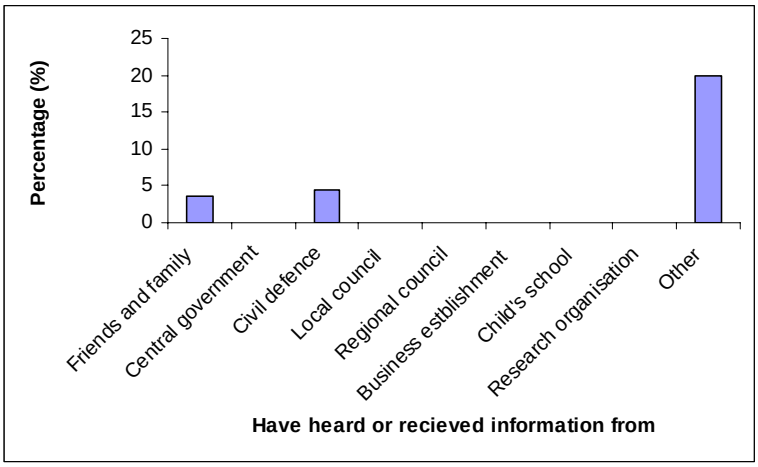


Figure 3.10: Sources where visitors have heard or received information on tsunamis from.

Table 3.5: Breakdown of responses into where respondents had heard or received information on tsunamis from by visitor type

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Friends or family	3	3.4%	0	.0%	1	9.1%	0	.0%
Central Government	0	.0%	0	3	0	.0%	0	.0%
Civil Defence	4	4.5%	0	.0%	0	.0%	1	16.7%
Local Council	0	.0%	0	.0%	0	.0%	0	.0%
Regional Council	0	.0%	0	.0%	0	.0%	0	.0%
Business establishment	0	.0%	0	.0%	0	.0%	0	.0%
Child's school	0	.0%	0	.0%	0	.0%	0	.0%
Research organisation	0	.0%	0	.0%	0	.0%	0	.0%
Other source	20	22.5%	0	.0%	1	9.1%	1	16.7%

As with the previous question asking where respondents had actively sought information on tsunamis from, very few had heard or received information from any source. There was a greater percentage of overnight visitors opposed to other respondent types who had heard or received the most information from any source.

New Zealand Tsunami

When asked where they thought New Zealand tsunami come from 38.2% of respondents interviewed indicated that they did not know. 27.3% said that they came from the Pacific Ocean, 16.4% said from South America, 8.2% said from Chile, 0.9% said that they came from Asia, 1.8% said from Australia, 0.9% said from the tropics, 0.9% said from Tonga, 0.9% said from the Hikurangi Trench, 2.7% said they came from earthquakes, and 1.8% said they came from landslides.

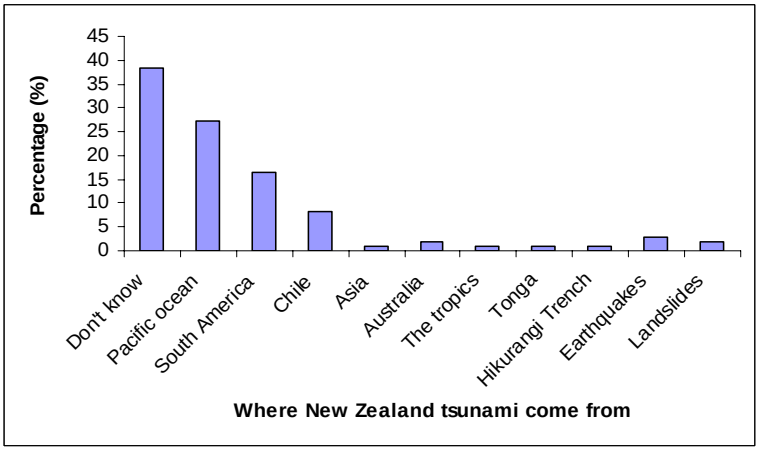


Figure 3.11: Where respondents think that New Zealand tsunami come from.

Understanding the source of New Zealand tsunamis is relatively low amongst all respondent types. Table 3.6 shows the breakdown into respondent type.

Table 3.6: Breakdown by respondent type of where respondents think that New Zealand tsunamis come from

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Don't Know	32	36.0%	1	25.0%	5	45.5%	4	66.7%
Pacific Ocean	24	27.0%	2	50.0%	3	27.3%	1	16.7%
South America	16	18.0%	1	25.0%	1	9.1%	0	.0%
Chile	9	10.1%	0	.0%	0	.0%	0	.0%
Asia	1	1.1%	0	.0%	0	.0%	0	.0%
Australia	1	1.1%	0	.0%	0	.0%	1	16.7%
The tropics	1	1.1%	0	.0%	0	.0%	0	.0%
Tonga	0	.0%	0	.0%	1	9.1%	0	.0%
Hikurangi Trench	1	1.1%	0	.0%	0	.0%	0	.0%
Earthquakes	3	3.4%	0	.0%	0	.0%	0	.0%
Landslide	1	1.1%	0	.0%	1	9.1%	0	.0%

Distant-source tsunami warnings

When asked ‘who do you think is responsible for issuing distant-source tsunami warnings to you?’ 10% of respondents said that they did not know, 20.9% said that Central Government was, 22.7% said Regional Council, 13.6% said Local Council, 61.8% said that Civil Defence was responsible, 8.2% said local police or fire service, 1.8% said NIWA, 2.7% said GNS, 0.9% said that no one can, and 17.3% said that

some other source was responsible. Other answers were the Metservice, the Pacific Tsunami Warning Centre (PTWC), the coastguard, and the media (radio/ TV news). In some instances respondents gave multiple answers.

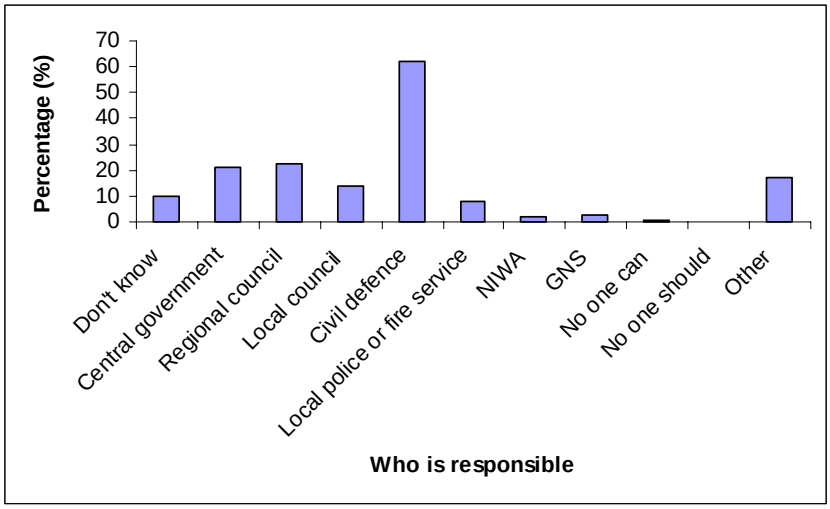


Figure 3.12: Who is responsible for issuing distant-source tsunami warnings.

The majority of employees surveyed indicated that they did not know who is responsible for issuing distant source tsunami warnings (Table 3.7), which causes concern as the majority of respondents surveyed said that they would expect some form of warning, or evacuation from camp ground staff. A smaller percentage of employees opposed to other respondent types indicated that they thought distant source tsunami warnings are issued by Central Government, Regional Councils and Civil Defence.

Table 3.7: Breakdown of respondent type showing who different respondent types think is responsible for issuing distant-source tsunami warnings

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Don't know	6	6.7%	0	.0%	2	18.2%	3	50.0%
Central Government	19	21.3%	1	25.0%	2	18.2%	1	16.7%
Regional Council	21	23.6%	3	75.0%	0	.0%	1	16.7%
Local Council	13	14.6%	2	50.0%	0	.0%	0	.0%
Civil Defence	59	66.3%	2	50.0%	6	54.5%	1	16.7%
Local Police or Fire Service	8	9.0%	1	25.0%	0	.0%	0	.0%
NIWA	2	2.2%	0	.0%	0	.0%	0	.0%
GNS	3	3.4%	0	.0%	0	.0%	0	.0%
No one can	0	.0%	0	.0%	1	9.1%	0	.0%
No one should	0	.0%	0	.0%	0	.0%	0	.0%
Other	17	19.1%	0	.0%	2	18.2%	0	.0%

Local-source tsunami warnings

When asked 'who do you think is responsible for issuing local-source tsunami warnings to you?' 10% of respondents admitted that they did not know, 4.5% said Central Government, 27.3% said Regional Council, 20% said Local Council, 61.8% said that Civil Defence was responsible, 10% said local police or fire service, 0.9% said NIWA, 4.5% said that no one can, and 6.4% indicated that some other source is responsible. Other sources were the radio and TV news.

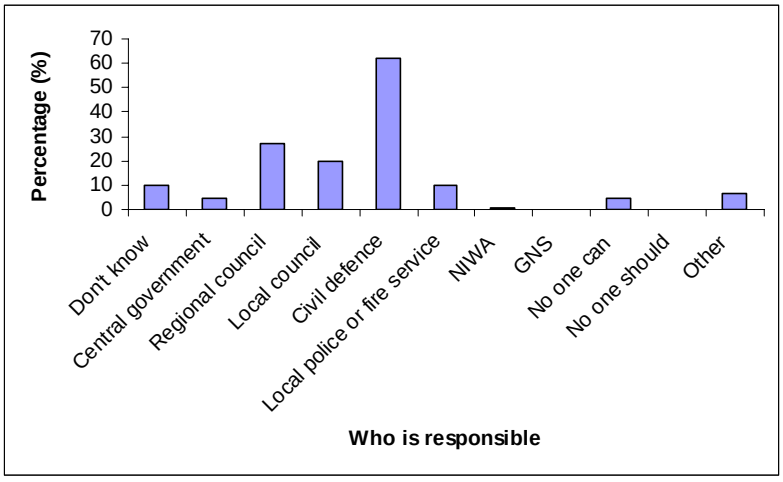


Figure 3.13: Visitor understanding of who is responsible for issuing local-source tsunami warnings.

It is interesting to note that although employees had little understanding of who is responsible for issuing distant source tsunami warnings, their understanding of who is responsible for issuing local source tsunami warnings is greater, with the majority indicating that the Regional Council and Civil Defence are responsible for issuing local source tsunami warnings to them (Table 3.8).

Table 3.8: Breakdown of respondent type showing who different respondent types think is responsible for issuing distant-source tsunami warnings

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Don't know	9	10.1%	0	.0%	2	18.2%	0	.0%
Central Government	5	5.6%	0	.0%	0	.0%	0	.0%
Regional Council	25	28.1%	2	50.0%	0	.0%	3	50.0%
Local Council	18	20.2%	1	25.0%	2	18.2%	1	16.7%
Civil Defence	54	60.7%	3	75.0%	7	63.6%	4	66.7%
Local Police or Fire Service	9	10.1%	1	25.0%	1	9.1%	0	.0%
NIWA	1	1.1%	0	.0%	0	.0%	0	.0%
GNS	0	.0%	0	.0%	0	.0%	0	.0%
No one can	4	4.5%	0	.0%	1	9.1%	0	.0%
No one should	0	.0%	0	.0%	0	.0%	0	.0%
Other	7	7.9%	0	.0%	0	.0%	0	.0%

Tsunami warning system

When asked if New Zealand has a tsunami warning system the majority (53.6%) of respondents said that they did not know. 35.5% said that New Zealand does have a tsunami warning system, and 10.9% of respondents said that New Zealand does not have a tsunami warning system.

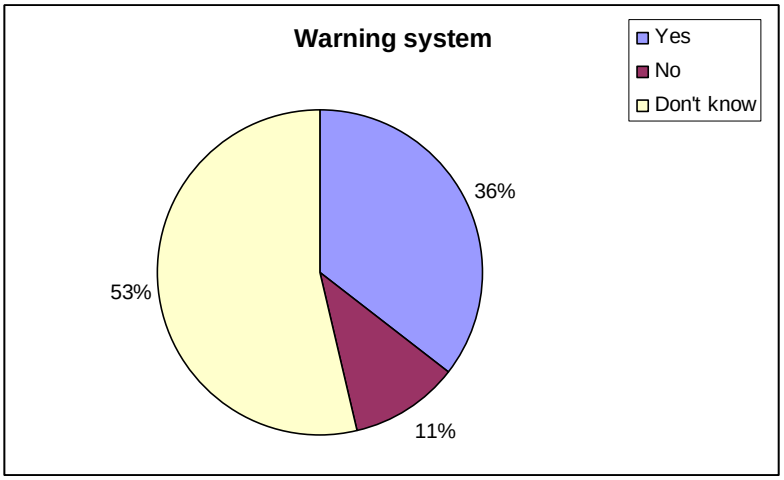


Figure 3.14: Respondents understanding of whether or not New Zealand has a tsunami warning system.

Around half of overnight visitors and permanent residents said that New Zealand does have a tsunami warning system, while all of the day visitors and employees both answered that New Zealand does not have a tsunami warning system, or they did not know if it has a tsunami warning system. Table 3.9 shows the breakdown of understanding of whether New Zealand has a tsunami warning system into respondent type.

Table 3.9: Breakdown into respondent type showing respondent understanding of whether New Zealand has a tsunami warning system

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Yes	34	38.2%	0	.0%	5	45.5%	0	.0%
No	6	6.7%	2	50.0%	1	9.1%	3	50.0%
Don't know	49	55.1%	2	50.0%	5	45.5%	3	50.0%

The New Zealand public warning notification system

When asked what the New Zealand public warning notification system consists of the majority of respondents (55.5%) indicated that they did not know. Other answers were radio warnings (13.6%), TV announcements (3.6%), and Sirens (36.4%). 2.7% of respondents answered that the New Zealand public notification system consisted of some other type of warning. These people said that it consisted of the Pacific

Tsunami Warning Centre (PTWC) or Civil Defence, but they did not specify how the public was notified.

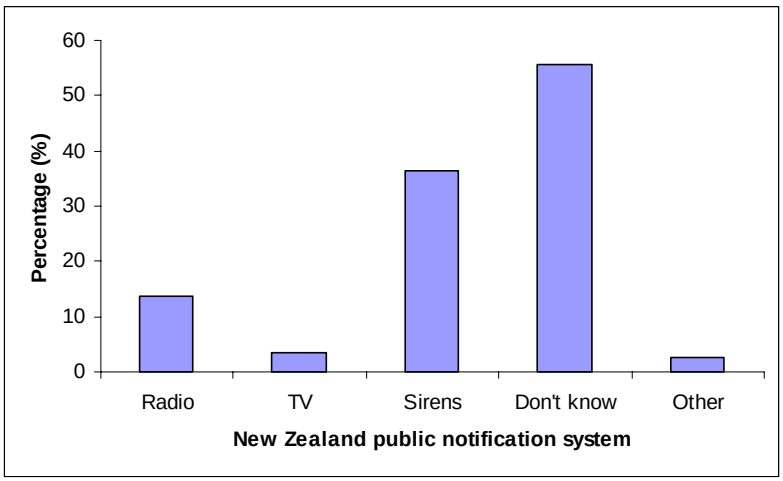


Figure 3.15: Respondents understanding of the New Zealand public warning notification system.

Overnight visitors and permanent residents had the greatest understanding of what the New Zealand public tsunami warning notification system consists of (Table 3.10). The majority of employees surveyed indicated that they did not know which is of concern due to employees often being the first contact point for a number of camping ground visitors. This issue is further explored in Chapter 4.

Table 3.10: Breakdown into visitor type of what respondents think the New Zealand public warning notification system consists of

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Radio announcements	9	10.1%	0	.0%	5	45.5%	1	16.7%
TV announcements	3	3.4%	0	.0%	1	9.1%	0	.0%
Sirens	34	38.2%	1	25.0%	4	36.4%	1	16.7%
TXT message announcements	0	.0%	0	.0%	0	.0%	0	.0%
Newspaper announcements	0	.0%	0	.0%	0	.0%	0	.0%
Internet warnings	0	.0%	0	.0%	0	.0%	0	.0%
Don't know	48	53.9%	3	75.0%	6	54.5%	4	66.7%
Other	2	2.2%	0	.0%	1	9.1%	0	.0%

Most effective way of delivering a warning

Respondents were asked what they thought was the most effective way of delivering a tsunami warning to the public. The majority (69.1%) said that they thought sirens would be the most effective way of delivering a warning. Other ways which people thought would be most effective were radio (16.4%), television (1.8%), the internet (0.9%), TXT message (0.9%), Loud speakers (1.8%), word of mouth (0.9%), the fire service/ local police warning people (2.7%), loud shouting (0.9%), media coverage (1.8%), and a helicopter with loud speakers flying around warning people (1.8%). 0.9% of respondents answered that they did not know what the most effective way of warning people would be.

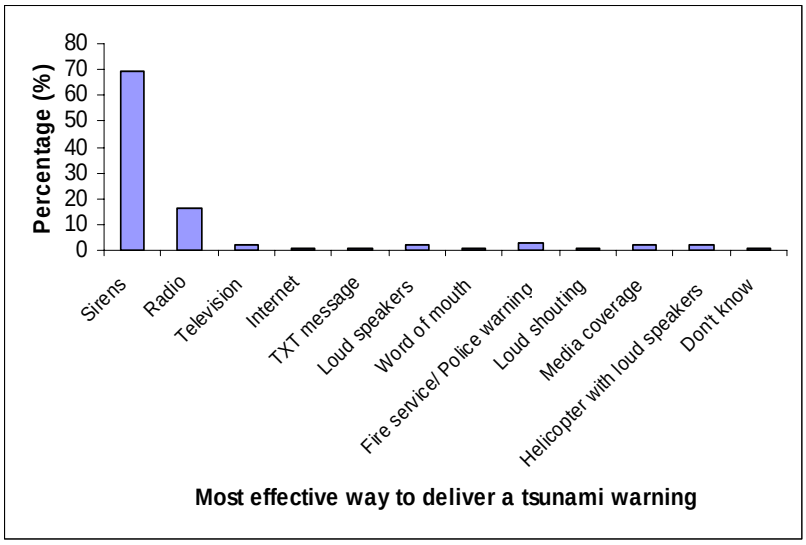


Figure 3.16: Respondents ideas of the most effective way of delivering a tsunami warning

Respondents ideas as to the most effective way for receiving a tsunami warning was similar across all respondent types (Table 3.11) with the majority of all respondent types indicating that they thought the most effective way of delivering a tsunami warning was by siren. Although sirens are the most common form of public notification, they are a relatively difficult option to make effective due to maintenance and testing requirements, and the difficulty associated with developing understanding and response (Leonard *et al*, 2006).

Table 3.11: Breakdown into respondent type of the most effective way of delivering a tsunami warning

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Sirens	61	68.5%	2	50.0%	9	81.8%	4	66.7%
Radio	14	15.7%	2	50.0%	1	9.1%	1	16.7%
Television	1	1.1%	0	.0%	0	.0%	1	16.7%
Internet	1	1.1%	0	.0%	0	.0%	0	.0%
TXT message	1	1.1%	0	.0%	0	.0%	0	.0%
Loud speakers	2	2.2%	0	.0%	0	.0%	0	.0%
Word of mouth	1	1.1%	0	.0%	0	.0%	0	.0%
Fire service/Police warnir people	3	3.4%	0	.0%	0	.0%	0	.0%
Loud shouting	1	1.1%	0	.0%	0	.0%	0	.0%
Media coverage	2	2.2%	0	.0%	0	.0%	0	.0%
Helicopter with loudspeal	2	2.2%	0	.0%	0	.0%	0	.0%
Don't know	0	.0%	0	.0%	1	9.1%	0	.0%

Natural signs of a tsunami

In many cases natural signs may be the only warning that exists. For example in areas where no official warning system is set-up, or in the instance of a local-source tsunami where there is no time to issue an official tsunami warning (Gregg et al, 2006a). When asked what the natural signs of a tsunami are, or signs that a tsunami may have been generated, the majority (67.3%) of respondents said that receding water was a natural sign, 14.5% said an earthquake, 6.4% said a large wave, 3.6% said that birds flying away was a natural sign, 11.8% indicated that they did not know, and 10.9% answered other. Other answers included higher than usual tides, calm seas, animals moving inland, and a rumbling noise.

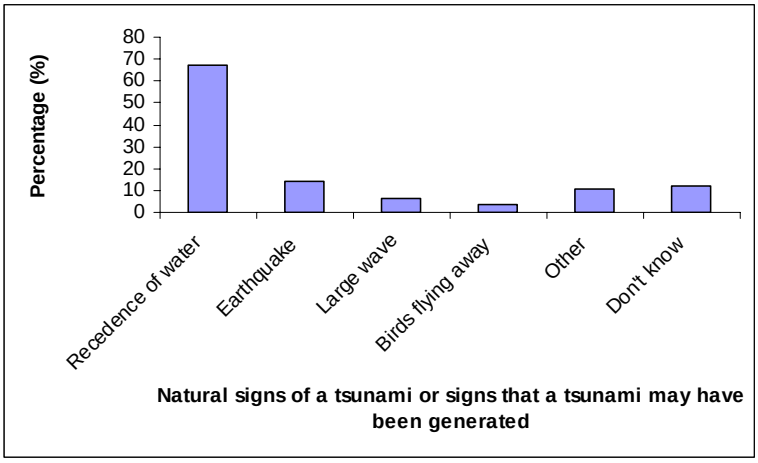


Figure 3.17: Respondents understanding of the natural signs of a tsunami, or signs that a tsunami may have been generated.

The majority of all respondent types believed that they natural signs of a tsunami, or signs that a tsunami may have been generated is receding water or an earthquake. Table 3.12 shows the breakdown of understanding into each respondent type.

Table 3.12: Breakdown into respondent type showing respondents understanding of the natural signs of a tsunami or signs that a tsunami may have been generated

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Recedence of water	60	67.4%	4	100.0%	7	63.6%	3	50.0%
Earthquake	10	11.2%	1	25.0%	2	18.2%	3	50.0%
Large wave	7	7.9%	0	.0%	0	.0%	0	.0%
Birds flying away	4	4.5%	0	.0%	0	.0%	0	.0%
Loud noise of water	0	.0%	0	.0%	0	.0%	0	.0%
Don't know	8	9.0%	0	.0%	4	36.4%	1	16.7%
Other	11	12.4%	0	.0%	1	9.1%	0	.0%

Preference for receiving a tsunami warning

Respondents were asked to list their preference for receiving a tsunami warning. Preferred warning methods that respondents indicated were: radio, TV, media, siren, TXT message, newspaper, internet, police, and other. Other preferred warnings included helicopters with loud speakers, loud speaker announcements, Civil Defence notification, official verbal warnings, and notification from camping ground staff. As can be seen in figure 3.18 sirens were by far the most preferred method of receiving a warning with over 70% of respondents answering that sirens were their preferred method for receiving a tsunami warning.

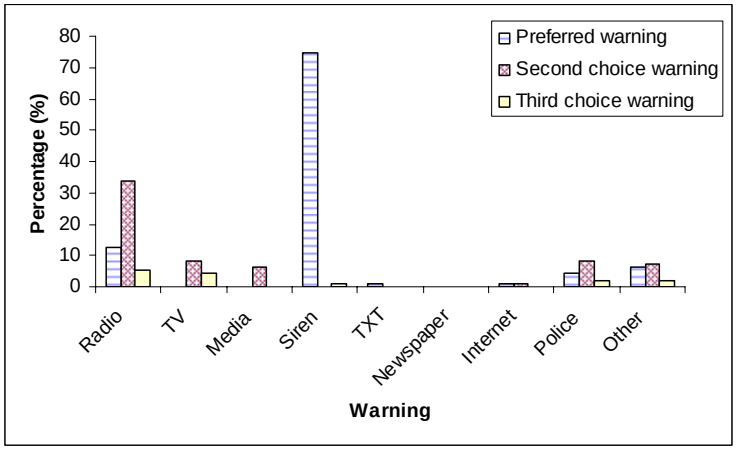


Figure 3.18: Preferred choice for receiving a tsunami warning.

Sirens were by far the most preferred way of receiving a warning by all respondent types. Table 3.13 gives a breakdown of preferred choices, second choices, and third choices for receiving a tsunami warning by respondent type.

Table 3.13: Breakdown into respondent type of respondents preferred ways of receiving a tsunami warning.

		Visitor type							
		Overnight visitor		Day visitor		Permanent resident		Employee	
		N	%	N	%	N	%	N	%
Radio	Preferred warning	9	10.1%	2	50.0%	1	9.1%	2	33.3%
	Second choice warning	34	38.2%	0	.0%	3	27.3%	0	.0%
	Third choice warning	3	3.4%	1	25.0%	1	9.1%	1	16.7%
TV	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	6	6.7%	1	25.0%	0	.0%	2	33.3%
	Third choice warning	4	4.5%	0	.0%	1	9.1%	0	.0%
Media	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	6	6.7%	1	25.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%
Siren	Preferred warning	67	75.3%	2	50.0%	10	90.9%	3	50.0%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	1	1.1%	0	.0%	0	.0%	0	.0%
TXT	Preferred warning	1	1.1%	0	.0%	0	.0%	0	.0%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%
Newspaper	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%
Internet	Preferred warning	1	1.1%	0	.0%	0	.0%	0	.0%
	Second choice warning	1	1.1%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%
Police informing	Preferred warning	5	5.6%	0	.0%	0	.0%	0	.0%
	Second choice warning	7	7.9%	0	.0%	1	9.1%	1	16.7%
	Third choice warning	1	1.1%	0	.0%	1	9.1%	0	.0%
Don't know	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%
Other	Preferred warning	6	6.7%	0	.0%	0	.0%	1	16.7%
	Second choice warning	6	6.7%	1	25.0%	0	.0%	1	16.7%
	Third choice warning	2	2.2%	0	.0%	0	.0%	0	.0%

3.3.4 DURING A TSUNAMI

This section looks at respondents' actions and expectations during a tsunami. It investigates what actions respondents would take in the event of both distant-source tsunami warnings, and local-source tsunami warnings, and looks into visitor understanding of how much time they would have to move to safety in the event of a distant or local-source tsunami. It also investigates what (if anything) visitors expect from camping ground accommodation staff in the event of a tsunami.

Actions in the event of a distant-source, official tsunami warning

In the event of a distant-source, official tsunami warning being issued, the majority (52.7%) of respondents said that they would move to high ground. 8.2% said that they would take supplies and move to high ground, 16.4% said that they would move inland, 4.5% said that they would take supplies and move inland. A further 13.6% of respondents said that they would just leave, and 3.6% said they would leave but would take supplies with them. 0.9% of respondents said they would take another action (climb a tree).

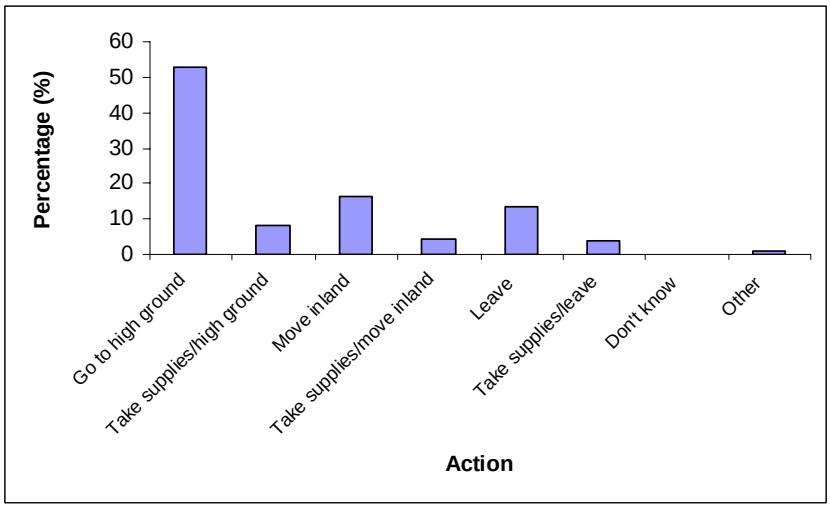


Figure 3.19: Actions respondents would take in the event of a distant-source, official tsunami warning.

Table 3.14 shows the breakdown into respondent type of the actions respondents would take in the event of a tsunami warning. The majority of all respondent types said that in the event of a tsunami warning they would move inland or to high ground, with a number of them also saying that they would take supplies. None of the employees said that they would take supplies, and it is concerning to note that none of the employees said that they would evacuate camp visitors or inform them of the approaching tsunami.

Table 3.14: Breakdown into respondent type of actions respondents would take in the event of a distant source, official tsunami warning.

	Visitor type							
	Overnight visitor		Day visitor		ermanent resider		Employee	
	N	%	N	%	N	%	N	%
Go to high ground	48	53.9%	1	25.0%	4	36.4%	5	83.3%
Take supplies and go to high ground	5	5.6%	1	25.0%	3	27.3%	0	.0%
Move inland	14	15.7%	2	50.0%	2	18.2%	0	.0%
Take supplies and move inland	4	4.5%	0	.0%	1	9.1%	0	.0%
Leave	15	16.9%	0	.0%	0	.0%	0	.0%
Don't know	0	.0%	0	.0%	0	.0%	0	.0%
Other	1	1.1%	0	.0%	0	.0%	0	.0%
Take supplies and leave	2	2.2%	0	.0%	1	9.1%	1	16.7%

Actions in the event of a possible local-source tsunami

In the event of a possible local-source tsunami the majority (73.6%) of respondents said that they would move to high ground, 4.5% said that they would take supplies and move to high ground, 10% said that they would move inland, 0.9% said that they would take supplies and move inland, 8.2% said that they would leave, 1.8% said that they would take supplies and leave, and 0.9% said that they would take some other action (jump in a boat).

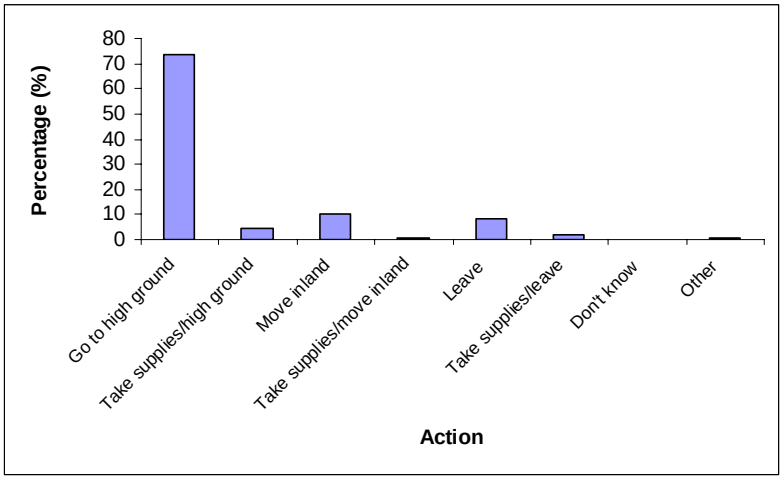


Figure 3.20: Actions respondents would take in the event of a possible local-source tsunami.

Actions that each respondent type said they would take in the event of a possible local source tsunami were very similar to those actions they would take in the event of a distant source official warning. Table 3.15 shows the breakdown by respondent type into the actions that respondents said they would take in the event of a possible local source tsunami.

Table 3.15: Breakdown by respondent type showing actions respondents would take in the event of a possible local source tsunami.

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Go to high ground	67	75.3%	3	75.0%	6	54.5%	5	83.3%
Take supplies and go to high ground	3	3.4%	0	.0%	2	18.2%	0	.0%
Move inland	8	9.0%	1	25.0%	2	18.2%	0	.0%
Take supplies and move inland	1	1.1%	0	.0%	0	.0%	0	.0%
Leave	8	9.0%	0	.0%	1	9.1%	0	.0%
Don't know	0	.0%	0	.0%	0	.0%	0	.0%
Other	1	1.1%	0	.0%	0	.0%	0	.0%
Take supplies and leave	1	1.1%	0	.0%	0	.0%	1	16.7%

Time to move to safety following an official tsunami warning

In the event of an official tsunami warning being issued 28.2% of respondents said that they did not know how much time they would have to move to safety, 20% said they would have only a few minutes, 20% said 10 minutes to half an hour, 5.5% said 1-2 hours, 10% said 2-5 hours, 11.8% said they would have more than 5 hours to move to safety, and 4.5% said that they would follow instructions.

Figure 3.21: Amount of time respondents think they have to move to safety following an official tsunami warning.

Understanding of how much time there would be to move to safety following an official tsunami warning was relatively low amongst all respondent types, with a relatively large percentage of all respondents thinking they would only have a few minutes to move to safety following an official tsunami warning. Table 3.16 shows the breakdown by respondent type of how much time people thought they would have to move to safety following an official tsunami warning.

Table 3.16: Breakdown by respondent type showing how much time respondents think they will have to move to safety following an official tsunami warning.

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Don't know	26	29.2%	0	.0%	4	36.4%	1	16.7%
A few minutes	18	20.2%	0	.0%	1	9.1%	3	50.0%
10 minutes to half an hour	19	21.3%	2	50.0%	1	9.1%	0	.0%
1-2 hours	4	4.5%	1	25.0%	0	.0%	1	16.7%
2-5 hours	7	7.9%	0	.0%	4	36.4%	0	.0%
More than 5 hours	11	12.4%	1	25.0%	1	9.1%	0	.0%
I will follow instructions	4	4.5%	0	.0%	0	.0%	1	16.7%

Time to move to safety from the beach following a strong earthquake

When asked how much time they have to move to safety if they are at the beach and feel a strong earthquake 30% of respondents answered that they did not know, 40.9% said they would only have a few minutes, 25.5% said they would have 10 minutes to half an hour, 2.7% said they would have 1-2 hours, and 0.9% said they would have 2-5 hours.

Figure 3.22: Amount of time respondents think they have to move to safety if they feel a strong earthquake while at the beach.

Understanding of how much time they would have to move to safety if they felt a strong earthquake while at the beach than it was for how much time they would have to move to safety following an official tsunami warning, with almost all respondents saying that they would have between a few minutes and half an hour (Table 3.17). There were, however, still a large percentage of respondents who said that they did not know how much time they would have to move to safety if they felt a strong earthquake while at the beach.

Table 3.17: Breakdown by respondent type showing how much time respondents thought they would have to move to safety if they felt a strong earthquake while at the beach.

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Don't know	28	31.5%	0	.0%	3	27.3%	2	33.3%
A few minutes	36	40.4%	2	50.0%	3	27.3%	4	66.7%
10 minutes to half an hour	21	23.6%	2	50.0%	5	45.5%	0	.0%
1-2 hours	3	3.4%	0	.0%	0	.0%	0	.0%
2-5 hours	1	1.1%	0	.0%	0	.0%	0	.0%
More than 5 hours	0	.0%	0	.0%	0	.0%	0	.0%
I will follow instructions	0	.0%	0	.0%	0	.0%	0	.0%

Expectations from camping ground staff

When asked what they expected from camping ground staff during a tsunami the majority of respondents (62.7%) said they expected some form of warning, 14.5% said that they expected evacuation information, 6.4% said they expected a set of

instructions on what to do and where to go, and 16.4% said that they would not expect anything. It is unfortunate that although the majority of respondents said that they would expect some form of warning, evacuation information, or a set of instructions from staff during a tsunami, findings from this survey indicate that staff knowledge is low.

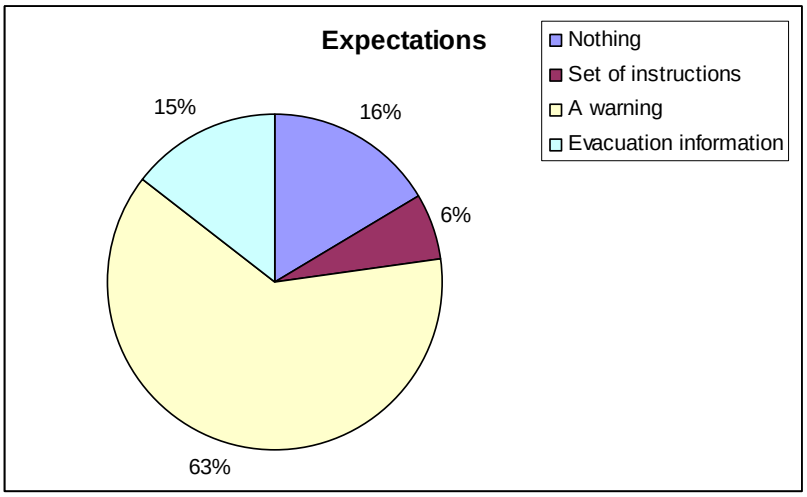


Figure 3.23: What visitors expect from camping ground staff during a tsunami.

Table 3.18 shows the breakdown into respondent type of what respondents would expect from camping ground staff in the event of a tsunami. Although the majority of all respondent types said that they would expect some form of warning, set of instructions, or evacuation information, it is of concern to note that a couple of employees that were surveyed said that they would expect nothing.

Table 3.18: Breakdown by respondent type showing what respondents would expect from camping ground staff in the event of a tsunami.

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Nothing	11	12.4%	1	25.0%	4	36.4%	2	33.3%
Set of instructions	6	6.7%	0	.0%	0	.0%	1	16.7%
A warning	61	68.5%	1	25.0%	5	45.5%	2	33.3%
Evacuation information	11	12.4%	2	50.0%	2	18.2%	1	16.7%

3.3.5 CHANGES IN PERCEPTION

This final section of the results looks into respondents changes in perception since the Boxing Day tsunami on 26 December 2004.

Before the Boxing Day 2004 tsunami

When asked if they knew what a tsunami was before the Boxing Day 2004 tsunami the majority (84.5%) of respondents answered that they did know what a tsunami was, and 15.5% answered that they did not know.

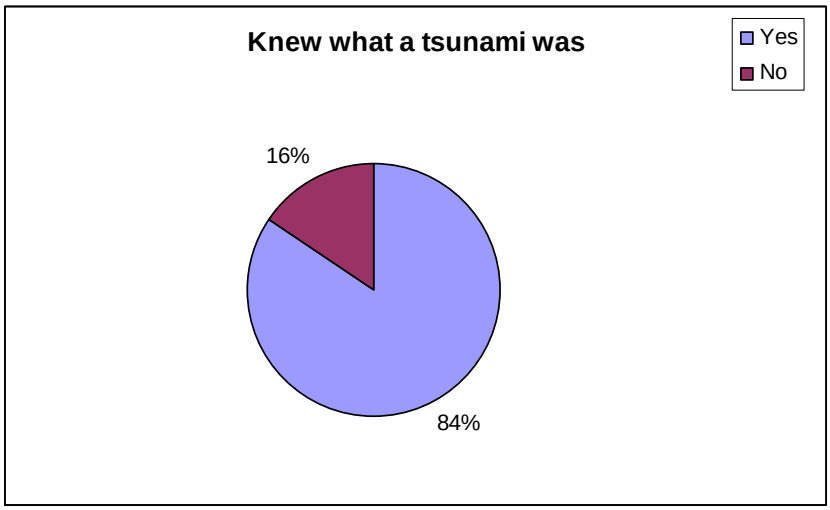


Figure 3.24: Knowledge of tsunamis before the Boxing Day 2004 tsunami.

The majority of all respondents knew what a tsunami was prior to the Boxing Day 2004 tsunami. Table 3.19 shows the breakdown by respondent type of respondents' knowledge of tsunamis before the Boxing Day 2004 tsunami.

Table 3.19: Breakdown by respondent type showing respondents knowledge of tsunamis before the Boxing Day 2004 tsunami.

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Yes	73	82.0%	4	100.0%	10	90.9%	6	100.0%
No	16	18.0%	0	.0%	1	9.1%	0	.0%

Since the Boxing Day 2004 tsunami

The majority (75.5%) of respondents said that since the Boxing Day 2004 tsunami they have learnt more about tsunamis. 8.2% said that they have actively sought more information on tsunamis. 22.7% of respondents said that since the Boxing Day 2004 tsunami they feel more at risk from tsunami, 0.9% said that they feel less at risk, and 44.5% said that it has not affected them. 38.2% of respondents said that since the Boxing Day 2004 tsunami they are more aware about tsunamis.

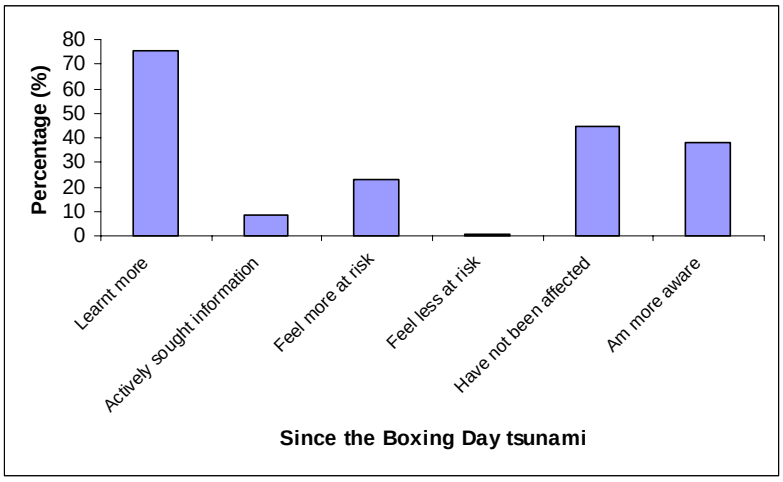


Figure 3.25: Changes in perception since the Boxing Day 2004 tsunami.

The majority of all respondent types said that since the Boxing Day 2004 tsunami they have learnt more about tsunamis (Table 3.20), and a number of respondents said that they are now more aware of the risk associated with tsunami.

Table 3.20: Breakdown into respondent type showing awareness since the 2004 Boxing Day tsunami.

	Visitor type							
	Overnight visitor		Day visitor		Permanent resident		Employee	
	N	%	N	%	N	%	N	%
Have learnt more	70	78.7%	4	100.0%	7	63.6%	2	33.3%
Have actively sought more information	8	9.0%	1	25.0%	0	.0%	0	.0%
Feel more at risk	18	20.2%	1	25.0%	5	45.5%	1	16.7%
Feel less at risk	1	1.1%	0	.0%	0	.0%	0	.0%
Have not been affected	41	46.1%	1	25.0%	3	27.3%	4	66.7%
Am more aware	38	42.7%	1	25.0%	2	18.2%	1	16.7%

3.4 DISCUSSION

The Chilean tsunami of 22 May 1960 was the last damaging tsunami to occur in Hawke's Bay. The tsunami occurred without warning, and although no loss of life occurred, there was considerable damage done to a number of coastal facilities around New Zealand (de Lange and Healy, 1986; Johnston *et al*, submitted). A large aftershock which occurred three days later resulted in a nationwide tsunami warning being broadcast (Johnston *et al*, submitted). The expected tsunami never arrived. However, thousands of people in coastal communities around the country were reported to have evacuated, making this the largest evacuation in the history of New Zealand (Johnston *et al*, submitted). There were also reports of large numbers of people ignoring the warnings and instead moving to the coast in order to watch the approaching tsunami. There was much discussion following this event of a need to improve both the national tsunami warning system and the awareness of the New Zealand public of the risks of such an event (Johnston *et al*, submitted). However, over the next 40 years until the Indian Ocean tsunami of 26 December 2004, public awareness of tsunami, and the preparedness of the New Zealand public diminished (Webb, 2005; Johnston *et al*, submitted).

The camping ground survey found that very few of the respondents surveyed in the camping grounds had had any previous tsunami experience. Those that did indicated that this related to the Chilean tsunami of May 1960.

Knowledge of tsunami risk was found to be low with the majority of respondents indicting that they did not know when the last damaging tsunami occurred in Hawke's Bay, and perception of tsunamis (both how likely visitors thought a tsunami was to affect the camping ground, and when they thought the next tsunami might occur in Hawke's Bay) was also low. Public perception of risk is an important factor in hazard assessment as it is an indicator of how well citizens will prepare for, and respond to the threat of a hazard (Peacock *et al*, 2005).

Preparedness for tsunami events was very low amongst all respondent types with very few having actively sought any information on tsunamis. Employees at the camping

grounds and any tourism establishment are often the first points of contact for tourists, and it would be desirable for staff to be more prepared and knowledgeable in order to reduce the risk to visitors. It is also concerning to note that very few respondents had heard or received information about tsunamis from any source.

When asked what the New Zealand public tsunami notification system consists of over half of those surveyed indicated that they did not know. Furthermore, when asked what their preferred method for receiving a tsunami warning would be, the majority of respondents said that warning sirens would be their preferred method. Although sirens are the most commonly suggested form of warning, there are difficulties associated with communities understanding and response to sirens. Further, the testing and maintenance of such systems tends to make them a relatively difficult option to make effective (Leonard *et al*, 2006). There are also problems associated with warning community members who may be in remote areas e.g. people on rural coastal properties, surfcasters etc. (Leonard *et al*, 2006).

Education is an important tool for ensuring that society is aware of the risks of a hazard, and for helping to better prepare communities for hazard events. It would be advisable that CDEM groups work with staff at the camping grounds to provide information that can be used by staff members to ensure that they are prepared for a tsunami in the area. Furthermore, this could then be passed on to people staying in the camping ground, to ensure that they too have an understanding of the risk of tsunamis in the area, and what to do in the event of such an event occurring. Clearly such provisions would also help to provide employees and visitors with information on who is responsible for issuing tsunami warnings. This would clarify for the number of respondents who do not know if New Zealand has a tsunami warning system that such systems are present for distant source tsunamis (Webb, 2005). Due to the short time period involved between generation of a local source tsunami, and the arrival time on our coasts (0-60 minutes) (Berryman, 2005), it is difficult to provide warning for local source tsunami. Therefore the public need to be aware of the natural signs of a tsunami, or signs that a tsunami may have been generated; for example ground shaking from an earthquake if at the coast, unusual sounds, wave forms, and sea level

fluctuations (Gregg *et al,* 2006) in order to be prepared for such an event and reduce the risk to themselves.

This survey found that knowledge of the natural signs of a tsunami, or signs that a tsunami may have been generated, was relatively high amongst respondents. However, there were a percentage of respondents who said that they did not know what the natural signs of a tsunami were. Ronan and Johnston (2005) discuss the role of schools, youth and families in promoting community resilience to disasters, and because schools are a central part of any community, and the children of today are the adults of tomorrow, it is important to bring hazard education into this area. The role that formal education can play in informing people of tsunami risk was highlighted in Thailand during the tsunami of 26 December, 2004, when a 10-year-old English girl, Tilly Smith, alerted an unknown number of people around her to evacuate from the beach because she recognized the natural warning signs of the approaching tsunami from education she had gained in a geography class at school (King and Gurtner, 2005; Gregg *et al,* 2006). However, traditional knowledge handed down through informal education is another way for people to become more knowledgeable of the signs of a natural hazard. The indigenous Moken people of the Andaman Sea area were among those who made the link between the receding sea prior to the Boxing Day 2004 tsunami, and imminent tsunami danger (Gregg *et al*, 2006). The links between the traditional knowledge of the Moken people and formal education such as Tilly Smith received highlights the need for people to be educated about tsunami risk through both traditional methods and through formal scientific education (Gregg *et al*, 2006).

It was encouraging to note that the majority of respondents at the camping grounds said that in the event of either a distant or local source tsunami they would move to high ground or inland, however few said that they would take supplies with them. This illustrates the need for people to be adequately prepared with a survival kit for such events, so that they are self reliant in the event of a disaster occurring. Understanding of how much time they would have to move to safety in the event of either a local or distant source tsunami was also low.

Distant source tsunamis are defined as having more than three hours travel time to the nearest coastline. Major sources of tsunami generation are a least 10 hours travel time from New Zealand, therefore there should be adequate time for authorities to provide timely warnings to CDEM groups and the New Zealand public (Webb, 2005). However, the majority of respondents in the camping ground survey either did not know how much time they would have to move to safety, or believed that they would have less than two hours. When asked how much time they would have to move to safety if they felt a strong earthquake while at the beach, the majority of respondents correctly said somewhere between a few minutes and half an hour. There was also a high percentage of respondents who indicated that they did not know, and a few people who over estimated the time they would have to move to safety. Local source tsunami are defined by Webb (2005) as having less than an hours travel time from the nearest New Zealand coastline. However, many may have less than 30 minutes travel time, and some can have travel times as short as 10 minutes (Webb, 2005). It is concerning to note that understanding of tsunami travel times is low amongst camping ground employees, especially as the majority of visitors and permanent residents at the camping ground said that in the event of a tsunami they would expect some form or warning, evacuation information, or a set of instructions from staff.

The majority of respondents said that they had an understanding of what a tsunami was before the Boxing Day 2004 tsunami. Webb (2005) speculated that the Boxing Day 2004 tsunami significantly increased awareness of the New Zealand to tsunami risk. This is reflected by the findings of this study where the majority of respondents at the camping grounds said that since this devastating event they have become more aware or have learnt more about tsunamis.

Chapter Four

The Tourism Surveys

4.1 INTRODUCTION

The tourism industry is highly vulnerable to disaster and the effects that a disaster may have, and the unfamiliarity of tourists with the hazards that may occur in a region greatly contributes to this vulnerability (Méheux and Parker, 2006). Tourists are likely to become disorientated in the event of a hazard as they generally have very little understanding of the region they are visiting. When under the stress that the hazard event may produce tourists become more vulnerable, especially as they do not have the support resources that they would have when at home. It is therefore important that hotels and motels cater for the safety of both their employees and visitors (Johnston *et al*, submitted), and if the correct actions and preparations are taken by tourism managers this vulnerability can be reduced (Drabek, 1994). The tourism surveys were conducted in order to see how prepared the Hawke's Bay tourism sector is for managing natural hazard events, and looks at staff hazard training, emergency exercises such as drill and evacuation procedures, and what hazard signage is available for visitors. Although there have been a number of studies that look at reasons why residential populations evacuate before or after a disaster (e.g. Mileti *et al*, 1985; Sorenson, 1991; Bateman and Edwards, 2002), very little research has been conducted into the effects of disasters on tourists (Drabek, 2000). Hawke's Bay is a popular tourist destination and because of the high number of visitors at any one time in the region, and its setting in one of New Zealand's most earthquake prone zones which places it amongst the most at risk from tsunami areas in the country (Berryman, 2005) it is important to determine how prepared the tourism sector is for managing natural hazard events, in order to help to minimize the consequences that a hazard event may have on these transient populations.

This survey is identical to that used in a survey of tourism venues in Washington State, USA in September 2005 which was conducted to evaluate staff training for emergencies, emergency management exercises including drills and evacuation, and hazard signage within 18 hotels and motels in Ocean Shores, Washington State (Johnston *et al*, In Press). Therefore, it is possible to make comparisons between hazard preparedness in the tourism sector in Hawke's Bay, New Zealand, and in Washington State, USA.

4.2 METHODS

The specific objectives of the tourism survey were (1) to assess whether hotel/motel staff in the Hawke's Bay tourism sector had undergone any hazard training; (2) to assess whether exercises/drills are performed at the hotel/motel; and (3) to assess if the hotel/motel has any hazard signage in place.

Face-to-face interviews were conducted at 23 hotels and motels in Napier City in March 2006. The number of tourists that each venue can accommodate ranges between 29 and 300 overnight visitors, with a mean of 83 visitors. Clearly those hotels/motels located within 1km of the coastline are the most at risk from tsunami hazards, and therefore these hotels/motels were chosen as the focus of this study. Each interview consisted of 16 questions relating to staff hazard training, what emergency management procedures such as drills and evacuation exercises were conducted, and what hazard signage if any was in place. A copy of the survey can be seen in Appendix C. Each interview took a maximum of 15 minutes.

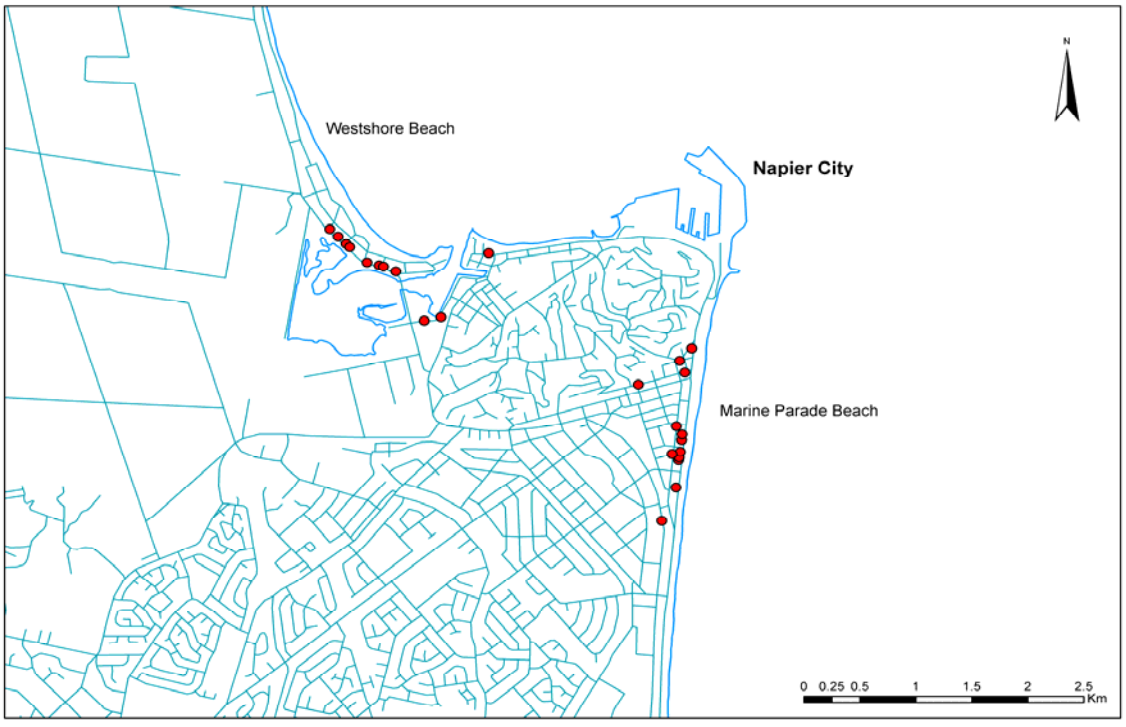


Figure 4.1: Locations of the 23 hotels/motels in Napier city that were surveyed.

4.3 RESULTS

This section presents the results for the preparedness survey. The results are drawn from the responses to interviews conducted at 23 hotels/motels in Napier City, Hawke's Bay. The results are separated into 6 categories: Respondents role and accommodation details; Staff hazard training; Other training; Exercises; Signage; and Personal information. Tabulated results can be found in Appendix D.

4.3.1 RESPONDENT ROLE AND ACCOMMODATION DETAILS

Respondent role

Of the 23 respondents that were surveyed 16 were the owners of the hotel/motel, 1 was the company director, 3 were managers, and 3 were receptionists.

Accommodation details

The majority (83%) of accommodation venues surveyed were motels, while the remaining 17% were hotels. The number of rooms at each hotel/motel ranged between 9 and 109, and the number of people that can be accommodated at each accommodation venue ranged from 29 through to 300 people. When respondents were asked how many visitors' would come through each day there was a range from 12-1000 visitors per day. The hotel that had 1000 visitors per day has 2 popular restaurants and 3 bars attached which is the reason visitor numbers through the door are in excess of the other 22 venues. The number of staff that worked at each hotel/motel ranged from 2 through to 50, and the number of years that respondents had been with the company ranged between 3 months and 18 years.

4.3.2 STAFF HAZARD TRAINING

When respondents were asked whether they had ever received any training for dealing with emergencies the majority (57%) answered 'no'. 10 (44%) of respondents had at some stage received training for dealing with emergencies.

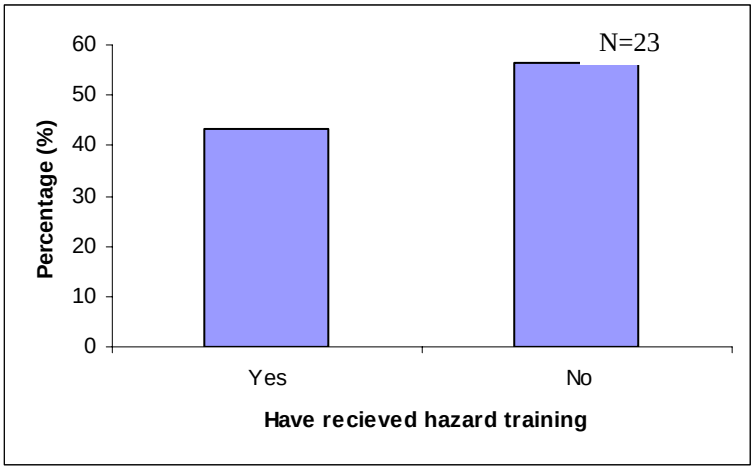


Figure 4.2: Percentage of respondents who have received some form of hazard training.

Of those that had received some form of training for dealing with emergencies 10 respondents (100%) had received training for fires, 4 (40%) had received training for earthquakes, 2 respondents (20%) had received training for storms, 2 (20%) had received training for flooding, and 1 respondent (10%) had received training for hurricanes. No one had received any training for tsunamis, and no one had received any other form of emergency training other than that mentioned above.

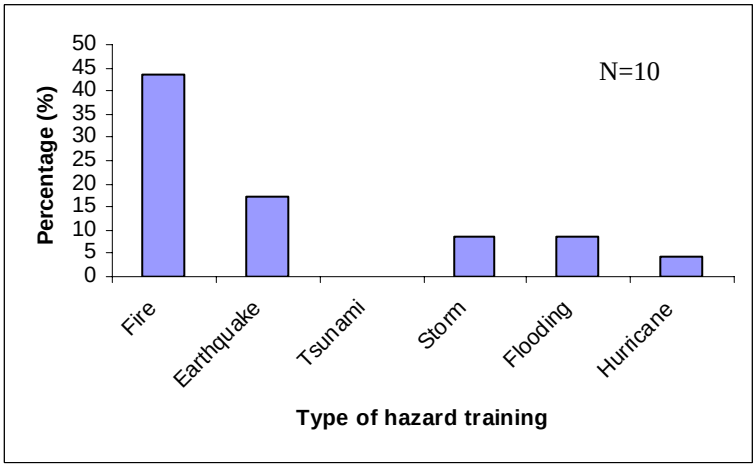


Figure 4.3: Type of hazard training respondents have received.

Of those 10 respondents who had received some form of staff hazard training 2 (20%) received training on an annual basis, 6 (60%) received training on induction into the company, 1 (10%) received training every 2 years, and 1 (10%) received training 'every now and then – approximately every 10 years'.

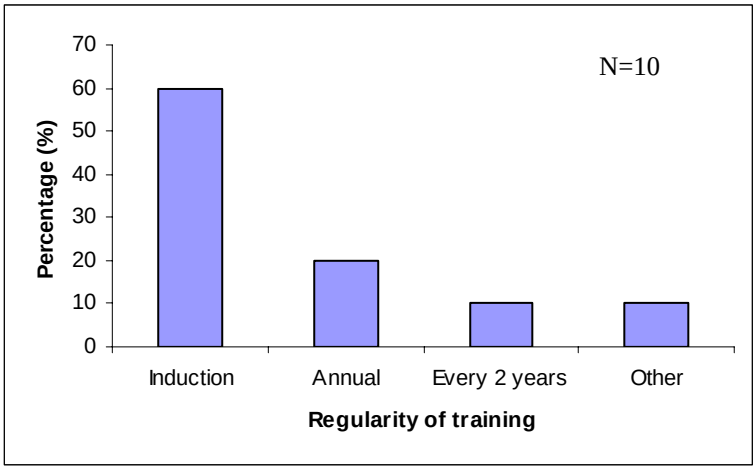


Figure 4.4: How often training is delivered.

Training was delivered by a variety of different methods. One respondent (10%) had been a police officer and had been given training through the New Zealand Police Service, four respondents (40%) had received training from the fire service, one (10%) had received training from both the fire service and the Earthquake Commission (EQC), one (10%) had received training from the Wormald Fire Protection Company, one (10%) had been given a manual to read, one (10%) had spoken with the fire department, and one (10%) had been to a 'variety of different courses'.

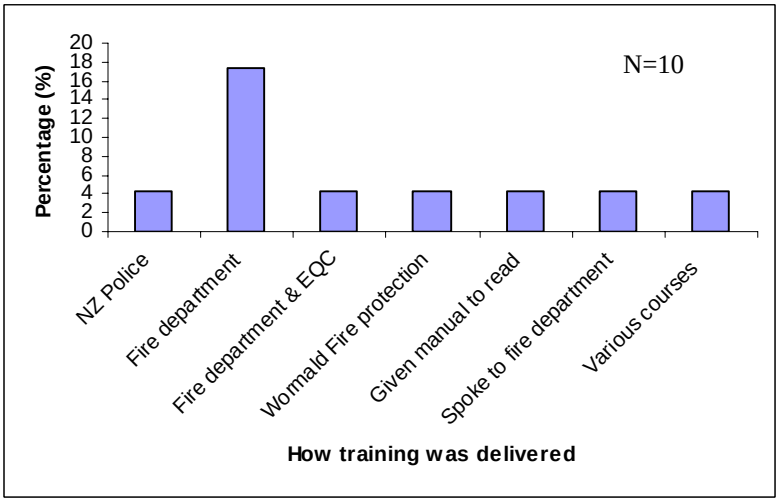


Figure 4.5: How hazard training was delivered.

Four of those respondents (40%) who received some form of staff hazard training said that their training is ongoing, and that they have installments/repeats every 12 months, while the other six respondents (60%) said that their training is not ongoing.

4.3.3 OTHER TRAINING (IN GENERAL)

When asked what other types of training in general they had received, one respondent (4%) said that they had received both Bar Manager and General Manager training, 18 respondents (78%) had received First Aid training, and one respondent (4%) had received Hotel Manager training. Three respondents (13%) had received no other general training.

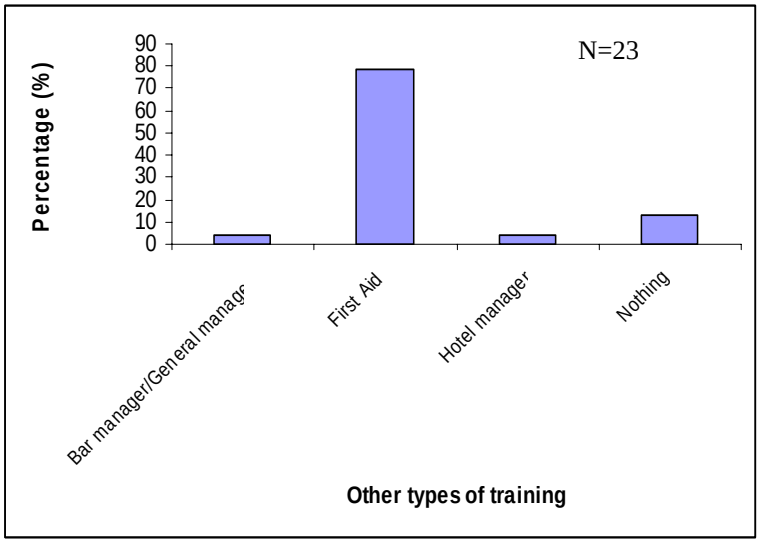


Figure 4.6: Other types of training (general) that respondents have received.

There were a variety of responses when respondents were asked how this other training was delivered. One (4%) had been trained by company training officers, one (4%) had attended a course, one (4%) had received the training (first aid training) at work (pharmacist), one (4%) had attended a Red Cross first aid course, 15 (65%) had attended St. Johns Ambulance first aid courses, and one (4%) had received it through knowledge based work training.

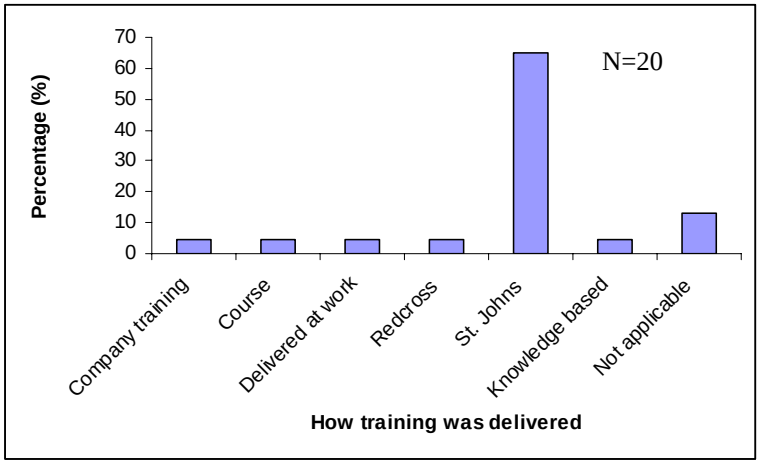


Figure 4.7: How other type of training was delivered.

When asked if this other training was ongoing, the majority of respondents (65%) answered that it was not ongoing. Training was ongoing for seven (35%) of the respondents, and these seven all had repeats/installments every 2 years.

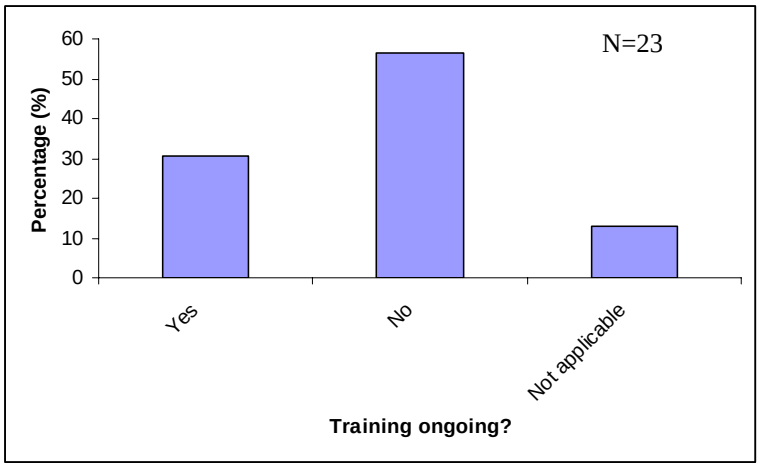


Figure 4.8: Percentage of respondents who have ongoing training.

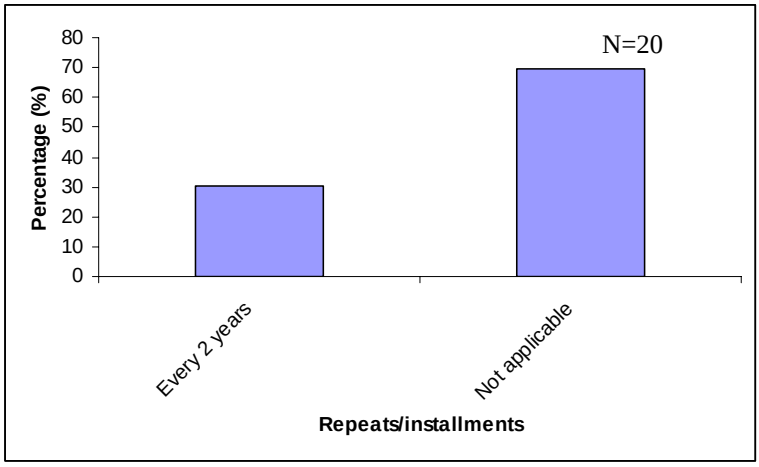


Figure 4.9: How often repeats/installments are conducted.

4.3.4 EXERCISES

13 (57%) of the respondents said that their accommodation venue conducted exercises or drills. The other 10 (43%) accommodation venues did not.

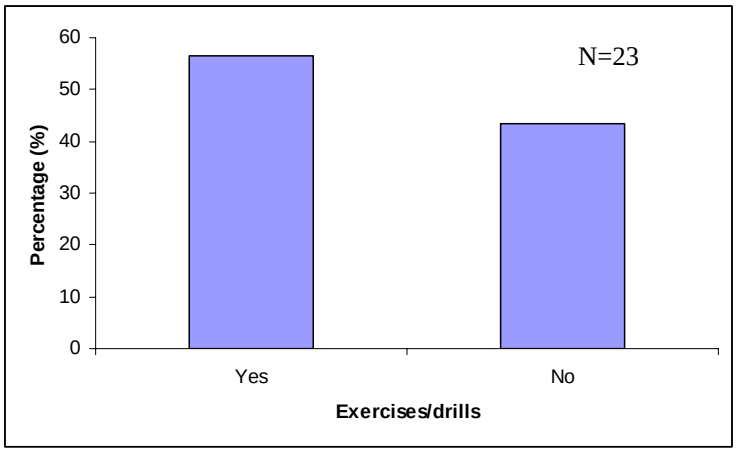


Figure 4.10: percentage of respondents who have exercises/drills.

Of those that did conduct exercises/drills these were for Fire (85%) and Fire and Earthquake (15%).

Figure 4.11: Type of hazard exercises/drills are conducted for.

2 respondents said that exercises/drills were held every month, 2 had exercises/drills every two months, 3 every three months, 5 held exercises/drills every 6 months, and 1 establishment held them every 12 months.

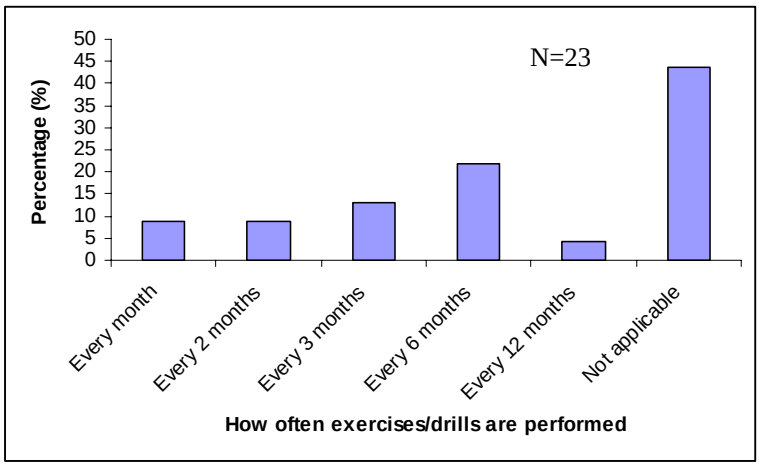


Figure 4.12: Regularity of exercises/drills.

4.3.5 HAZARD SIGNAGE

The majority (96%) of accommodation venues did have some form of hazard signage in place. The types of hazard signs were for Fire (50%), Fire and Earthquake (23%), Fire/Earthquake/Tsunami/ (4.5%), and general 'In case of an emergency' (23%).

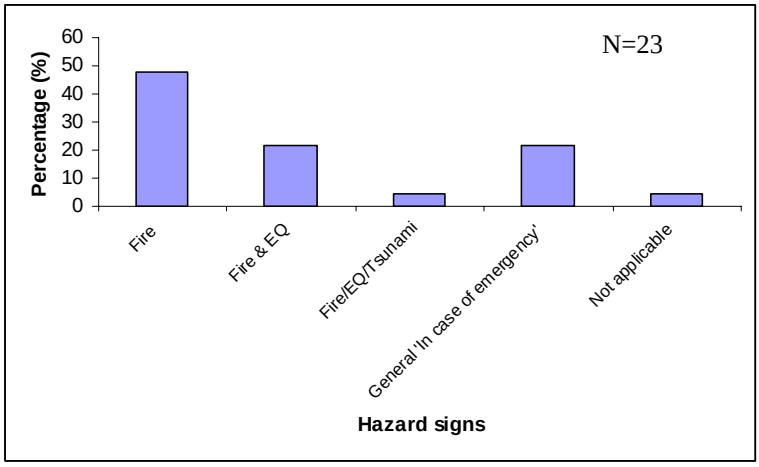


Figure 4.13: Types of hazard signs the hotels/motels have.

All of the hotels/motels that did have hazard signage in place said that the signs were up in all of the rooms/units.

4.3.6 PERSONAL INFORMATION

There was a relatively even gender balance between males (43.5%) and females (56.5%), and 83% of respondents described themselves as New Zealanders, 13% described themselves as New Zealand Europeans, and one respondent described themselves as British.

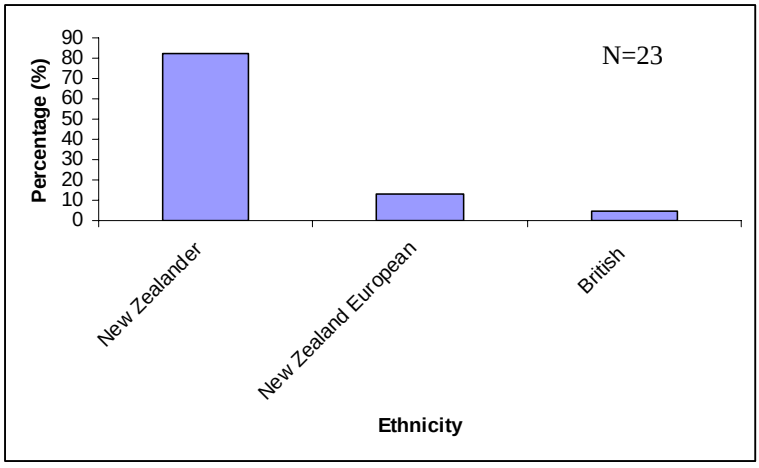


Figure 4.14: How respondents described their ethnicity.

When asked whether they had had any previous experience of hazards the majority of respondents (19) had not had any previous experience.

Four respondents had had previous experience. The previous experiences were the 1960 Chilean tsunami, an earthquake in Dannevirke in Central Hawke's Bay, a fire, and one respondent had been in a boat during the Wahine Storm in April 1968.

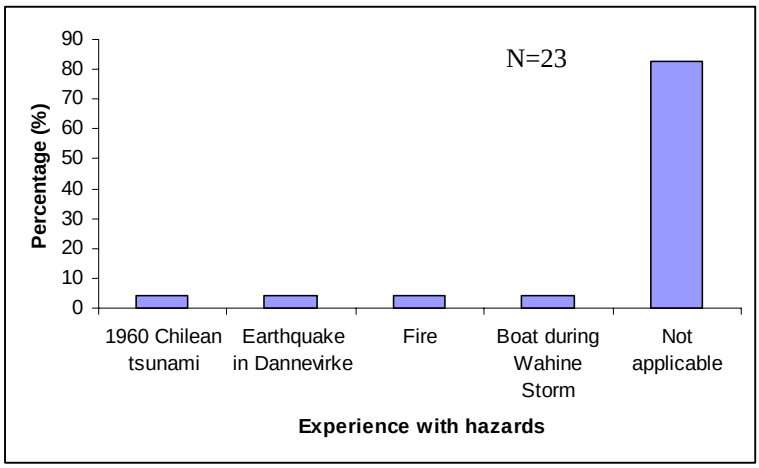


Figure 4.15: Type of hazards that respondents had experienced.

It is interesting to make note that of those respondents who had had previous experience with a natural hazard, only one of the 4 respondents has had training for dealing with emergencies.

4.4 COMPARISONS BETWEEN PREPAREDNESS OF THE HAWKE'S BAY, NEW ZEALAND TOURISM SECTOR AND THE TOURISM SECTOR IN OCEAN SHORES, WASHINGTON, USA.

In the 2005 preparedness survey of accommodation venues in Ocean Shores, Washington State, USA, it was found that the number of employees who had received training for hazards was low. Only 22% of those surveyed reported having received training on how to respond to hazard events (Johnston *et al*, In Press). In comparison, 44% of employees surveyed in the 2006 survey of accommodation venues in Napier, New Zealand, reported having received some form of training for responding to hazard events. However, no employees surveyed in the Napier survey had received any form of training for tsunamis. In the Ocean Shores survey four (22%) establishments had been exposed to training relating to how to respond to tsunami events, with one of the 18 surveyed reporting that they had an on-going training programme for tsunamis. This was the only Ocean Shores establishment that

reported having regular drills and evacuation practices (Johnston *et al*, In Press), in contrast to 13 (57%) establishments in Napier that reported having exercises or drills.

In Ocean Shores all of the 18 accommodation establishments surveyed had signage for fire hazards. Four (22%) of these establishments had information available that gave information specifically on tsunamis, however only one of these accommodation venues had information on tsunami hazards available in every room (Johnston *et al*, In Press). In comparison, not all of the establishments surveyed in Napier had hazard signage in place, however the majority (96%) of the 23 establishments did. Only one establishment in Napier reported having signage relating to tsunamis however this was not specifically for tsunamis but also included fire and earthquake evacuation information. In contrast to Ocean Shores, all of the hotels/motels in Napier that did have hazard signage in place reported that signs were up in every room/unit.

4.5 DISCUSSION

A study by Drabek (1994) into disaster evacuation and the tourism industry found that the thinking and behaviour of tourism industry executives at three sites in the USA showed major vulnerability to natural disasters. The Hawke's Bay tourism sector does not appear to be very well prepared for managing hazard events in general, with only 44% of those surveyed indicating that they had received any form of training for managing natural hazard events, and no one indicating that they had received any form of training for tsunami events. There is also a noticeable lack of preparedness for tsunamis with only one establishment having hazard signage in place that referred to tsunamis in any way.

As discussed in Chapters 1 and 2, Hawke's Bay is at risk from both locally and distantly generated tsunamis. It would be appropriate for the Hawke's Bay Civil Defence and Emergency Management Group to look into ways for preparing the accommodation sector for managing tsunami events, and providing some form of training. Providing managers with an understanding into how people respond to and perceive risk will help to ensure that managers make more informed decisions about risk (Burns *et al*, 1993), which will help to ensure that the tourism sector is more

prepared for hazard events. Following the 2005 survey of accommodation venues in Ocean Shores, Washington State, USA, Johnston *et al* (In Press) suggested that workshops could be organized by emergency management communities and key tourism managers in order to determine levels of knowledge of hazards, emergency procedures, and levels of understanding of visitors' needs and their expectations from tourism establishments. The Hawke's Bay Civil Defence and Emergency Management (CDEM) group should consider establishing similar workshops for the Hawke's Bay tourism sector, and training workshops on what actions to take in the event of a tsunami warning being issued would also be desirable.

Chapter Five

2006 NATIONAL COASTAL SURVEY

5.1 THE 2006 NATIONAL COASTAL SURVEY

In June 2003 a National Coastal Survey was conducted to determine the levels of understanding and preparedness coastal community members have for coastal hazards (Johnston *et al*, 2003). Following the destructive Sumatran earthquake and consequent tsunami of 26 December 2004, it was decided that a resurvey of those community members who participated in the 2003 national coastal survey should be conducted to determine whether people's perceptions of tsunami hazard may have changed following this event.

5.1.1 Communities surveyed

In September 2006, a pilot survey was sent to 9 coastal communities around New Zealand. These communities were Wainui in Gisborne, Westshore, Haumoana and Te Awanga in Hawke's Bay, and New Brighton, South Shore, Sumner, Kaikoura, and Pareora in Canterbury. This thesis concentrates primarily on the surveys conducted in Gisborne and Hawke's Bay. Figure 5.1 shows the locations of the communities that were surveyed in Gisborne and Hawke's Bay.

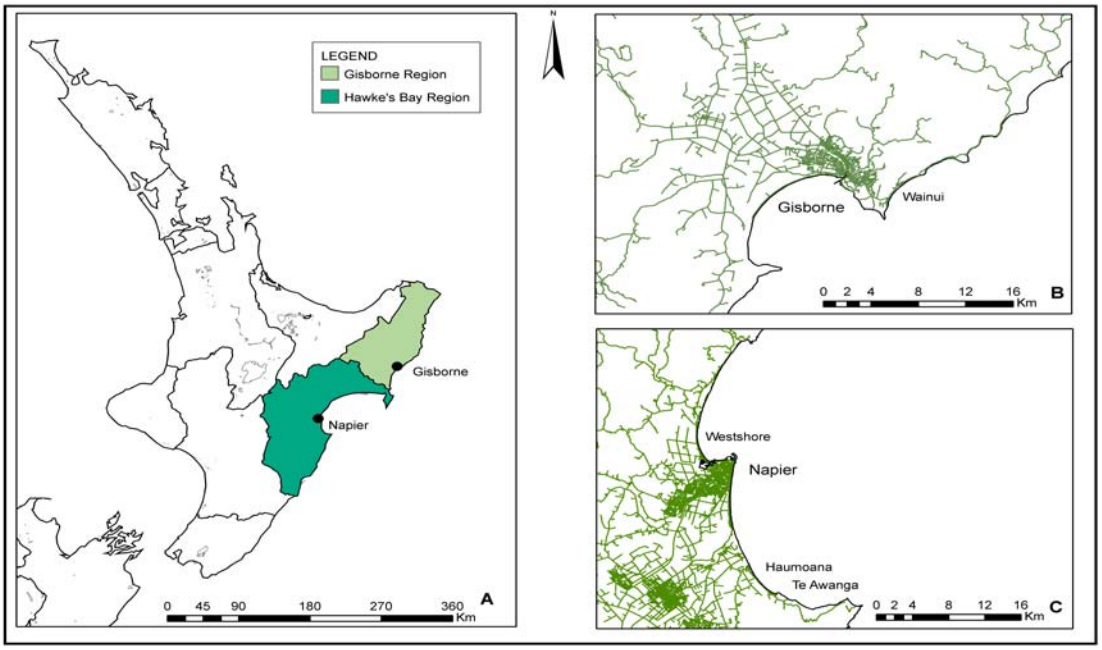


Figure 5.1: Location of the communities in the North Island of New Zealand that were surveyed in the 2006 National Coastal Survey.

5.2 METHODS

The specific objectives of the 2006 National Coastal Survey were (1) to determine community awareness of natural hazards (with a primary focus on tsunami hazard); and (2) to see how peoples' perceptions and understanding of tsunami risk may have changed following the Boxing Day 2004 tsunami. Specific questions were drawn up to meet these objectives, and the draft then underwent a wide-ranging consultation process. The final questionnaire contained 57 questions covering a variety of questions relating to awareness and experience of natural hazards, tsunamis and tsunami warnings and preparation, how respondents would react in the event of a tsunami, and demographical questions. A copy of the questionnaire is included in Appendix E.

A total of 700 questionnaires were delivered in the 4 coastal communities along the east coast of the North Island (Table 5.1). The survey numbers and the location were recorded to allow returned surveys to be identified in relation to the geographical area and the natural hazards related to that area, and to assess the return rate for each community. On return the questionnaires were then coded and analysed using SPSS version 13.

Table 5.1: Communities that surveys were sent to and the return rate for each community.

	Community	**Code**	**Sent**	**Non-delivered**	**Delivered**	**Returned**	**Return rate%**
1	Wainui	1000	200	13	187	51	27.27%
2	Westshore	2000	300	44	256	77	30.08%
3	Haumoana	3000	100	5	95	41	43.16%
4	Te Awanga	4000	100	5	95	38	40.00%
Total			**700**	**67**	**633**	**207**	**35.12%**

5.3 RESULTS FOR THE 2006 NATIONAL COASTAL SURVEY

This section presents the results for the 2006 National Coastal Survey. Only questions relating directly to tsunami are presented. Tabulated results can be seen in Appendix F.

The results section has been separated into 4 categories: General tsunami questions; Tsunami warnings and preparation; during a tsunami; and Demographics.

5.3.1 GENERAL TSUNAMI QUESTIONS

The following section presents the results of a number of general tsunami questions. Except where stated the results have been expressed as a total of all 4 communities.

Most frequent cause of tsunamis in general

When asked what they thought the most frequent cause of tsunamis was the majority (90.2%) of respondents said earthquakes were the most frequent cause. 2.4% said volcanic eruptions and 2% said landslides. It is interesting to note that 2% of respondents believe that hurricanes/storms are the most frequent cause of tsunamis, and 1.5% thought that the high tide is the most frequent cause. 1.5% of respondents indicated that they did not know what the most frequent cause of a tsunami is.

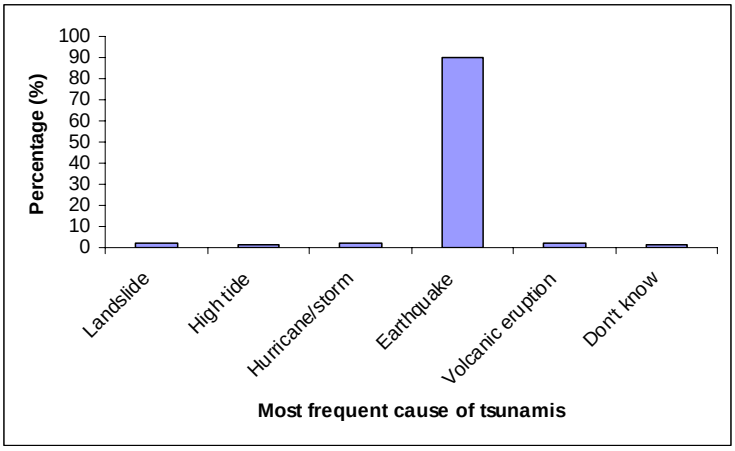


Figure 5.2: Respondents understanding of the most frequent cause of tsunamis in general.

How tsunami waves can occur

Respondents were asked how tsunami waves can occur. They were asked to tick all answers that they thought applied. The majority (61.5%) of respondents indicated that tsunami waves can occur as multiple big waves/surges, with 53.2% of respondents indicating that they could also occur as multiple big waves/surges and multiple small waves/surges. 50.2% answered that tsunami waves can occur as a rapidly rising and falling water . 44.9% answered that a tsunami will occur as one big wave/surge, 21% answered that it could occur as one small wave/surge, and 29.8% answered that a tsunami could occur as multiple small waves/surges. 6.8% of respondents indicated that they did not know how tsunami waves can occur.

Last tsunami that affected this community

Respondents were asked when they thought the last tsunami that affected their community occurred. The results for this question have been separated into the 4 different communities.

Wainui

94% of residents at Wainui thought that the last tsunami that affected the Wainui area occurred within the last 100 years. 2% thought that the last tsunami had occurred within the last 10 years, and 4% of respondents indicated that they did not know.

Westshore

19.7% of residents at Westshore thought that a tsunami had never affected their community. 1.3% thought that the last tsunami had occurred within the last 10 years, 39.5% in the last 100 years, and 2.6% in the last 10 000 years. 35.5% of residents indicated that they did not know when the last tsunami had affected Westshore.

Haumoana

12.2% of Haumoana residents thought that a tsunami had never affected the area, 4.9% thought a tsunami had occurred in the last 10 years, and 39% in the last 100 years. The majority (43.9%) of residents at Haumoana indicated that they did not know when the last tsunami had affected the area.

Te Awanga

23.7% of residents at Te Awanga thought that a tsunami had never affected the area, 5.3% thought that the last tsunami had affected the area in the last 10 years, 50% in

the last 100 years, and 2.6% in the last 1000 years. 18.4% of residents at Te Awanga did not know when the last tsunami had affected the area.

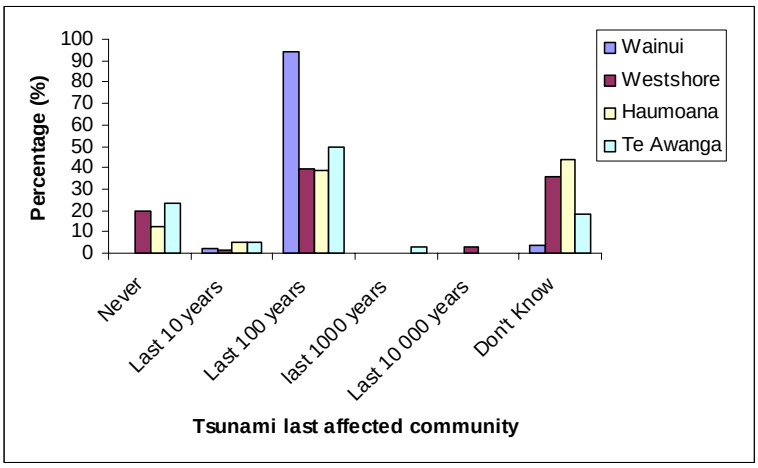


Figure 5.3: When residents at each community think that the last tsunami affected their community

Last *damaging* tsunami that affected this community

Respondents were asked when they thought the last *damaging* tsunami that affected their community occurred. The last damaging tsunami to affect Gisborne and Hawke's Bay was the 1960 Chilean tsunami, which caused considerable damage to infrastructure including houses, boats, wharves, and port facilities (Berryman, 2005). This question has been divided into separate responses for each of the 4 communities.

Wainui

8% of residents at Wainui thought that a damaging tsunami had never occurred in the area. The majority (86%) of residents thought that the last damaging tsunami had occurred within the last 100 years, 2% in the last 1000 years, and 4% of residents answered that they did not know when the last damaging tsunami had occurred.

Westshore

31.6% of residents at Westshore were of the understanding that a damaging tsunami had never affected the community, 21.1% thought that the last damaging tsunami had occurred within the last 100 years, and 1.3% of residents at Westshore thought that the last damaging tsunami had affected the area sometime in the last 10 000 years. The majority (44.7%) of residents at Westshore indicated that they did not know when the last damaging tsunami had affected their community.

Haumoana

26.8% of residents at Haumoana thought that a damaging tsunami had never affected the Haumoana community, 4.9% thought that the last damaging tsunami had occurred within the last 10 years, and 19.5% within the last 100 years. The majority (48.8%) of residents did not know when the last damaging tsunami had affected the Haumoana community.

Te Awanga

26.3% of residents at Te Awanga believed that a damaging tsunami had never affected the community. 2.6% of residents thought that the last damaging tsunami had affected the area within the last 10 years, 34.2% within the last 100 years, and 5.3% within the last 1000 years. 31.6% of residents at Te Awanga did not know when the last damaging tsunami had affected the area.

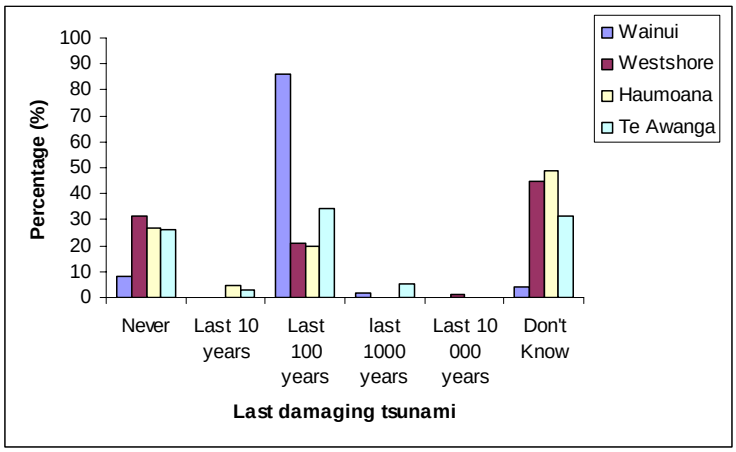


Figure 5.4: When residents at each community think that the last *damaging* tsunami affected their community.

Next tsunami could occur

Residents at each community were asked when they thought that the next tsunami could occur. The results for this question have been divided into each of the 4 different communities.

Wainui

The majority of residents at Wainui (36%) think that the next tsunami could occur within the next 1-10 years. 16% think a tsunami could occur within the next year, and

28% within the next 10-100 years. 18% of residents at Wainui do not know when the next tsunami could occur.

Westshore

9.2% of residents at Westshore think that the next tsunami could occur within the next year, 27.6% think a tsunami could occur within the next 1-10 years, and 39.5% think within the next 10-100 years. 1.3% of residents at Westshore think that the next tsunami will not occur within the next 100 years, and 1.3% of residents think that a tsunami will never occur. 21.1% of those surveyed at Westshore did not know when the next tsunami could occur.

Haumoana

24.4% of residents at Haumoana think that the next tsunami could occur within the next year, 19.5% within the next 1-10 years, and 17.1% think within the next 10-100 years. 2.4% of those surveyed at Haumoana think that a tsunami will not occur within the next 100 years, and 34.1% indicated that they do not know when the next tsunami could occur.

Te Awanga

7.9% of residents at Te Awanga think that the next tsunami could occur within the next year, 18.4% within the next 1-10 years, and 42.1% within the next 10-100 years. 2.6% of residents at Te Awanga do not think that a tsunami will occur within the next 100 years, and 28.9% of residents do not know when the next tsunami could occur.

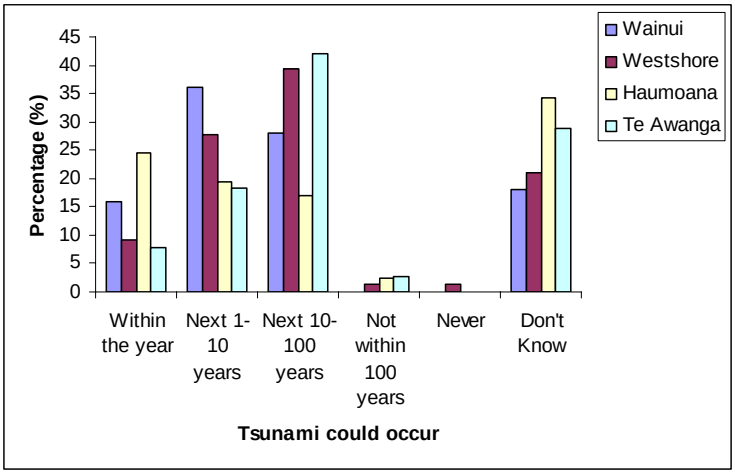


Figure 5.5: When residents at each community think that the next tsunami could occur.

5.3.2 TSUNAMI WARNINGS AND PREPARATION

The following section asks respondents a number of questions relating to tsunami warnings and how prepared they are for dealing with tsunamis.

Tsunami hazard zone maps

Residents were asked if they had seen any tsunami hazard zone maps for their community. Wainui has maps readily available to the public on the Gisborne District Council website showing evacuation areas for distant source tsunami (Gisborne District Council, 2007). Hawke's Bay does not have hazard zone maps readily available to the public. However, in 2000 international data was used to create hazard zone maps, but these are not ideal as they are based on mathematical models and no local near shore bathymetry was used. NIWA has been contracted by the Hawke's Bay Regional Council to produce hazard zone maps which should be available in 2008 (Pearse, L. 2007 pers. Comm. 20 February). This question has been separated into responses from each of the 4 different communities.

Wainui

When asked whether they had seen any tsunami hazard zone maps for their community the majority of residents at Wainui (66%) answered that they had seen tsunami hazard zone maps. 4% of residents were not sure, and 28% answered that they had not seen any tsunami hazard zone maps.

Westshore

The majority of residents at Westshore (69.7%) had not seen any tsunami hazard zone maps for their community. 22.4% of residents answered that they had seen tsunami hazard zone maps, and 7.9% were unsure if they had seen any.

Haumoana

17.1% of residents at Haumoana had answered that they had seen tsunami hazard zone maps for their community however the vast majority (78%) of residents had not seen any tsunami hazard zone maps. 2.4% of residents were unsure if they had seen hazard zone maps for the Haumoana community.

Te Awanga

36.8% of residents at Te Awanga said that they had seen tsunami hazard zone maps for the community. 2.6% of residents were unsure, and 60.5% had not seen any tsunami hazard zone maps for the Te Awanga community.

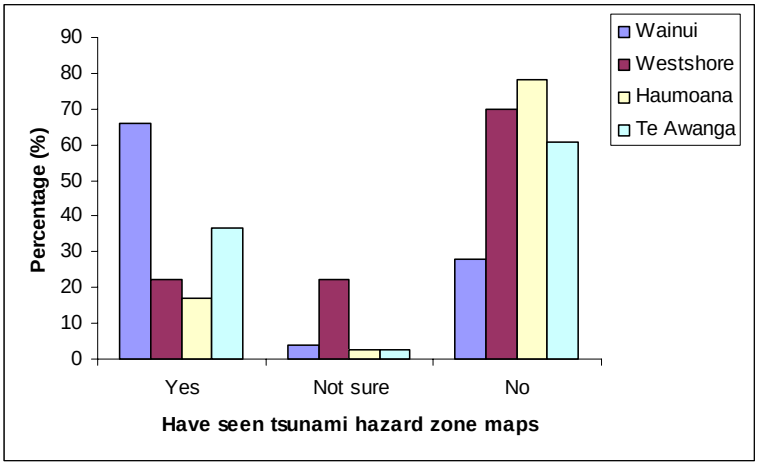


Figure 5.6: Percentage of residents who have seen tsunami hazard zone maps for their community.

Live in a tsunami inundation zone

Residents were asked if they live in a tsunami inundation (hazard or danger) zone. This question has been separated into the different communities.

Wainui

The majority (90%) of Wainui residents answered that they live in a tsunami inundation zone. 6% said that they do not live in a tsunami inundation zone, while 2% did not know.

Westshore

77.6% of Westshore residents live in a tsunami inundation zone. 2% answered that they do not, and 19.7% do not know if they live in a tsunami inundation zone or not.

Haumoana

82.9% of residents at Haumoana answered that they do live in a tsunami inundation zone, 2.4% said that they do not, and 12.2% did not know.

Te Awanga

73.7% of Te Awanga residents live in a tsunami inundation zone. 2.6% answered that they do not live in a tsunami inundation zone, and 21.1% do not know.

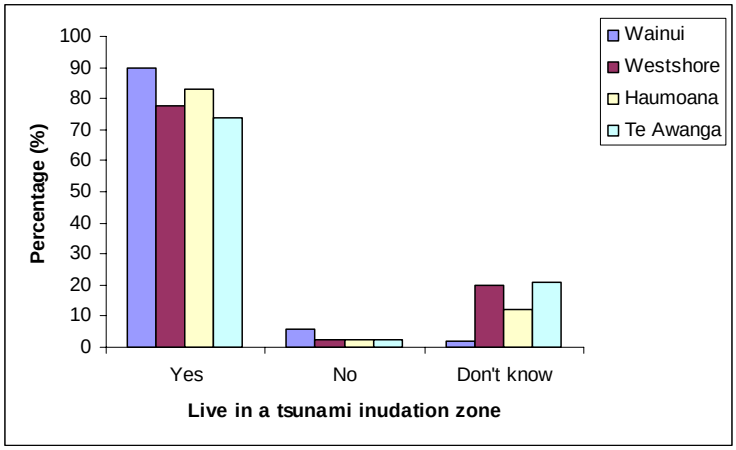


Figure 5.7: Percentage of residents who live in a tsunami inundation (hazard or danger) zone

New Zealand public tsunami warning system

Respondents were given a list of options and asked to tick all that apply in making up the New Zealand public tsunami warning system. The majority (76.6%) of respondents thought that radio/TV warnings make up the New Zealand public tsunami warning system, however this was very closely followed by sirens (76.1%). 42% of respondents thought that warnings are delivered door- to-door by emergency services or civil defence staff, 22% by loudspeaker announcements, and 6.3% by flashing lights. 1% of those surveyed ticked the 'other' box. Other answers included warnings given by neighbours, and in one instance the respondent answered that nothing makes up the New Zealand public tsunami warning system. 8.8% of residents who responded to the question indicated that they do not know what makes up the New Zealand public tsunami warning system.

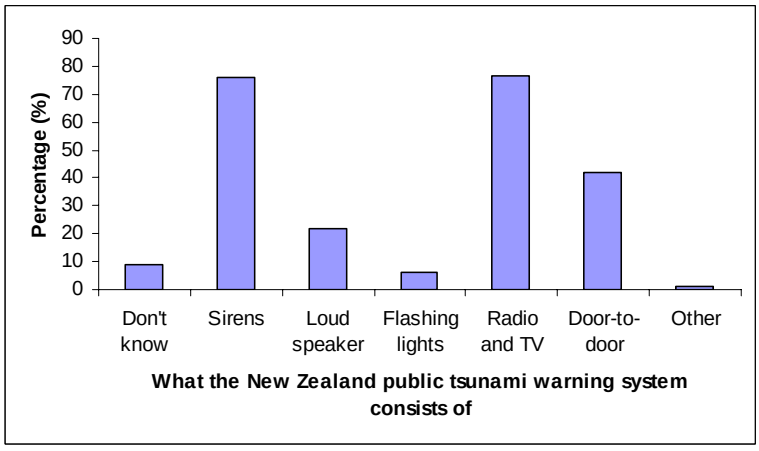


Figure 5.8: What residents believe makes up the New Zealand public tsunami warning system

Preferred method of receiving a tsunami warning

Overall the preferred method of all respondents for receiving a tsunami warning is by siren (59%). The next most preferred method is by radio/TV announcements (29.3%). 18% of respondents would prefer to be notified by door-to-door warnings delivered by emergency services or civil defence staff, 12.7% would like a tsunami warning to be delivered by loud speaker announcements, 2% by flashing lights, and 10.2% by some other method of warning. Other methods included warnings via telephone calls, mass txt message alerts, car horns tooting, warnings via the internet, and warning delivered by neighbours. 2.9% of those surveyed indicated that they do not know what their preferred method for receiving a tsunami warning would be.

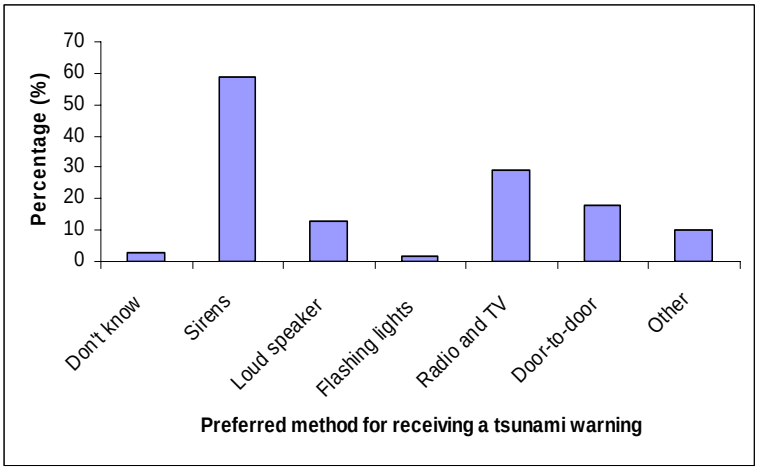


Figure 5.9: Respondents preferred method for receiving a tsunami warning.

Issuing tsunami warnings

The majority (76.6%) of respondents believe that the Civil Defence is responsible for issuing tsunami warnings. This is followed by the local police or fire service (38.5%). 25.4% of respondents believe that GNS or NIWA is responsible for issuing warnings. 22.9% think that the regional council is responsible, 22% think that local council is responsible, and 20.5% think that central government is responsible for issuing tsunami warnings. 10.7% of those surveyed did not know who is responsible for issuing tsunami warnings, and 1% of respondents thought that the responsibility lay some 'other' organization. 'Other' answers were that no one is responsible for issuing tsunami warnings, and also that radio/TV is responsible for issuing warnings.

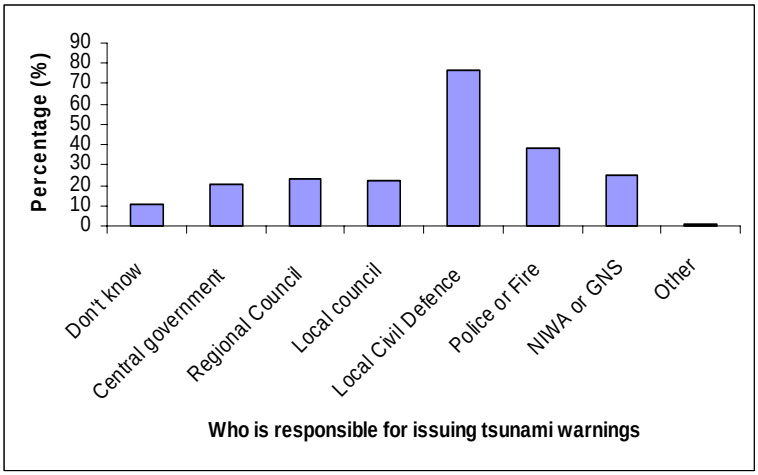


Figure 5.10: Who residents think is responsible for issuing tsunami warnings.

Extent of agreement

Respondents were asked to indicate to extent to which they agree or disagree with the following tsunami related questions.

Tsunamis are too destructive to bother preparing for

Of the 193 residents who answered this question the majority (49.8%) of respondents strongly disagreed with the statement that tsunamis are too destructive to bother preparing for. 15.1% disagreed with the statement, 19% of respondents maybe agreed with the statement, 7.3% agreed, and 2.9% strongly agreed that tsunami are too destructive to bother preparing for.

A serious tsunami is unlikely to affect me in the future

Of the 198 residents who answered this question 38% of residents strongly disagreed with the statement that a serious tsunami is unlikely to affect them in the future, and 18% of residents disagreed with the statement. 24.9% thought that a serious tsunami would maybe affect them in the future, 9.8% agreed that a serious tsunami is unlikely to affect them in the future, and 5.9% of residents strongly agreed that a serious tsunami would be unlikely to affect them.

It is unnecessary to prepare for tsunamis as assistance will be provided

197 residents responded to this question. 64.4% of these residents strongly disagreed with the statement that it is unwise to prepare for tsunamis because assistance will be provided by local/regional council or the civil defence. 17.1% disagreed with the statement, 8.3% maybe agreed with the statement, 3.9% agreed with the statement, and 2.4% strongly agreed with the statement.

Preparing for tsunamis is inconvenient for me

Of the 196 residents who responded to this question 41.5% strongly disagreed with the statement that preparing for tsunamis is inconvenient. 25.9% disagreed with the statement, 16.1% maybe agreed with the statement, 8.3% agreed with the statement, and 3.9% strongly agreed that preparing for tsunamis is inconvenient for them.

It is difficult to prepare for tsunamis

199 residents responded to this question. 22.9% of these residents strongly disagreed that it is difficult to prepare for tsunamis, 17.6% disagreed with this statement. 26.8% of residents thought that it is maybe difficult to prepare for tsunamis, 13.7% agreed that it is difficult to prepare for tsunamis, and 16.1% strongly agreed that it is difficult to prepare for tsunamis.

Preparing for tsunamis will reduce damage to my home

Of the 196 residents who responded to this question the majority (39.5%) of residents strongly disagreed with the statement that preparing for tsunamis would reduce damage to their homes. 17.1% disagreed with the statement, 20% maybe agreed with the statement, 7.3% agreed, and 11.7% strongly agreed that preparing for tsunamis would reduce damage to their homes.

Preparing for tsunamis will improve my everyday living conditions

196 residents answered this question. Of those residents 31.2% strongly disagreed with the statement that preparing for tsunamis would improve their everyday living conditions and 21% disagreed with the statement. 25.9% of respondents maybe agreed with the statement, 8.3% agreed with the statement, and 9.3% strongly agreed.

Preparing for tsunamis will improve my ability to deal with disruption to family/community life

Of the 197 residents who responded to this question, 6.8% strongly disagreed with the statement that preparing for tsunamis would improve their ability to deal with disruption to family/community life. 11.2% disagreed and 25.4% maybe agreed. 26.8% agreed with the statement and 25.9% of respondents strongly agreed.

Preparing for tsunamis will help save lives

200 residents responded to this question. Of those 4.9% strongly disagreed with the statement that preparing for tsunamis will help save lives and 2.4% disagreed. 12.7% of respondents maybe agreed, 25.9% agreed, and 51.7% strongly agreed that preparing for tsunamis would help save lives.

I do not know how I can prepare for tsunamis

Of the 192 residents who responded to this question 23.9% strongly disagreed with the statement that they do not know how they can prepare for tsunamis. 19% of respondents disagreed with the statement, 24.9% maybe agreed, 17.1% agreed, and 8.8% strongly agreed that they do not know how to prepare for tsunamis.

Heard or received information on tsunamis

Residents were given a list of places from where they may have heard or received information about preparing for tsunamis from, and were asked to tick all that apply. 33.2% of residents had not heard or received any information about preparing for tsunamis from any source. 21% had heard or received information from friends, 16.6% from neighbours, and 10.2% from relatives. 14.1% had heard or received information from Central Government, 23.4% from the Regional Council, 31.2% from Local Council, and 38.5% from Civil Defence. 1.5% of residents had received information from a business establishment, 12.2% from research organizations such as NIWA, GNS, or Universities, 4.9% had received information from their workplace, 5.4% from their child's school, and 9.8% from some other source. Other sources included a knock on the door at 5am on the morning of 4 May 2006, personal research, the back of the phone book, and media (e.g. radio and TV).

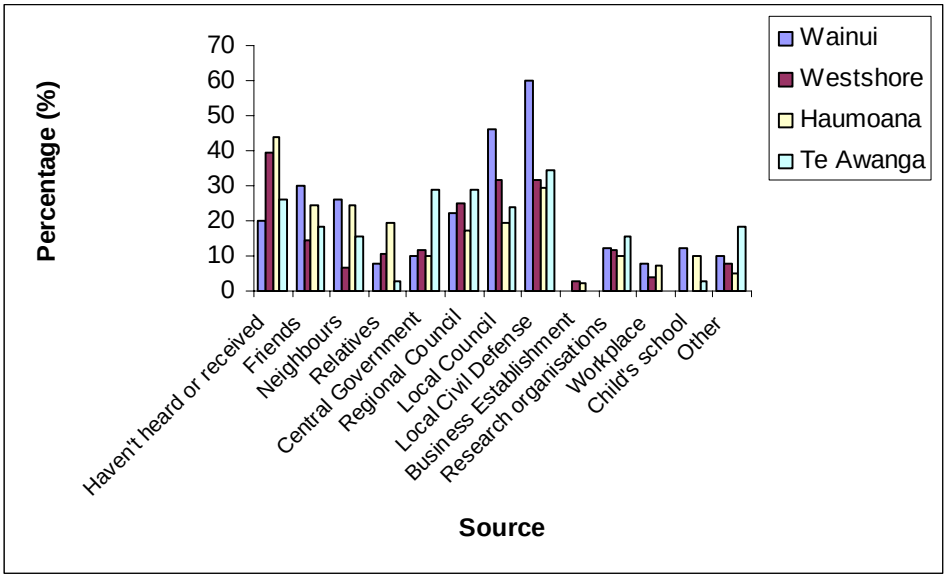


Figure 5.11: Sources from where respondents have heard or received information on preparing for tsunamis from

Intentions

Respondents were asked a number of questions relating to whether in the next month or so they intended take any actions on dealing with tsunamis. When asked whether they intended to improve their knowledge of how to respond to tsunamis 24.9% of respondents said no, 55.6% said possibly, and 16.1% said they definitely would. 26.3% of respondents said they would not increase their ability to respond to tsunamis, 53.2% said they possibly would, and 16.6% said that they definitely would. When asked if they would become involved with a local group/neighbourhood to discuss how to respond to tsunamis 51.7% of respondents answered no, 37.1% said possibly, and 5.9% said definitely. 37.1% of respondents said that they would not seek information on tsunami risks, 43.9% said they possibly would, and 12.2% said they definitely would. 26.8% of respondents said that they would not seek information on things to do to respond to tsunamis, 50.2% said that they possibly would, and 17.6% of respondents said that they definitely would seek information on things to do to respond to tsunamis.

Asked for information on how to get ready for tsunami hazards

Residents were asked to indicate from where they may have asked for information on how to get ready for tsunamis. They were given a list and asked to tick all sources that applied.

They majority (71.2%) of residents said that they had not asked anyone for information on how to get ready for tsunami hazards. 8.8% said that they had asked friends, 7.8% had asked neighbours, and 5.4% had asked relatives. No one had asked Central Government for information on how to get ready for tsunamis; however 3.9% had asked the Regional Council, 7.3% had asked their local council, and 11.7% had asked the Civil Defence. 0.5% of respondents said that they had asked a business establishment, 1.5% had asked a research organization (e.g. NIWA, GNS, University), 2.9% had asked their workplace, and 1.5% had asked their child's school. 2% had asked another source. 'Other' sources included the internet, the police, and a local progressive association.

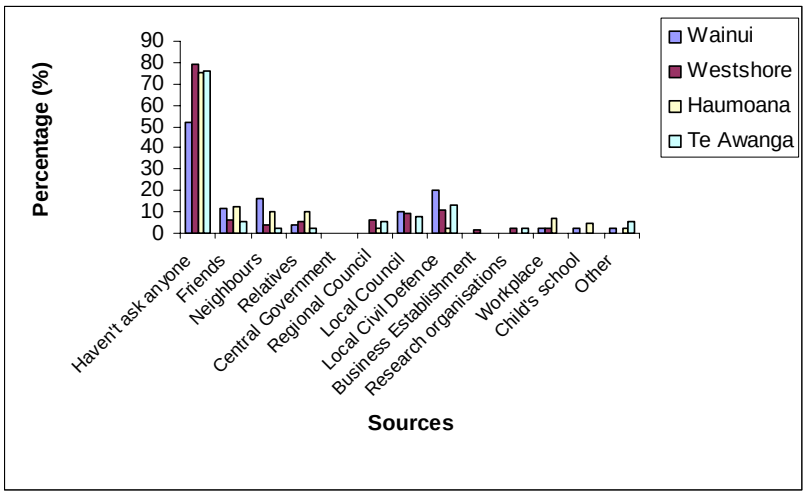


Figure 5.12: Sources from where residents have sought information on how to get ready for tsunami hazards.

Official tsunami evacuation routes

Residents were asked whether there were any official tsunami evacuation routes for their community. The results for this question have been separated into each of the 4 different communities.

Wainui

The majority (40%) of respondents at Wainui did not know if there were any official tsunami evacuation routes in place for the Wainui community. 30% of respondents answered that there were official tsunami evacuation routes in place, and 26% said that there are no evacuation routes.

Westshore

84.2% of respondents at Westshore did not know if there are any official tsunami evacuation routes in place for their community, 5.3% said that there were evacuation routes in place, and 10.5% said that there are no evacuation routes in place.

Haumoana

26.5% of those surveyed at Haumoana think that there are official evacuation routes in place in the community, 17.1% said that there are no evacuation routes established, and 53.7% of respondents did not know.

Te Awanga

The majority (50%) of respondents at Te Awanga did not know if there are any official tsunami evacuation routes in place in their community. 26.3% of respondents said that there are evacuation routes in place, and 23.7% said that there are no evacuation routes in the Te Awanga community.

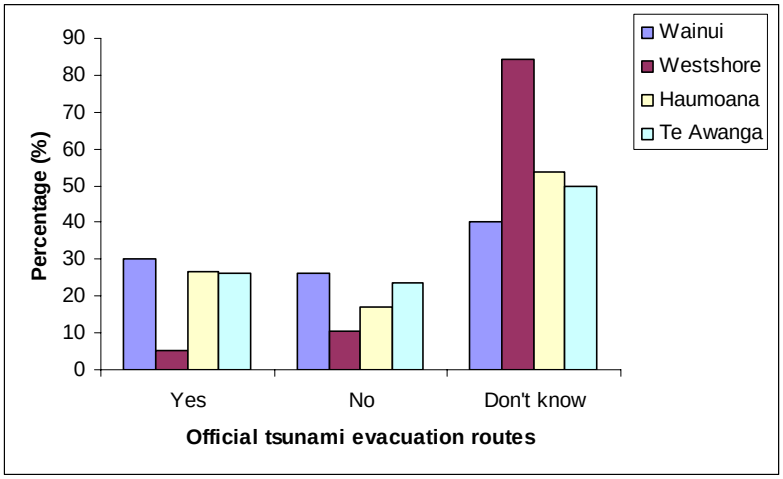


Figure 5.13: Respondents knowledge of whether there are any official tsunami evacuation routes in their community.

All of those who said that there were official tsunami evacuation routes in their community said that the evacuation routes led to higher ground or inland. Some specified that local schools had been designated as evacuation meeting points.

Of those respondents who answered that there are no official evacuation points in place, and some respondents who answered that they did not know, a total of 89.1% thought that evacuation routes should be established for their community. 10.9% of respondents did not think an official tsunami evacuation route should be established.

Tsunami prepared

When asked if they are currently becoming 'tsunami prepared' the majority (45.9%) of respondents answered no. 42.4% said that they are becoming 'tsunami prepared', and 8.8% of respondents said they did not know.

Steps to becoming tsunami prepared

Respondents were asked to indicate whether they had taken any of the following steps to become more tsunami prepared.

Developing a family response plan

Of the 193 residents who responded to this question 44.6% said that they were not developing a family response plan, 45.1% said that they were developing a family response plan and 10.3% said that this did not apply to them.

Have a back pack filled with supplies

Of the 198 residents who responded to this question 66.2% said that they do not have a back pack filled with supplies that is ready to take with them, 32.3% said that they did have back pack filled with supplies, and 1.5% said that this does not apply to them.

Participated in an official tsunami evacuation drill

Of the 194 residents who responded to this question 93.3% said that they had not participated in an official tsunami evacuation drill, 3.1% said that they had, and 3.6% said that this did not apply to them. Residents who said that they had participated in an official tsunami evacuation drill came from Wainui (1 resident), Westshore (3 residents), Haumoana (1 resident), and Te Awanga (1 resident).

Participated in an unofficial tsunami evacuation drill

Of the 195 residents who answered this question 88.7% said that they had not participated in an unofficial tsunami evacuation drill, 8.2% said that they had, and 3.1% said that this does not apply. Residents who said that they had participated in an unofficial tsunami evacuation drill came from Wainui (8 residents), Westshore (4 residents), and Te Awanga (4 residents).

Influence over willingness to prepare

Respondents were asked to indicate how much they agree or disagree that the following sources of information influenced their willingness to prepare.

Public educational meetings

Of the 166 people who answered this question 29.8% strongly disagreed that public educational meetings had influenced their willingness to prepare for tsunamis, 10.7% disagreed, 19.5% said that public educational meetings had maybe influenced their willingness to prepare, 12.7% agreed, and 8.3% strongly agreed.

World events such as the 2004 Indian Ocean tsunami

Of the 185 respondents who answered this question 7.8% strongly disagreed world events such as the 2004 Indian Ocean tsunami had influenced their willingness to prepare for tsunamis. 3.9% disagreed and 19% said that world events had maybe influenced their willingness to prepare. 28.8% of respondents agreed that world events had influenced their willingness to prepare, and 30.7% strongly agreed.

Neighbourhood educators

Of the 159 respondents who answered this question 35.5% strongly disagreed that neighbourhood educators had influenced their willingness to prepare for tsunamis. 10.2% disagreed, 17.1% said that neighbourhood educators had maybe influenced their willingness to prepare, 11.7% agreed, and 2.9% strongly agreed.

School programmes

Of the 152 respondents who answered this question 32.2% strongly disagreed that school programmes had influenced their willingness to prepare for tsunamis. 8.3% of

respondents disagreed, 14.1% said that school programmes had maybe influenced their willingness to prepare, 12.2% agreed, and 7.3% strongly agreed.

Council newsletters

Of the 172 respondents who answered this question 22.9% strongly disagreed that council newsletters influenced their willingness to prepare for tsunamis. 6.8% disagreed, 18.5% said that council newsletters had maybe influenced their willingness to prepare, 22.4% agreed, and 13.2% strongly agreed.

Public tsunami drills

Of the 160 respondents who answered this question the majority (40%) strongly disagreed that public tsunami drills had influenced their willingness to prepare for tsunamis. 8.8% disagreed, 16.6% said that drills had maybe had an influence, 7.8% agreed, and 4.9% of respondents strongly agreed.

Before the 2004 Boxing Day Tsunami

When asked if they had known what a tsunami was previous to the 2004 Boxing Day tsunami, the majority (92.2%) of respondents answered yes. 5.9% admitted that they did not know what a tsunami was prior to this event.

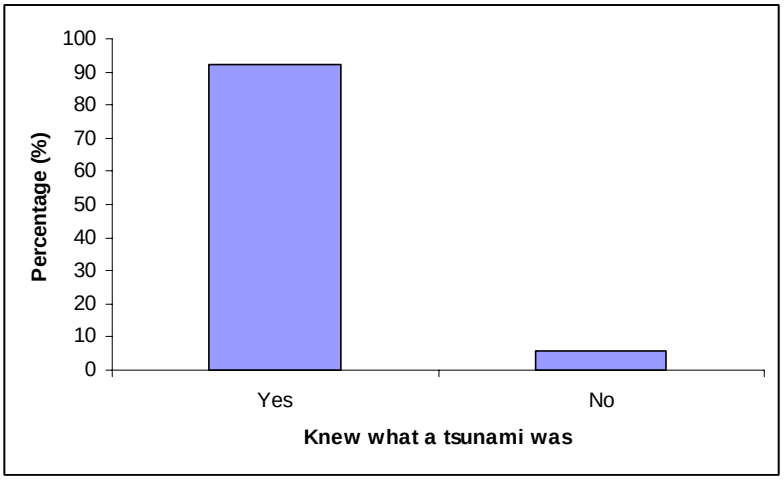


Figure 5.14: Percentage of respondents who knew what a tsunami was before the 2004 Boxing Day event

Since the 2004 Boxing Day tsunami

Respondents were asked a number of questions relating to their actions and perceptions following the 2004 Boxing Day tsunami. They were asked to tick all that apply.

The majority (69.8%) of respondents said that since the 2004 Boxing Day tsunami they have learned more about tsunamis and 18.5% of respondents have actively sought information on tsunamis. A large percentage (61.5%) of respondents said that they feel more at risk from tsunamis following the 2004 event, with 1% of respondents saying that they feel less at risk, and 23.4% saying that they have not been affected. 3.4% of respondents answered 'other'. 'Other' answers included that they are now more aware, that they feel more at risk from earthquakes, and that they had always known that a tsunami could occur.

5.3.3 DURING A TSUNAMI

The following section presents the results of a number of questions relating to understanding of, and actions respondents would take during a tsunami. Except where stated the results have been expressed as a total of all 4 communities.

Response to a local source tsunami warning

When asked how they would respond to a warning of a local source tsunami (from a place less than 1 hour travel time away) the majority of respondents said that they would move to high ground (69.3%) or inland (9.8%). 27.3% of respondents indicated that they would take supplies with them, 17.6% said that they would take their family and/or pets. Only 9.8% of residents said that they would inform their friends and neighbours, while 2% said that they would seek further information before taking any action. 8.3% of respondents stated that they would evacuate, but did not indicate where to, and a further 8.3% said that they would leave, but also did not indicate where they would go to. 5.9% of respondents said that they would take some other action. Other answers included that they did not know what they would do, that they would run, freak out, would take important documents, would prepare family to leave, would offer assistance if needed, and would follow instructions.

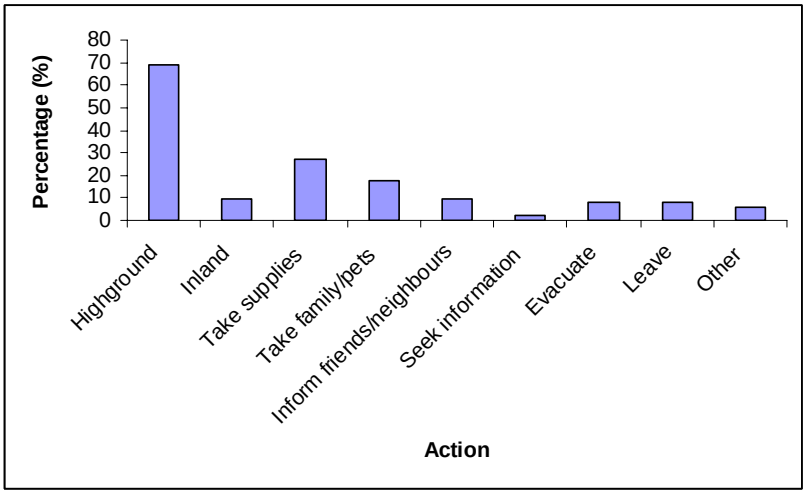


Figure 5.15: Actions respondents would take following warning of a *local* source tsunami

How responses would *differ* for a distant source tsunami warning

When respondents were asked to indicate how their response to a warning of a distant source tsunami warning would differ to their response to a local source tsunami warning the majority (40%) said that their response would not differ. 24.9% said that they would follow instructions, 17.1% said that they would pack and take supplies, and 3.4% said that they would inform their friends and neighbours. 15.6% of respondents said that they would take some other action. Other actions included waiting for more information, taking valuable possessions, and heading further inland than if it was a local source tsunami.

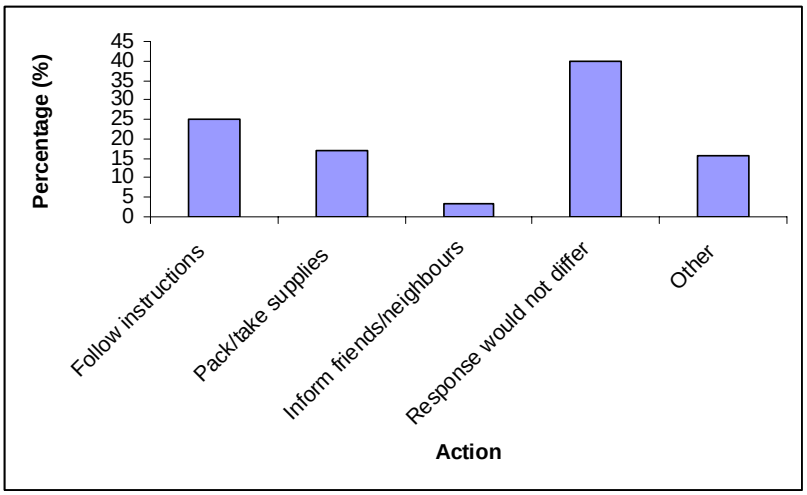


Figure 5.16: How responses would differ following warning of a *distant* source tsunami

Time to move to safety following an official tsunami warning

When respondents were asked how much time they have to move to safety if they are at the coast and receive an official tsunami warning the majority (34.1%) answered that they did not know. 17.6% said they would have a few minutes, 20% said between 10 minutes- half an hour, 15.6% between half an hour- 1 hour, 6.3% said 1-2 hours, 2.9% said 2-5 hours, and 0.5% said more than 5 hours.

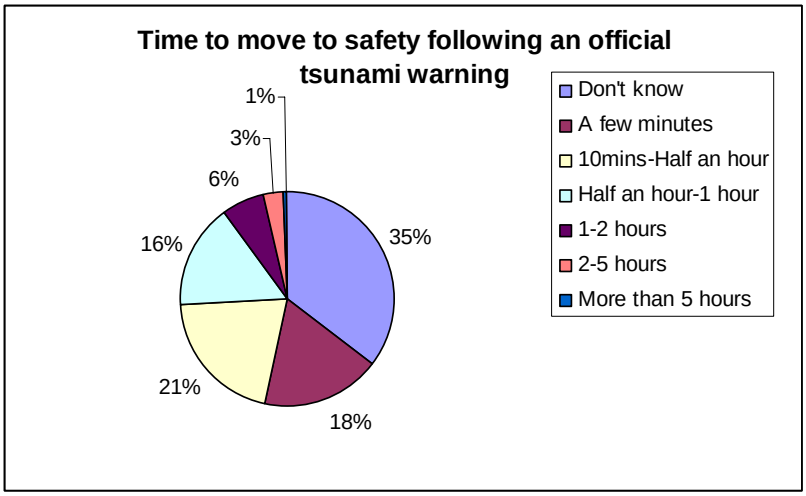


Figure 5.17: Understanding of the time to move to safety following an official tsunami warning.

It is interesting to note that a number of respondents also stated that the time to move to safety depends on the source of the tsunami, and whether or not the tsunami was local or distant. In New Zealand there are no warning systems in place for local source tsunami as there is very little time to get a warning to the public. An official tsunami warning will only be issued if the tsunami is from a distant source due to the difficulty of implementing local-source tsunami warnings (Webb, 2005). The public need to be made aware of this, and need to recognize natural warning signs in order to prepare for local source tsunami (Webb, 2005).

Time to move to safety if a strong earthquake is felt while at the beach

Respondents were asked how much time they have to move to safety if they feel a strong earthquake while at the beach. A large percentage (33.7%) of residents indicated that they did not know, however it is interesting to note the all of the respondents said that they would have less than an hour to move to safety. 34.1% said they would only have a few minutes, 23.4% said 10 minutes – half an hour, and a small percentage (7.3%) said they would have half an hour – 1 hour.

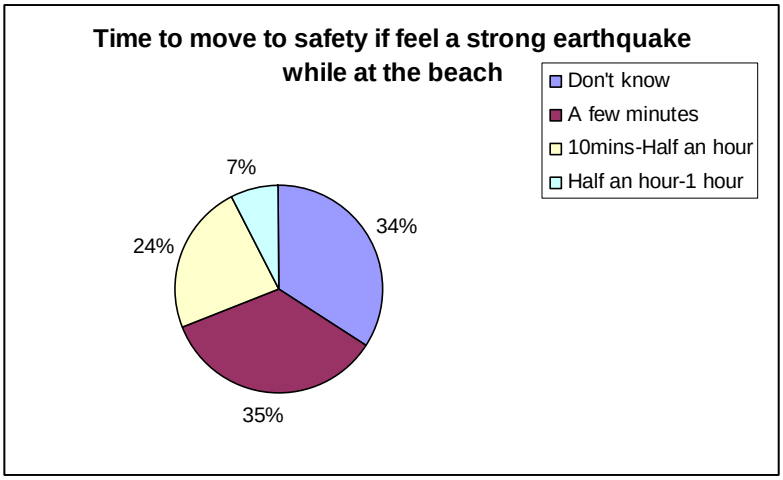


Figure 5.18: Understanding of the time to move to safety if a strong earthquake is felt while at the beach.

Time between one tsunami wave/surge and the next

When asked how much time there is between one tsunami wave/surge and the next the majority of respondents indicated that they do not know. 34.1% respondents said 1-15 minutes, 2.9% said 16-30 minutes, and 1% said there would be over 30 minutes. 23.4% answered that it could be all of the above.

Take personal belongings during a *local* source tsunami warning

When respondents were asked if they would take personal belongings with them during a *local* source tsunami warning almost half (49.8%) said that they would, with 40.5% saying that they would not. 8.8% of respondents said that they did not know if they would take personal belongings or not.

Take personal belongings during a *distant* source tsunami warning

The majority (81.5%) of respondents said that they would take personal belongings with them during a *distant* source tsunami warning. 9.8% said that they would not, while 7.8% indicated that they did not know if they would or not.

The three most important things in personal survival kit

Respondents were asked to list the three most important items for their health/welfare if they currently had a personal survival kit.

The majority (55.6%) of respondents said water, 45.9% said food, 17.1% said medication, 29.3% clothing, 4.9% shelter, 2.9% Photo albums and/or personal mementos, 3.9% cash/card/wallet, 5.9% legal documents, 9.3% said radio, and 27.8% said that some other item was the most important for their personal health/welfare. Other items included First Aid kit, blankets/sleeping bags, car, cell phone, waterproof matches, pets, torch, and strong footwear.

Extent of agreement to how a tsunami will affect the respondent

Respondents were asked to indicate how strongly they agree or disagree with the following statements.

I think tsunami could pose a threat to my personal safety

The majority (54.6%) of respondents strongly agreed with the statement that tsunamis could pose a threat to their personal safety. 22% of respondents agreed, 14.1% thought maybe, 3.4% disagreed, and 3.9% strongly disagreed.

I think tsunami could pose a threat to my daily activities (such as work, leisure or property)

Residents in Wainui, Gisborne appeared to be more of the attitude that tsunami would not pose at threat to their daily activities with 10% of respondents strongly disagreeing with the statement. This is almost 5% more than the attitudes of residents at Westshore in Napier, and close to 8% more than residents at Haumoana and Te Awanga. Overall however the majority (46.3%) of all residents from the four communities strongly agreed that tsunamis could pose a threat to their daily activities, 22.4% agreed, 14.6% thought a tsunami could maybe pose a threat to their daily activities, 5.9% disagreed, and 5.4% strongly disagreed.

The tsunami that may occur here won't be that bad

When asked to what extent they agree or disagree with the statement that the tsunami that may occur here won't be that bad, the majority (45.4%) of residents strongly disagreed. 21.5% disagreed, 18% answered maybe, 6.8% agreed, and 3.4% strongly agreed with the statement.

Tsunamis won't affect this area

The majority (57.6%) of residents strongly disagreed with the statement that tsunamis won't affect their area. 17.6% disagreed, 10.2% thought maybe, 6.3% agreed with the statement, and 3.9% strongly agreed.

Tsunamis won't affect me

56.6% of residents strongly disagreed with the statement that tsunamis wouldn't affect them. 21.5% disagreed, 10.2% thought maybe, 3.4% agreed, and 3.9% strongly agreed.

The likelihood that major tsunamis will occur here has been greatly exaggerated

When asked to which extent they agree or disagree with the statement that the likelihood that major tsunamis will occur here has been greatly exaggerated the majority (36.1%) of respondents strongly disagreed with the statement. 22.4% disagreed, 23.4% said maybe, 8.8% agreed, and 4.4% strongly agreed.

Tsunamis have affected this area since I have lived here

Over half of all residents strongly disagreed with the statement that tsunamis have affected their area since they have lived there. 9.3% disagreed, 14.1% said maybe, 5.9% agreed, and 10.2% strongly agreed.

I will be fine if any tsunami hits here in the future

When asked to which extent they agree or disagree with the statement 'I will be fine if any tsunami hits here in the future' the majority (53.2% strongly disagreed. 16.6% disagreed, 13.2% said maybe, 4.9% agreed, and 7.3% strongly agreed that they would be fine if a tsunami hit their area in the future.

Components of community tsunami warning system

Residents were asked to list the components of their community's tsunami warning system. This section has been separated into results for the four different communities.

Wainui

The majority of Wainui residents indicated that they either did not know if their community has a tsunami warning system (38%), or indicated that their community has a tsunami warning system but they do not know the components of it (36%). 14% of Wainui residents said that their community's warning system consists of a siren, 14% said loudspeaker, 12% TV and radio, and 18% door to door warnings.

Westshore

35.5% of residents at Westshore said that their community tsunami warning system consisted of a siren, 2.6% said loudspeaker announcements, 11.8% said TV and radio, and 1.3% said other. Similar to Wainui residents the majority of Westshore residents indicated that they either do not know if their community has a tsunami warning system (32.9%), or said that their community has a tsunami warning system but that they do not know the components of it (30.3%).

Haumoana

43.9% of Haumoana residents said that they do not know if their community has a tsunami warning system, and 22% said that there is a tsunami warning system but they do not know the components of it. 29.3% of residents said that the community tsunami warning system consists of a siren, 2.4% said TV and radio, and 4.9% said door to door warnings.

Te Awanga

34.2% of residents at Te Awanga said that their community tsunami warning system consists of a siren, 2.6% said loudspeaker announcements, 18.4% said TV and radio, 10.5% said door to door warnings, and 13.2% said some other form of warning. 42.1% of residents did not know if their community had a tsunami warning system, and 7.9% said that their community does have a tsunami warning system but they do not know the components of it.

Advice given about what to do during a tsunami evacuation

Respondents were asked to specify what advice they had been given about what to do during a tsunami evacuation. These results are given for each of the four different communities.

Wainui

The majority (38%) of Wainui residents said that they had not been given any advice on what to do during a tsunami evacuation. 4% had been told to have emergency supplies, 2% had been told to listen to the radio, 36% had been told to evacuate to high ground or inland following an earthquake, and 14% had been told to take some other action. Other actions included not going down to the beach, and not driving.

Westshore

6.6% of Westshore residents said that they had been told to have emergency supplies, 17.1% had been told to evacuate to high ground or inland following an earthquake, 5.3% had been told to listen to the radio, and 14.5% had been given some other form of advice. Other advice included reading instructions in the back of the telephone book, driving to the nearest high point, moving at least 1km inland or 35m above sea level, not going sigh seeing. The majority (61.8%) of Westshore residents however said that they had not been given any advice.

Haumoana

The majority (51.2%) of Haumoana residents had not been given any advice on what to do during a tsunami evacuation. 9.8% had been told to have emergency supplies, 31.7% had been told to evacuate to high ground or inland following an earthquake, 4.9% had been told to listen to the radio, and 12.2% had been given another form of advice. Other advice included keeping away from the sea and rivers, moving 1-2km inland, leaving a note in the window saying that they had evacuated, and to respect the ocean and be prepared for the worst.

Te Awanga

13.2% of Te Awanga residents had been told to have emergency supplies, 34.2% had been told to move inland or to high ground following an earthquake, 2.6% had been told to listen to the radio, and 5.3% had been given some other form of advice. Other advice included not going to the beach, and not to panic. 50% of Te Awanga residents had not been given any advice on what to do during a tsunami evacuation.

It is interesting to note that overall the majority (51.7%) of residents from all of the four communities surveyed said that they had not been given any advice on what to do during a tsunami evacuation. This is something that needs to be addressed by the relevant CDEM groups.

Child's school disaster preparedness plan

Those residents who have school aged children were asked whether their child's school has a disaster preparedness plan that includes tsunamis. 49 residents responded to this question, with 26.5% saying yes, 16.3% saying no, and 57.1% saying they did not know if their child's school has a preparedness plan that includes tsunamis.

Child's school disaster preparedness plan- extent of agreement

Respondents with school aged children were asked to indicate to which extent they agree or disagree with the following statements.

Allow child to remain at school when a tsunami warning is issued

When asked to which extent they agreed or disagreed that they would allow their child to remain at school when a disaster warning is issued 25.5% of respondents strongly disagreed with the statement, 6.4% disagreed, 21.3% said maybe, 14.9% agreed, and 31.9% strongly agreed.

Will go and get child from school when a tsunami warning is issued

The majority (42.6%) of residents strongly agreed that they would go and get their child from school when a tsunami warning was issued. 14.9% agreed with the statement, 19.1% said maybe, 6.4% disagreed, and 10.6% strongly disagreed. 6.4% said that this does not apply.

Will trust the schools tsunami plan to protect their child

15.2% of residents strongly disagreed with the statement that they would trust the schools tsunami plan to protect their child during a tsunami event, 4.3% disagreed, 10.9% said maybe, 26.1% agreed, and 37% strongly agreed. 6.5% said that this does not apply.

5.3.4 DEMOGRAPHICS

The majority (79.5%) of respondents were the owner and the address this survey was sent to was their primary residence. 15.6% of respondents were renting and this was

their primary residence, and 3.9% were the owner of the residence but this was their holiday home.

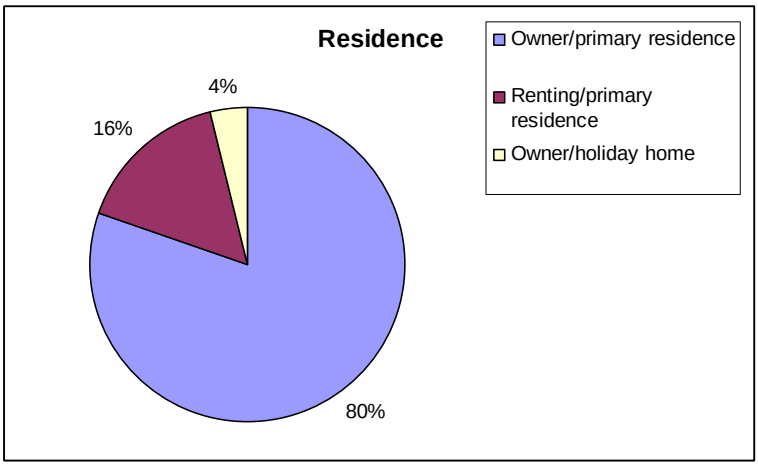


Figure 5.19: Indication of whether the respondent is the owner or renter of the property this questionnaire was sent to.

Gender

The majority (50.7%) of those who took part in the survey were female. 47.8% were male. However three respondents chose not to answer this question.

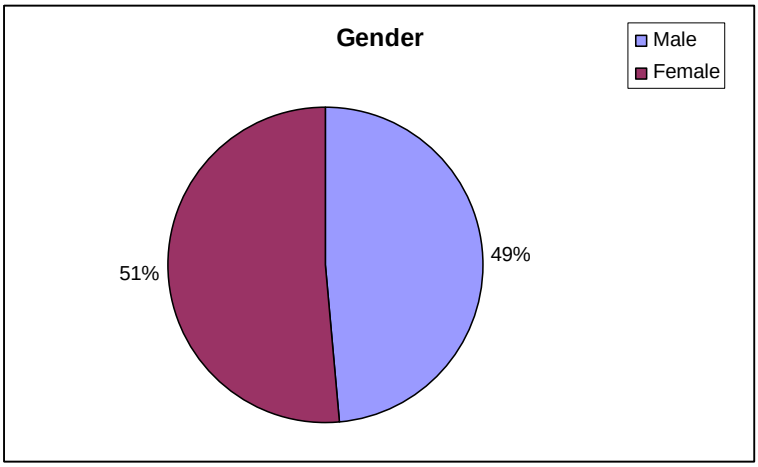


Figure 5.20: Percentage of males and females.

Living situation

The majority (36.1%) of respondents said that their living situation was a family without children, 33.2% were a family with children, 22.9% of respondents lived

alone, and 5.4% of respondents said that they lived with non-family members. Five people did not answer this question.

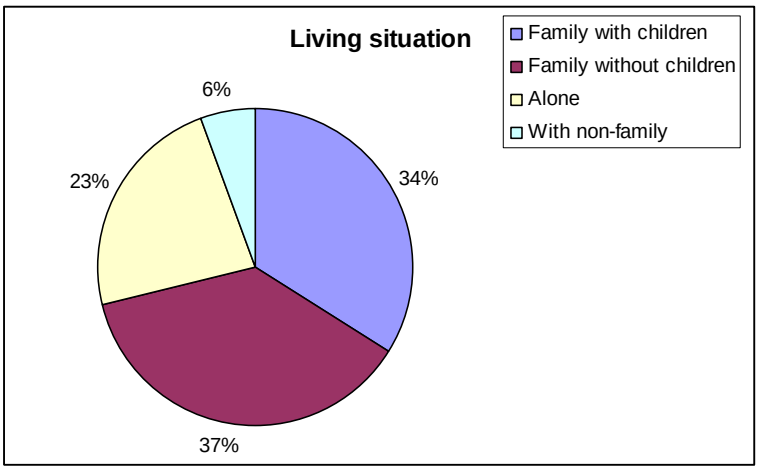


Figure 5.21: Respondents living situation.

Completed the 2003 coastal survey

When asked whether the had completed the 2003 National Coastal Survey the majority (44.9%) of respondents said that they had, 39.5% said that they had not, and 8.3% were unsure. 15 people did not answer this question.

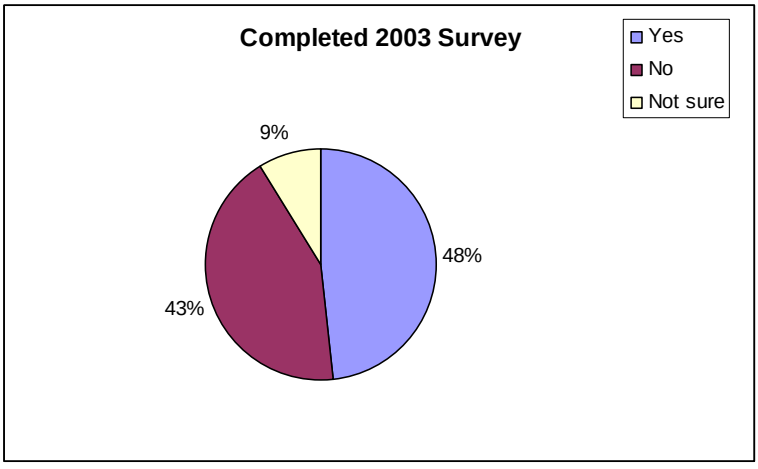


Figure 5.22: Percentage of respondents who completed the 2003 National Coastal Survey.

Ethnic group

The majority (83.9%) of respondents described themselves as New Zealand European, 7.3% were Maori, 0.5% Pacific Islander, and 4.9% said they were from

another ethnic group. Other ethnic groups included Australian, British, European, New Zealander/Pacific Islander, Scottish, and South African. Seven people did not answer this question.

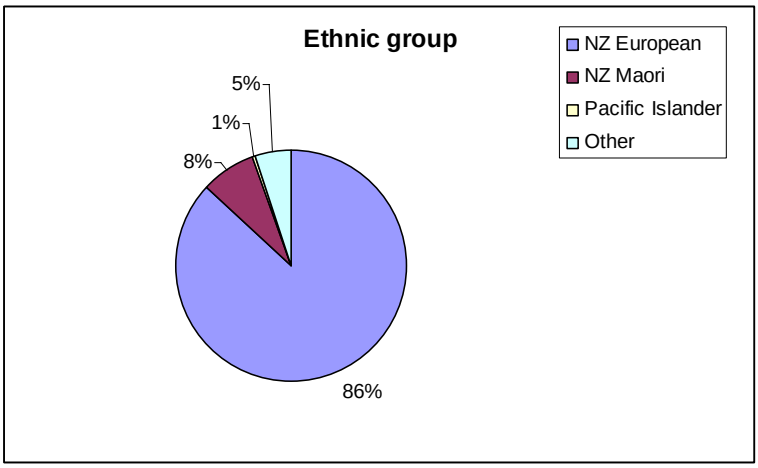


Figure 5.23: Percentage of ethnic groups.

Age

The mean age of respondents on their last birthday was 55 years old. There was a range from 18-86 years of age. Nine people did not answer this question.

Current employment status

The majority (31.2%) of respondents were in full time employment, 14.6% were in part time employment, 29.3% were not in paid employment, and 22% were self employed. Six people did not answer this question.

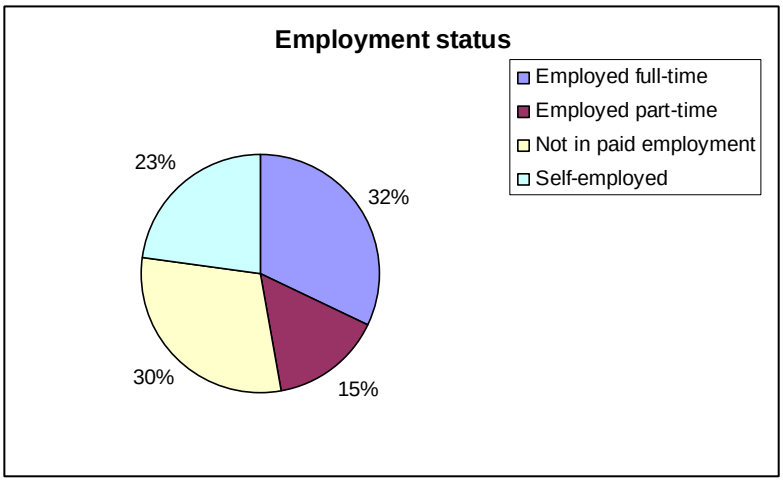


Figure 5.24: Respondents employment status.

Household gross annual income

The majority (18.5%) of respondents had a household gross annual income between $60 001 to $90 000. Figure 5.25 shows the percentage of household gross annual incomes. 23 respondents chose not to answer this question.

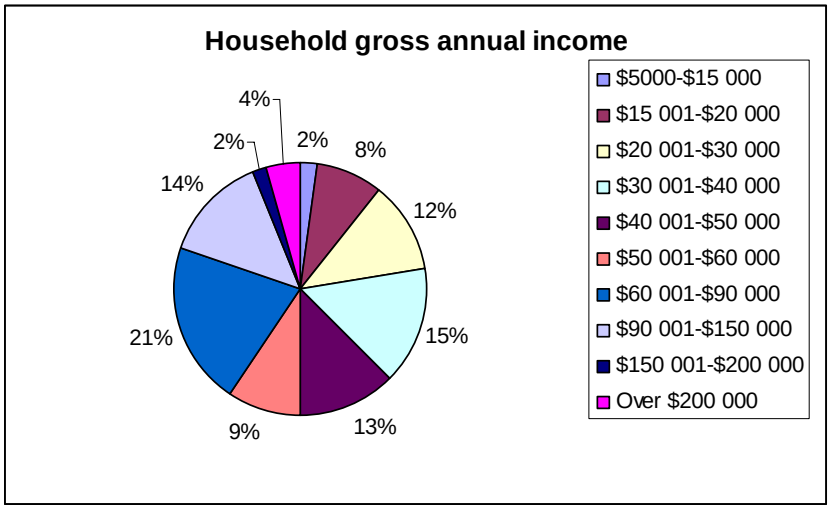


Figure 5.25: Percentage of household annual gross income.

5.4 COMPARISON BETWEEN 2003 AND 2006 COASTAL SURVEYS

There are a number of questions that were asked in both the 2003 National Coastal survey and the 2006 National Coastal survey. This section compares these results, and discusses how peoples' perceptions may have changed following the 2004 Indian Ocean tsunami. Results from the 2003 survey were obtained from Johnston *et al*, 2003.

Last tsunami that affected this area

There is a noticeable difference between results of the 2003 and 2006 coastal surveys (Figure 5.17) in relation to when residents thought that the last tsunami that affected their area occurred. The percentage of residents who did not know when the last tsunami affected their area had decreased markedly between 2003 and 2006, and the percentage who said they thought the last tsunami had occurred in the last 100 years had increased between the 2003 and the 2006 surveys for all communities except for Westshore where there was found to be a slight decrease from 2003 to 2006..

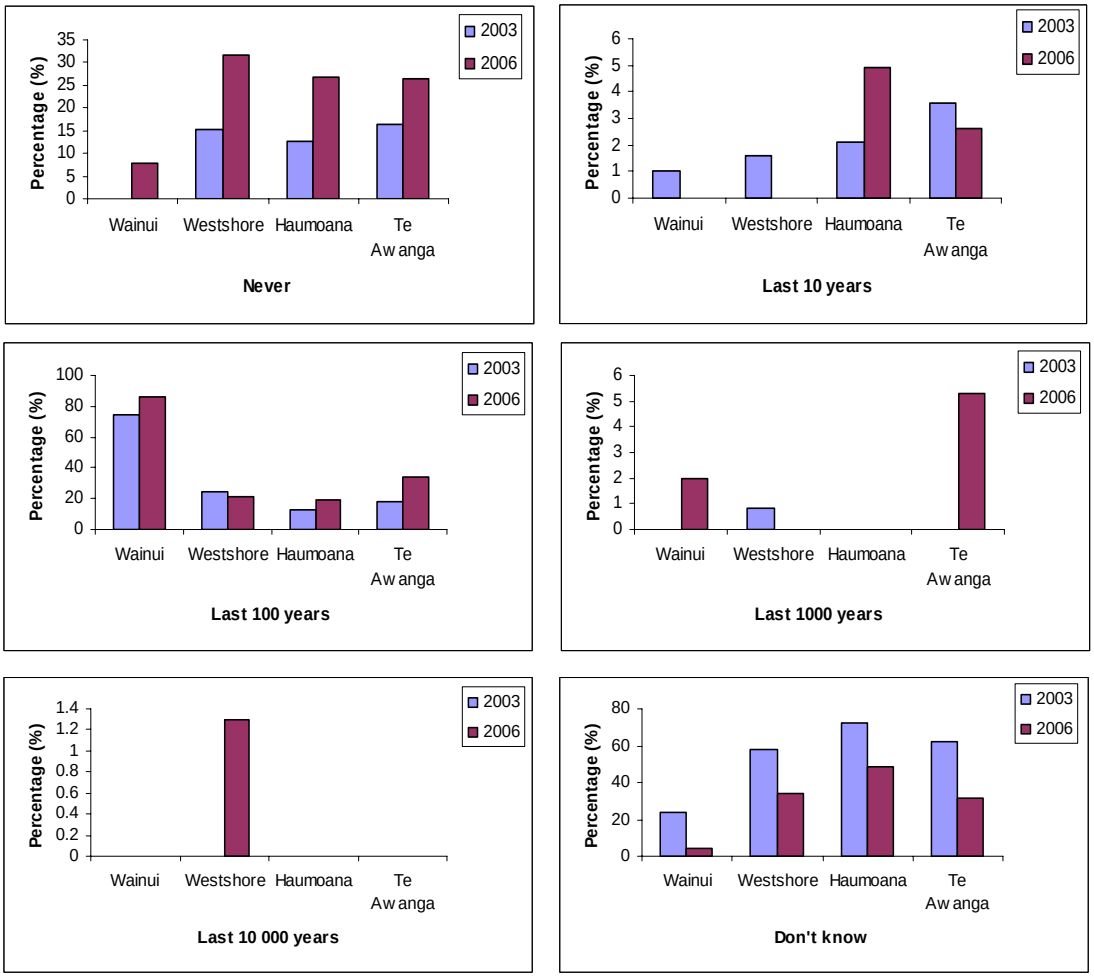


Figure 5.26: Comparison between 2003 and 2006 showing when respondents thought the last *damaging* tsunami affected their area.

Hazard zone maps

Between 2003 and 2006 there has been a noticeable increase in residents from each community who have seen tsunami hazard zone maps for their area (Figure 5.18). There has also been a decrease in the number of residents who said that they are unsure if they have seen tsunami hazard zone maps (Figure 5.19), and residents who said that they have not seen tsunami hazard zone maps for their community (Figure 5.20).

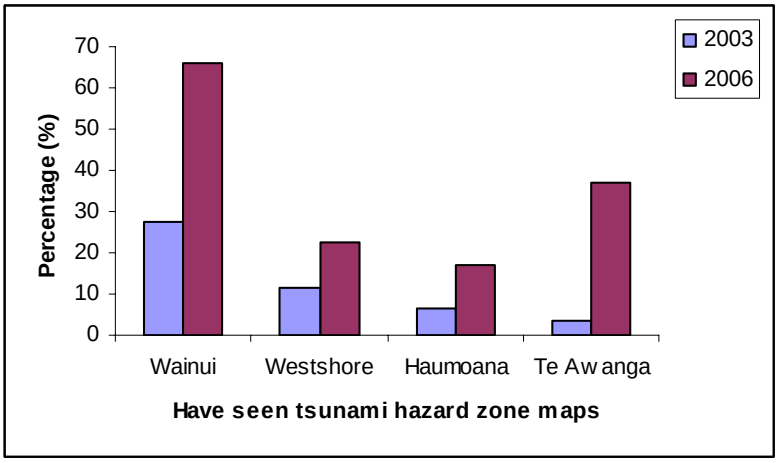


Figure 5.27: Comparison between 2003 and 2006 of residents who had seen tsunami hazard zone maps for their community.

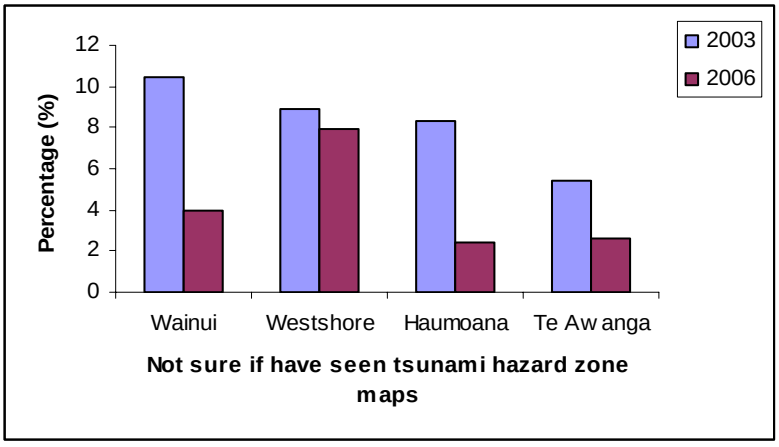


Figure 5.28: Comparison between 2003 and 2006 of residents who where not sure if they had seen tsunami hazard zone maps for their community.

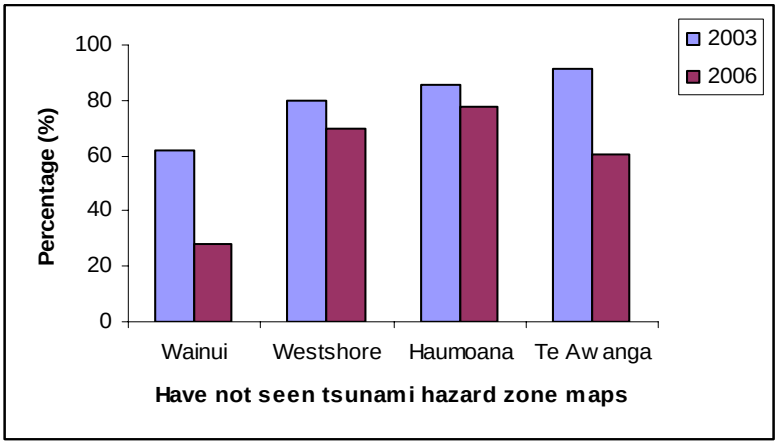


Figure 5.29: Comparison between 2003 and 2006 of residents who had not seen tsunami hazard zone maps for their community.

New Zealand public tsunami warning system

There was a noticeable decrease from 2003 to 2006 in the number of respondents who said that they did not know what the New Zealand public tsunami warning system consists of (Wainui: 32% in 2003 to 8% in 2006; Westshore: 23.8% in 2003 to 7.9% in 2006; Haumoana: 38.8% in 2003 to 14.6% in 2006; and Te Awanga: 40.4% in 2003 to 5.3% in 2006). There was an increase in the awareness of respondents saying that the New Zealand public tsunami warning system consists of sirens and radio and TV announcements.

Who is responsible for issuing tsunami warnings

From 2003 to 2006 there was a decrease in the number of respondents who said that they do not know who is responsible for issuing tsunami warnings of (Wainui: 25.8% in 2003 to 2% in 2006; Westshore: 17.5 in 2003 to 11.8% in 2006; Haumoana: 34.7% in 2003 to 24.4% in 2006; and Te Awanga: 24.6% in 2003 to 5.3% in 2006). There has been an increase in those respondents who think that Central Government and their Regional Council is responsible for issuing warnings.

Time to move to safety following a tsunami warning

It was encouraging to note that between the 2003 National coastal survey and the 2006 resurvey of these communities there was a decrease in the number of respondents who said that they did not know how much time they would have to move to safety following a tsunami warning (Wainui: 44.2% in 2003 to 32% in 2006; Westshore: 37.1% in 2003 to 32.9% in 2006; Haumoana: 40.8% in 2003 to 39% in 2006; and Te Awanga: 50% in 2003 to 34.2% in 2006). There was also an overall decrease in the number of residents who said that they would have only a few minutes to move to safety following a tsunami warning, and an overall decrease in the number of residents who said that they would have between 10 minutes and half an hour to move to safety. There was also a general decrease in the number of residents who said that they would have 1-2 hours to move to safety following a tsunami, except at Westshore where there was an increase in the number of respondents who thought that they would have this amount of time to move to safety. There were inconsistencies in the time frame variables that were given in the 2003 and the 2006 surveys (the 2003 survey had the time frame option of more than 2 hours, while the

2006 survey had time frame options of 2-5 hours, and more than 5 hours) and it is therefore not possible to further make comparisons.

Time to move to safety from a possible tsunami if the respondent feels a strong earthquake while at the beach

As with the previous question there was a decrease in the number of respondents who said that they did not know how much time they would have to move to safety from a possible tsunami if they felt a strong earthquake while at the beach (Wainui: 46.3% in 2003 to 32% in 2006; Westshore: 42.1% in 2003 to 31.6% in 2006; Haumoana: 50% in 2003 to 41.5% in 2006; and Te Awanga: 44.6% in 2003 to 31.6% in 2006). There was an increase in the number of respondents who said that they thought they would only have a few minutes, and an increase in the number of respondents who said they would have between 10 minutes and half an hour, and overall an increase in those who said they would have between half an hour and 1 hour to move to safety. There was a decrease in the number of respondents who said that they would have any more than 1 hour to move to safety.

Heard or received information on preparing for tsunamis

There was an overall increase in the number of respondents who had heard or received information on preparing for tsunamis from the 2003 to the 2006 surveys. This increase is especially noticeable for those saying they heard or received information on tsunamis from Central Government Agencies (Wainui: 6.2.% in 2003 to 10% in 2006; Westshore: 4% in 2003 to 11.8% in 2006; Haumoana: 2% in 2003 to 9.8% in 2006; and Te Awanga: 5.3% in 2003 to 28.9% in 2006), the Regional Council (Wainui:11.3.% in 2003 to 22% in 2006; Westshore: 7.9% in 2003 to 25% in 2006; Haumoana: 4.1% in 2003 to 17.1% in 2006; and Te Awanga: 8.8% in 2003 to 28.9% in 2006), and Civil Defence (Wainui: 33% in 2003 to 60% in 2006; Westshore: 27.8% in 2003 to 31.6% in 2006; Haumoana: 6.1% in 2003 to 29.3% in 2006; and Te Awanga: 21.1% in 2003 to 34.2% in 2006).

Asked for information on how to get ready for tsunami hazards

Very few respondents from either the 2003 or 2006 surveys had asked anyone for information on how to get ready for tsunami hazards, however there was a slight

decrease between the 2003 and the 2006 surveys in the percentage of respondents who said that they had not asked anyone for information (Wainui: 88.7% in 2003 to 52.1% in 2006; Westshore: 79.4% in 2003 to 78.9% in 2006; Haumoana: 85.7% in 2003 to 75.6% in 2006; and Te Awanga: 93% in 2003 to 76.3% in 2006). This possibly indicates that the New Zealand public are becoming more aware of the risk that tsunami pose to coastal communities. However, it is also likely that those who have had previous tsunami experience (e.g. the Tongan earthquake and consequent tsunami warning for Gisborne and Hawke's Bay in May 2006) are more likely to have sought information since this incident. Findings from a survey conducted following the tsunami warning in May 2006 have shown that Gisborne residents were more aware of the possible tsunami than Hawke's Bay residents (see Chapter 2), and this may explain why a smaller percentage of Wainui residents have not sought information on tsunami than Hawke's Bay residents, and why there is such a noticeable decrease from 2006 to 2003 in the number of residents who said they had not asked anyone for information.

Seek information on tsunami hazards

There was an overall increase between 2003 and 2006 of residents who said that they would in the next month or so after completing the survey seek information on tsunami hazards.

Seek information on responding to tsunami hazards

There was an increase in the percentage of respondents who said that in the next month or so after completing the survey they would seek information on how to respond to tsunamis.

Become involved with a local group to discuss how to reduce tsunami risks

Between 2003 and 2006 there was a noticeable increase in the number of respondents who said that they would become involved in a local group to discuss how to reduce tsunami risks.

5.5 DISCUSSION

Webb (2005) found that there was complacency and a limited understanding of tsunami risk evident amongst residents in coastal communities around New Zealand. It appears that this is still the case. This limited understanding and complacency is partly due to the fact that there has been a relatively calm period from tsunami since the last damaging tsunami which occurred in May 1960 (Webb, 2005). Devastating events can often increase a persons' awareness and perception of risk, however, as Johnston *et al* (Submitted) speculate, perception of risk often diminishes over a period in which no hazards occur.

In New Zealand, it is the responsibility of MCDEM and Regional Councils to mitigate the effects of natural hazard events (de Lange, 2003). However, in order to develop effective risk management measures we need to have a better understanding of experience in dealing with significant tsunami at an individual, community, and national level (Webb, 2005). In 2003 a national coastal community survey was conducted at 42 communities around New Zealand with the aim of identifying residents and visitors perceptions of, and preparedness for coastal hazards (Johnston *et al*, 2003; Webb, 2005). Following the devastating 2004 Boxing Day tsunami it was decided to resurvey residents in order to determine how peoples' perceptions of, and knowledge of tsunami risk may have changed.

Tsunami generating earthquakes are relatively rare (between 1861 and 1948 only 124 tsunami were recorded from a total of 15 000 earthquakes) (Bryant, 2005). However, earthquakes are the most common cause of tsunami (Dudley and Lee, 1988; de Lange, 2003). Knowledge of the most common cause of tsunamis was high amongst respondents of the 2006 national coastal resurvey, with the majority of respondents understanding that earthquakes are the most frequent cause. It is somewhat disturbing however to note that there are still a number of residents who either do not know what the most frequent cause of a tsunami is, or who believe that high tides, or hurricanes/storms are responsible.

The 2006 national coastal survey found that awareness of tsunami risk in New Zealand was still relatively low, although this has increased somewhat since the 2003 National Coastal Survey. In saying this however, it must be noted that residents of Wainui have a very good awareness of when the last tsunami affected their area in comparison with the other communities surveyed.

The majority of respondents believed that the next tsunami could occur at some stage within the next 100 years. It was noted however, that a number of respondents (24.4%) answered that they did not know when the next tsunami might occur. How people perceive risk is an important factor into how well they well prepare for, and respond in the event of a hazard (Peacock *et al*, 2005). Thus, it is important to ascertain public risk perception in order for authorities to make the most effective decisions in relation to natural hazard events. Perception of risk is also positively related to how people will respond to warnings (Peacock *et al*, 2005).

It was encouraging to note that the majority of respondents surveyed said that they would move inland or to high ground in the event of a tsunami warning being issued, or in the event of a possible local source tsunami occurring. This was consistent in both the 2003 and the 2006 surveys. It is disappointing however, that very few said that they would take emergency supplies with them. In the event of a disaster people may need to evacuate for extended periods of time - possibly over 24 hours (Johnston, D.M. 2007, pers. comm., 18 February), therefore, it is vital that people take emergency supplies with them when evacuating from their homes. The majority of respondents did not know how much time they would have to move to safety in the event of a distant source tsunami warning being issued. However, all respondents said that they would have less than an hour to move to safety in the event of a possible local source tsunami. In New Zealand there are only warning systems in place for distant source tsunami, as there will generally not be adequate time to issue a warning in the instance of a local source tsunami being generated (Webb, 2005). It is important therefore to ensure that the public receive effective and continuous education into public warnings (both human generated warnings and natural warnings) in order to ensure we have tsunami ready communities (Darienzo *et al*, 2005). Local populations need to be aware of the signs of an approaching local

source tsunami in order to be able to take the correct actions without relying on directions from officials (Dengler, 2005).

Education is an important tool for ensuring that the public are aware of the risk associated with natural hazards, and evidence suggests that public response to warnings will increase if well designed public education initiatives are undertaken (Leonard *et al*, 2006). Since the early 1990s, Washington State, USA has undertaken considerable tsunami hazard assessments, along with tsunami warning and mitigation efforts. A number of products for communicating tsunami risk to the public such as tsunami brochures, evacuation maps, posters, and a tsunami school education program have been developed. These products have all been successful in increasing awareness about tsunami hazard amongst coastal Washington residents. However, levels of preparedness were still found to be low to moderate amongst residents. These findings show the need for use of additional strategies to help improve public preparedness (Crawford, 2006). Paton *et al*, (2004) also found that the effectiveness of public education strategies which are based entirely on providing information to the public are questionable, and recommended the need for greater community engagement and empowerment in emergency management planning.

Preparedness activities can help to reduce the risk of injury and damage, and can help to facilitate a capability for coping with disruption associated with the hazard (Paton, 2003). Preparedness for tsunamis was found to be low amongst residents of the 2006 national coastal survey with the majority of residents indicating that they are not becoming tsunami prepared. The majority in high risk areas do not have a backpack filled with emergency supplies, less than half said they were developing a family response plan, and almost no one had participated in either an official, or an unofficial tsunami evacuation drill. It is also disappointing to note that the majority of residents had not asked for any information on how to get ready for a tsunami hazard, although it should be noted that there has been an increase between the 2003 survey and the 2006 survey in the number of residents who had asked for information. It is possible that the 2004 Boxing Day tsunami influenced this increase, as the majority of residents said that the Boxing Day 2004 tsunami had influenced their willingness to prepare for tsunami hazards. It is also possible that the tsunami warning for the east

coast of New Zealand following the Tongan earthquake on 4 May 2006 contributed to this increase. However, although a persons' risk perception can be influenced by personal experience with a hazard, this does not necessarily lead to better preparedness (Johnston *et al*, 1999). This is backed up by the findings that preparedness for tsunamis is low on the east coast of New Zealand, even though both Hawke's Bay and Gisborne experienced the false tsunami warning in May 2006.

Understanding of tsunami hazards does not appear very high in any of the communities surveyed. It is possible that sufficient information on tsunamis is not available to the public. Findings from this survey have shown that although the majority of residents surveyed in the 2006 coastal survey indicated that they did live in a tsunami inundation zone, when asked if they had seen any tsunami hazard zone maps for their area the majority of residents had not. Only the Wainui community had more than half of the residents answering that they had seen tsunami hazard zone maps. Also one third of all residents surveyed said that they had not heard or received any information on tsunamis from any source, and the vast majority of residents indicated that they did not know if there were tsunami evacuation routes in place in their community. This causes some concern, as although Paton *et al* (2004) speculate that the effectiveness of public education that is based solely on providing information to the public is questionable, it would be preferable for more residents to have been provided with adequate information on preparing for tsunamis, tsunami hazard zone maps, and tsunami evacuation procedures and routes.

Chapter Six

SUMMARY AND RECOMMENDATIONS

6.1 INTRODUCTION

This study has examined community understanding of, and preparedness for tsunami hazard in the eastern North Island, New Zealand. Several questions were asked in Chapter 1 before embarking on this research in order to better understand community perception, understanding, and preparedness for tsunami risk in New Zealand. These questions were:

- Does the public have sufficient knowledge of tsunami hazards in their community?
- Is there adequate information on tsunamis available to the public?
- Does the public have an understanding of tsunami warnings - both natural warnings and human generated warning systems?
- Is the public aware of the correct actions to take in the event of a tsunami warning being issued?
- How prepared are staff in hotels/motels for dealing with natural hazards in the Hawke's Bay tourism sector?

These questions can be used to summarise the major findings of this study.

6.2 MAJOR FINDINGS

The findings of community understanding and preparedness for tsunami risk in the eastern North Island are as follows:

- The general public has limited knowledge of tsunami risk in their area. Hawke's Bay residents and visitors to camping grounds in Hawke's Bay appear to have a lower understanding of tsunami risk in the area than do residents in the Gisborne area.

- There does not appear to be adequate information on tsunamis available to the public. The majority of residents surveyed in the 2006 National Coastal Survey had not seen any information on tsunami evacuation routes for their

area, and only one third of residents had heard or received any information on tsunamis from any source. Less than one third of respondents surveyed at the camping grounds in Hawke's Bay had heard or received any information on tsunamis.

- Understanding of the official tsunami warning system was higher amongst residents surveyed in the 2006 National Coastal Survey than visitors surveyed in the camping grounds. The majority of camping ground survey respondents indicated that they do not know what makes up the local public notification system.

- Understanding of the natural signs of a tsunami, or signs that a tsunami may have been generated was high amongst respondents surveyed in the camping grounds. The majority of respondents indicated that they believe receding water is a natural sign of a tsunami. This question was not asked in the 2006 National Coastal Survey. Therefore, no comparison can be made between the two surveys.

- Overall, the public are aware of the correct actions to take in the event of a tsunami warning being issued. The majority of respondents surveyed in the camping ground survey, and the majority of respondents surveyed in the 2006 National Coastal Survey indicated that in the event of a tsunami warning they would move either to high ground or inland. However, very few respondents in either survey said that they would take supplies with them.

- Staff in hotels/motels in the Napier area were not well prepared for managing natural hazard events. The majority of respondents had not received any training for dealing with emergencies, and none of those who had received training had received training for tsunami hazards. However, for the majority of respondents who had received some training for emergencies, this training was not ongoing, and there was also no consistency in how this training was delivered, or in the regularity of it.

- Just over half of those surveyed said that their establishment conducted exercises or drills. However, none of the establishments conducted exercises/drills for tsunamis. The timing of how often these exercises/drills were conducted also varied between once a month and once every 12 months.

- Although it was found that almost all of the establishments surveyed did have hazard signage in place, and these signs were located in all of the rooms/units, it was found that only one of the establishments had hazard signage that indicated what to do in the event of a tsunami.

6.3 RECOMMENDATIONS

The findings of this study suggest that several recommendations be made in order to ensure that coastal communities are better prepared in the event of a tsunami event. These are as follows:

The public need to be provided with more information on tsunami in their local area. This includes: 1) specific area at risk; 2) what types of warnings may be issued; 3) who will be issuing them; 4) what specific actions should be taken upon receipt of a warning (e.g. what to take, where to go, what route(s) to follow). This may be in the form of pamphlets, educational workshops, tsunami evacuation route information, or media coverage.

Workshops need to be conducted by emergency managers with staff from tourist establishments (including camping grounds) in Hawke's Bay to determine knowledge of natural hazard events, and provide information on how hazard events can be better managed.

The suggested actions, described above, need to be part of a longer-term strategy to develop tsunami resilient communities. This will require not only public education but a range of activities that engage, empower and motivate at-risk communities to respond effectively and appropriately to tsunami warnings.

Chapter Seven

REFERENCES

7.0 REFERENCES

Alexander, D. 1993. *Natural Disasters*. UCL Press Limited, London.

Anderson-Berry, L.J. 2003. Community Vulnerability to Tropical Cyclones: Cairns, 1996-2000. *Natural Hazards* 30: 209-232.

Baker, E.J. 1991. Hurricane evacuation behaviour. *International Journal of Mass Emergencies and Disasters* 9(2): 287-310.

Berryman, K. 2005. Review of Tsunami Hazard and Risk in New Zealand. *Institute of Geological & Nuclear Sciences client report 2005/104.*

Blaikie, P.; Cannon, T.; Davis, I.; Wisner, B. 1994. *At Risk: natural hazards, people's vulnerability, and disasters.* Routledge, London.

Bryant, E. 2001. *Tsunami. The Underrated Hazard.* Cambridge University Press, UnitedKingdom. 320p.

Bryant, E. 2005. *Natural Hazards* (2nd ed). Cambridge University Press. Cambridge, United Kingdom. 312p.

Burns, W.J.; Slovic, P.; Kasperson, R.E.; Kasperson, J.X.; Renn, O.; Emani, S. 1993. Incorporating Structural Models into Research on the Social Amplification of Risk: Implications for Theory Construction and Decision Making. *Risk Analysis* 13: 611-623.

Centre for Advanced Engineering, 1997. *Risks & Realities. A Multi-disciplinary Approach to the Vulnerability of Lifelines to Natural Hazards*. Centre for Advanced Engineering, University of Canterbury, Christchurch, New Zealand. 312p.

Chagué-Goff, C.; Dawson, S.; Goff, J.R.; Zachariasen, J.; Berryman, K.R.; Garnett, D.L, Waldron, H.M.; Mildenhall, D.C. 2002. A tsunami (ca. 6300 years BP) and other Holocene environmental changes, northern Hawke's Bay, New Zealand. *Sedimentary Geology* 150: 89-102.

Crawford, G.L. 2006. Developing tsunami ready communities: translating scientific research into usable emergency management products. *Proceedings of the 8th U.S National Conference on Earthquake Engineering. April 18-22. San Francisco, California, USA. Paper No. 1334.*

Darienzo, M.; Aya, A.; Crawford, G.L.; Gibbs, D.; Whitmore, P.M.; Wilde, T.; Yanagi, B.S. 2005. Local Tsunami Warning in the Pacific Coastal United States. *Natural Hazards* 35 (1): 111-119.

de Lange, W.P.; Healy, T.R. 1986. New Zealand tsunamis 1840-1982. *New Zealand Journal of Geology and Geophysics* 29: 115-134.

de Lange, W.P. 1998. The last wave. Chapter 5 p. 99-123. In: *Awesome Forces*. (Ed) Geoff Hicks, G.; Campbell, H. Te Papa Press, Wellington.

de Lange, W.P.; Healy, T.R. 2001. Tsunami Hazard for the Auckland Region and Hauraki Gulf, New Zealand. *Natural Hazards* 24: 267-284.

de Lange, W.P. 2003. Tsunami and storm-surge hazard in New Zealand. Chapter 4, p. 79-95. In: *The New Zealand Coast. TE TAI O AOTEAROA*. (Ed) Goff, J.R.; Nichol, S.L.; Rouse, H.L. Dunmore Press, Palmerston North with Whitireia Publishing and Daphne Brasell Associates Ltd. New Zealand.

Dengler, L. 2005. The Role of Education in the National Tsunami Hazard Mitigation Program. *Natural Hazards* 35: 141-153.

Downes, G.; Power, W.; Leonard, G.; Bell, R.; de Lange, W. 2006. Review of observations relating to the recent Tonga tsunami.

Drabek, T.E. 1994. *Disaster Evacuation and the Tourist Industry*. University of Colorado, United States of America.

Drabek, T.E. 1996. *Disaster Evacuation Behaviour: Tourists and Other Transients.* University of Colorado, United States of America.

Dudley, W.C.; Lee, M. 1988. *Tsunami!* University of Hawaii Press, Honolulu.

Eiby, G.A. 1968. Tsunami risk in New Zealand. *Bulletin of the New Zealand Society for Earthquake Engineering* 1:98-101.

Eiby, G.A. 1982a. Earthquakes and tsunamis in a region of diapiric folding. *Tectonophysics* 85: T1-T8.

Eiby, G.A. 1982b. Two New Zealand Tsunamis. *Journal of the Royal Society of New Zealand* 12 (4): 337-351.

Espiner, S. R. 1999. The use and effect of hazard warning signs. Managing visitor safety at Franz Josef and Fox Glaciers. Department of Conservation. Wellington.

Gisborne District Council. The State of Our Environment – Gisborne 2003-2004. The Coast. Retrieved from http://www.gdc.govt.nz on 18 September 2006.

Gisborne District Council. Tsunami evacuation maps. Retreived from http://www.gdc.govt.nz/cdem/tsunamiplanmaps.htm on 20 February 2007.

Goff, J.R.; Chagué-Goff, C. 2001. *Catastrophic events in New Zealand coastal environments.* Conservation Advisory Science Notes No. 333. Department of Conservation, Wellington, New Zealand.

Gregg, C.E.; Houghton, B.F.; Paton, D.; Lachman, R.; Lachman, J.; Johnston, D.M.; Wongbusarakum, S. 2006. Natural Warning Signs of Tsunamis: Human Sensory Experience and Response to the 2004 Great Sumatra Earthquake and Tsunami in Thailand. *Earthquake Spectra* 22 (S3): S671-S691.

Gregg, C.E.; Houghton, B.F.; Paton, D.; Johnston, D.M.; Swanson, D.A.; Yanagi, B.S. 2007. Tsunami Warnings: Understanding in Hawai'i. *Natural Hazards* 40: 71-87.

Gusiakov, V.K. 2005. Tsunami generation potential of different tsunamigenic regions in the Pacific. *Marine Geology* 215: 3-9.

Hawke's Bay Regional Council. http://www.hbrc.govt.nz cited July 2006.

Hume, T.M.; Bell, R.G.; de Lange, W.P.; Healy, T.R.; Hicks, D.M.; Kirk, R.M. 1992. Coastal oceanography and sedimentology in New Zealand, 1967-91. *New Zealand Journal of Marine and Freshwater Research* 26: 1-36.

ICG-PTWS, 2006. Tsunami newsletter. May-June 2006. Volume XXXVIII, no. 2.

Intergovernmental Oceanographic Commission. 1987. *Master Plan for the Tsunami Warning System in the Pacific.* Intergovernmental Oceanographic Commission, Paris.

Johnston, D.M.; Bebbington, M.S.; Lai, C.; Houghton, B.F.; Paton, D. 1999. Volcanic hazard perceptions: comparative shifts in knowledge and risk. *Disaster Prevention and Management* 8 (2): 118-126.

Johnston, D.; Leonard, G.; Bell, R.; Stewart, C.; Hickman, M.; Thomson, J.; Kerr, J.; Glassey, P. 2003. Tabulated results of the 2003 National Coastal Community Survey. *Institute of Geological & Nuclear Sciences science report 2003/35.*

Johnston, D.; Paton, D.; Crawford, G.L.; Ronan, K.; Houghton, B.; Bürgelt, P. 2005. Measuring Tsunami Preparedness in Coastal Washington, United States. *Natural Hazards* 35: 173-184.

Johnston, D.; Becker, J.; Gregg, C.; Houghton, B.; Paton, D.; Leonard, G.; Garside, R. In Press. Developing warning and disaster response capacity in the tourism sector in coastal Washington, USA. *Disaster Prevention and Management*.

Johnston, D.; Downes, G.; Paton, D.; Petterson, R.; Bell, R. Submitted to Natural Hazards Review. Public response to tsunami warnings: Lessons from the warning of the 1960 Chile earthquake tsunami in New Zealand coastal communities.

King, P. 2005.May/June. Boxing Day Blues. Tsunami reasons, risks and remedies. *E.nz Magazine 6/3.*

King, D; Gurtner, Y. 2005. After the Wave: a wake up warning for Australian coastal locations. *The Australian Journal of Emergency Management* 20 (1): 4-9.

Laing, A.C.M. 1954. Note on Tsunamis reaching New Zealand. *New Zealand Journal of Science and Technology* 35B: 470-472.

Leonard, G.S.; Johnston, D.M.; Saunders, W. Paton, D. 2006. Assessment of Auckland Civil Defence and Emergency Management Group warning system options. *GNS Science report. 2006 002*.

McDonald, G.; Patterson, M. 2003. Ecological Footprints of New Zealand and its Regions, 1997/98.Ministry for the Environment, Wellington.

Méheux, K.; Parker, E. 2006. Tourist sector perceptions of natural hazards in Vanuatu and the implications for a small island developing state. *Tourism Management* 27: 69-85.

Ministry of Civil Defence and Emergency Management. 2005. *Hawke's Bay & Gisborne Care Facilities Emergency Planning Guide. A Workbook for Emergency Planning at Early Childhood Centres, Schools and Resthomes.* Retrieved from http://www.civildefence.govt.nz on 7 April 2006.

Ministry of Civil Defence & Emergency Management. 2006. Exercise Pacific Wave '06-17 May 2006. National Report.

Neville, S. 2006. *Crown Law draws flak for analysis*. The Dominion Post, 18 May, p A2.

Papathoma, M.; Dominey-Howes, D.; Zong, Y.; Smith, D. 2003. Assessing tsunami vulnerability, an example from Herakleio, Crete. *Natural Hazards and Earth System Sciences* 3: 377-389.

Pararas-Carayannis, G. 1988. Risk Assessment of the Tsunami Hazard, In M.I. El-Sabh and T.S. Murty (eds). *Natural and Man-made Hazards*, D. Reidel Publishing Company, p 183-191.

Paton, D. 2003. Disaster preparedness: a social-cognitive perspective. *Disaster Prevention and Management* 12 (3): 210-216.

Paton, D.; Smith, L.; Johnston, D.; Johnston, M.; Ronan, K. 2004. Developing a model to predict the adoption of natural hazard risk reduction and preparatory adjustments. *EQC Research Project No. 01-479.*

Peacock, W.G.; Brody, S.D.; Highfield, W. 2005. Hurricane risk perceptions among Florida's single family homeowners. *Landscape and Urban Planning* 73: 120-135.

Rabinovich, A.B.; Stephenson, F.E. 2004. Longwave Measurements for the Coast of British Columbia and Improvement to the Tsunami Warning Capability. *Natural Hazards* 32: 313-343.

Ridgeway, N.M. 1984. Tsunami Hazard in New Zealand. In: *Scientific, Economic and Social Reviews of Natural Hazards in New Zealand*. Speden, I.G; Crozier, M.J. New Zealand National Commission for UNESCO, Wellington.

Ronan, K.R.; Johnston, D.M. 2005. *Promoting Community Resilience in Disasters. The Role for Schools, Youth, and Families*. Springer Science+Business Media, Inc, USA.

Rouse, H.; Nichol, S. Goff, J. 2003. Introduction to the New Zealand coast. Chapter 1, p 11-23. In: *The New Zealand Coast. TE TAI O AOTEAROA*. (Ed) Goff, J.R.; Nichol, S.L.; Rouse, H.L. Dunmore Press, Palmerston North with Whitireia Publishing and Daphne Brasell Associates Ltd. New Zealand.

Small, C.; Gornitz, V.; Cohen, J.E. 2000. Coastal Hazards and the Global Distribution of Human Population. *Environmental Geosciences* 7 (1): 3-12.

Sorenson, J.H. 2000. Hazard Warning Systems: Review of 20 Years of Progress. *Natural Hazards Review* 1 (2): 119-125.

Statistics New Zealand. Retrieved from http://www.stats.govt.nz on 4 April 2006.

Stevens, L.; Robertson, B. 2005. Broad Scale Habitat Mapping of the Coastline of the Hawke's Bay Region. Prepared for the Hawke's Bay Regional Council by the Cawthron Institute. *Cawthron Report Number 1034.*

Stewart, C.; Leonard, G.S.; Johnston, D.M.; Hume, T.M. 2005. The National Coastal Community Survey: results for Waikato beach communities. *Institute of Geological & Nuclear Sciences science report 2005/28.*

Titov, V.V.; González, F.I.; Bernard, E.N.; Eble, M.C.; Mofjeld, H.O.; Newman, J.C.; Venturato, A.J. 2005. Real-Time Tsunami Forecasting: Challenges and Solutions. *Natural Hazards* 35: 41-58.

Twigg, J. 2003. The Human Factor in Early Warnings: Risk Perception and Appropriate Communications. In: *Early Warning Systems for Natural Disaster Reduction*. (Ed) Zschau, J.; Kuppers, A.N. Springer-Verlag, New York.

Unpublished GNS New Zealand Tsunami Database, 2006. Courtesy of Gaye Downes, GNS Science, Lower Hutt, New Zealand.

Vogt, B.M; Sorensen, J.H. 1992. Evacuation Research: A Reassessment. Prepared by the Oak Ridge National Laboratory, Oak Ridge Tennessee for the U.S Department of Energy, USA.

Walters, R.A.; Barnes, P.; Goff, J.R. 2006. Locally generated tsunami along the Kaikoura coastal margin: Part 1. Fault ruptures. *New Zealand Journal of Marine and Freshwater Research* 40: 1-16.

Washington Military Department. 2006. *Broadcasters Tsunami Emergency Guidebook.* Washington Military Department, United States of America.

Watt, E. 2006. Online database helps emergency readiness. The Dominion Post, 31 October.

Webb, T. 2005. Review of New Zealand's preparedness tsunami hazard, comparison to risk and recommendations for treatment. *Institute of Geological & Nuclear Sciences client report 2005/162.*

Wisner, B. 2001. 'Vulnerability' in Disaster Theory and Practice: From Soup to Taxonomy, Then to Analysis and finally Tool. http://www.radixonline.org/resources cited 6 November, 2006.

Woo, G. 1999. *The mathematics of natural catastrophes.* Imperial College Press, London.

Chapter Eight
APPENDICES

APPENDIX A: Copy of the Camping ground survey

Interview by: Date: Location:

Personal Information

1. Are you an overnight camping visitor, a day visitor, or an employee?
_____

2. How many days per year on average do you visit? _____

3. How many years have you been visiting? _____

4. Are you from the Hawke's Bay Region, New Zealand, or abroad?
_____

5. □ Male □ Female

6. Age group:
□18- 20 □ 20s-30s □ 30s-40s □ 40s-50s □ 50+

7. Have you had any previous personal experience of a tsunami?

Knowledge of Risk

8. What do believe likely natural hazards to affect this area are?

□ None □ Landslide □ Earthquake □ Tsunami □ Wildfire □ Flooding □ Volcano
□ Coastal Erosion □ other _____
Where did you obtain this information?_____

9. How likely do you think it is that the following natural hazards could affect this area:

1 = definitely not affect – 5 = definitely affect

Landslide □
Earthquake □
Tsunami □
Wildfire □
Flooding □
Volcano □
Coastal Erosion □

or

No natural hazards will affect this area □

10. When was the last tsunami that caused damage in Hawke's Bay?

□ Never □ Within the last year □ In the last 1-10 years □ In the last 10-100 years □ In the last 100-1000 years □ Don't know

11. Do you think that a tsunami could occur:

□ While you are visiting □ Within the year □ In the next 1-10 years □ In the next 10-100 years □ Not within 100 years □ Never

Preparation and Warnings

12. Have you

a) actively sought information about this area and/or

b) heard or received information about tsunamis from any of the following sources?

(List under (a) and (b))

a b
□ □ Friends or Family
□ □ Central Government
□ □ Civil Defence
□ □ Local Council
□ □ Regional Council
□ □ Business establishment
□ □ Child's school
□ □ Research organization (e.g. GNS, University)
□ □ Other_____

13. Where do New Zealand tsunami come from? _____

14. Who do you think is responsible for issuing distant-source tsunami warnings to you?

□ Don't know □ Central Government □ Regional Council □ Local Council □ Civil Defence □ Local Police or Fire Service □ NIWA □ GNS □ No one can □ No one should □ Other _____

15. Who do you think is responsible for issuing local-source tsunami warnings to you?

□ Don't know □ Central Government □ Regional Council □ Local Council □ Civil Defence □ Local Police or Fire Service □ NIWA □ GNS □ No one can □ No one should □ Other _____

16. Does New Zealand have a tsunami warning system?

_____

17. What does the New Zealand public warning notification system consist of?

_____

18. Which do you think would be the most effective way of delivering a warning?

_____

19. What are the natural signs of a tsunami, or the signs that a tsunami might have been generated?

_____

Please list your preference for receiving a warning (in order of preference).

During a Tsunami

20. In the event of a distant source, official tsunami warning, what actions would you take? _____

21. In the event of signs of a possible local-source tsunami, what actions would you take?

_____

22. If you are at the coast and receive an official tsunami warning how much time do you have to move to safety?

□ Don't know □ A few minutes □ 10 minutes to a half an hour □ 1-2 hours
□ 2-5 hours □ more than 5 hours □ I will follow instructions

23. If you feel a strong earthquake while at the beach, how much time do you have to move to safety?

□ Don't know □ A few minutes □ 10 minutes to a half an hour □ 1-2 hours
□ 2-5 hours □ more than 5 hours

24. What do expect from campground/accommodations staff during a tsunami?

_____

Changes in Perception

25. Did you know what a tsunami was before the 2004 Boxing Day tsunami?

_____

26. Since the 2004 Boxing Day tsunami you:

□ Have learned more about tsunamis □ Have actively sought more information on tsunamis □ Feel more at risk from tsunamis □ Feel less at risk □ Have not been affected □ Other _____

APPENDIX B: Camping ground visitor survey tables

PERSONAL INFORMATION

Visitor type

		Visitor type							
		Overnight visitor		Day visitor		Permanent resident		Employee	
		N	%	N	%	N	%	N	%
Location	Kennedy Park	13	14.6%	1	25.0%	0	.0%	0	.0%
	Te Awanga	4	4.5%	0	.0%	2	18.2%	1	16.7%
	Bay View	28	31.5%	0	.0%	4	36.4%	1	16.7%
	Westshore	8	9.0%	3	75.0%	2	18.2%	1	16.7%
	Clifton	36	40.4%	0	.0%	3	27.3%	3	50.0%
	Total	89	100.0%	4	100.0%	11	100.0%	6	100.0%

Area visitors originate from

		N	%
Area from	Hawke's Bay	51	46.4
	Elsewhere in New Zealand	54	49.1
	Abroad	5	4.5
	Total	110	100.0

Area different visitor types originate from

		Area from					
		Hawke's Bay		Elsewhere in New Zealand		Abroad	
		N	%	N	%	N	%
Visitor type	Overnight visitor	37	72.5%	47	87.0%	5	100.0%
	Day visitor	1	2.0%	3	5.6%	0	.0%
	Permanent resident	10	19.6%	1	1.9%	0	.0%
	Employee	3	5.9%	3	5.6%	0	.0%

Gender

		N	%
Gender	Female	49	44.5
	Male	61	55.5
	Total	110	100.0

Age

		N	%
Age group	18-20	3	2.7
	21-30	13	11.8
	31-40	18	16.4
	40-50	19	17.3
	51+	57	51.8
	Total	110	100.0

Previous tsunami experience

		N	%
Previous tsunami experience	Yes- 1960	4	3.6
	No	101	91.8
	False warning	5	4.5
	Total	110	100.0

Previous tsunami experience in relation to respondents age group

		Previous tsunami experience					
		Yes- 1960		No		False warning	
		N	%	N	%	N	%
Age group	18-20	0	.0%	3	3.0%	0	.0%
	21-30	0	.0%	13	12.9%	0	.0%
	31-40	0	.0%	18	17.8%	0	.0%
	40-50	0	.0%	19	18.8%	0	.0%
	51+	4	100.0%	48	47.5%	5	100.0%

KNOWLEDGE OF TSUNAMI RISK

Percentage of respondents who think that a tsunami is likely to affect the camping ground

		Tsunami affect area	
		N	%
Location	Kennedy Park	10	71.4%
	Te Awanga	4	57.1%
	Bay View	24	72.7%
	Westshore	11	78.6%
	Clifton	29	69.0%

When respondents think that the last damaging tsunami occurred in Hawke's Bay

	Last tsunami that caused damage in Hawke's Bay											
	Never		Within the last year		In the last 1-10 years		In the last 10-100 years		In the last 100-1000 years		Don't know	
	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	1	7.1%	0	.0%	0	.0%	5	35.7%	0	.0%	8	57.1%
Te Awanga	1	14.3%	0	.0%	0	.0%	2	28.6%	1	14.3%	3	42.9%
Bay View	0	.0%	0	.0%	0	.0%	10	30.3%	0	.0%	23	69.7%
Westshore	1	7.1%	0	.0%	0	.0%	2	14.3%	0	.0%	11	78.6%
Clifton	2	4.8%	0	.0%	1	2.4%	14	33.3%	0	.0%	25	59.5%
Total	5	4.5%	0	.0%	1	.9%	33	30.0%	1	.9%	70	63.6%

When respondents think the next tsunami might occur in Hawke's Bay

	Next tsunami											
	While visiting		Within the year		In the next 1-10 years		In the next 10-100 years		Not within 100 years		Never	
	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	4	28.6%	1	7.1%	5	35.7%	2	14.3%	0	.0%	2	14%
Te Awanga	1	14.3%	0	.0%	2	28.6%	3	42.9%	1	14.3%	0	.0%
Bay View	8	24.2%	1	3.0%	11	33.3%	11	33.3%	2	6.1%	0	.0%
Westshore	5	35.7%	0	.0%	3	21.4%	5	35.7%	0	.0%	1	7.1%
Clifton	11	26.2%	0	.0%	12	28.6%	15	35.7%	4	9.5%	0	.0%
Total	29	26.4%	2	1.8%	33	30.0%	36	32.7%	7	6.4%	3	2.7%

PREPARATION AND WARNINGS

Sources from where respondents have actively sought information on tsunamis

	Friends/ Family		Central Government		Civil Defence		Local Council		Regional Council		Business establishment		Child's school		Research organisation (e.g. GNS, University)		Other source	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Te Awanga	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Bay View	1	3%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	2	6.1%
Westshore	0	.0%	0	.0%	1	7%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Clifton	1	2%	0	.0%	1	2%	0	.0%	2	5%	0	.0%	0	.0%	0	.0%	0	.0%
Total	2	2%	0	.0%	2	2%	0	.0%	2	2%	0	.0%	0	.0%	0	.0%	2	1.8%

Sources from where respondents have heard or received information on tsunamis

	Friends or family		Central Government		Civil Defence		Local Council		Regional Council		Business establishment		Child's school		Research organisation (e.g. GNS, University)		Other source	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	3	21%
Te Awanga	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	1	14%
Bay View	3	9%	0	.0%	3	9%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	4	12%
Westshore	0	.0%	0	.0%	1	7%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	3	21%
Clifton	1	2%	0	.0%	1	2%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	11	26%
Total	4	4%	0	.0%	5	5%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	22	20%

Where respondents think New Zealand tsunami come from

	Kennedy Park		Te Awanga		Bay View		Westshore		Clifton		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Don't Know	3	21%	2	28.6%	14	42.4%	5	35.7%	18	42.9%	42	38.2%
Pacific Ocean	6	43%	3	42.9%	8	24.2%	4	28.6%	9	21.4%	30	27.3%
South America	1	7.1%	0	.0%	8	24.2%	2	14.3%	7	16.7%	18	16.4%
Chile	2	14%	1	14.3%	1	3.0%	1	7.1%	4	9.5%	9	8.2%
Asia	1	7.1%	0	.0%	0	.0%	0	.0%	0	.0%	1	.9%
Australia	1	7.1%	0	.0%	0	.0%	0	.0%	1	2.4%	2	1.8%
The tropics	0	.0%	1	14.3%	0	.0%	0	.0%	0	.0%	1	.9%
Tonga	0	.0%	0	.0%	0	.0%	0	.0%	1	2.4%	1	.9%
Hikurangi Trench	0	.0%	0	.0%	1	3.0%	0	.0%	0	.0%	1	.9%
Earthquakes	0	.0%	0	.0%	0	.0%	1	7.1%	2	4.8%	3	2.7%
Landslide	0	.0%	0	.0%	1	3.0%	1	7.1%	0	.0%	2	1.8%

Who respondents think is responsible for issuing distant source tsunami warnings

	Kennedy Park		Te Awanga		Bay View		Westshore		Clifton		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Don't know	0	.0%	1	14.3%	3	9.1%	3	21%	4	9.5%	11	10%
Central Government	6	42.9%	1	14.3%	11	33%	1	7.1%	4	9.5%	23	21%
Regional Council	1	7.1%	0	.0%	7	21%	5	36%	12	29%	25	23%
Local Council	3	21.4%	0	.0%	7	21%	3	21%	2	4.8%	15	14%
Civil Defence	11	78.6%	5	71.4%	17	52%	6	43%	29	69%	68	62%
Local Police or Fire	2	14.3%	0	.0%	2	6.1%	2	14%	3	7.1%	9	8.2%
NIWA	0	.0%	0	.0%	0	.0%	1	7.1%	1	2.4%	2	1.8%
GNS	0	.0%	0	.0%	0	.0%	1	7.1%	2	4.8%	3	2.7%
No one can	0	.0%	0	.0%	0	.0%	0	.0%	1	2.4%	1	.9%
No one should	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Other	2	14.3%	0	.0%	7	21%	4	29%	6	14%	19	17%

Who respondents think is responsible for issuing local source tsunamis

	Kennedy Park		Te Awanga		Bay View		Westshore		Clifton		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Don't know	0	.0%	1	14.3%	2	6.1%	1	7.1%	7	17%	11	10%
Central Government	2	14.3%	0	.0%	1	3.0%	1	7.1%	1	2.4%	5	4.5%
Regional Council	5	35.7%	1	14.3%	11	33.3%	3	21%	10	24%	30	27%
Local Council	3	21.4%	0	.0%	11	33.3%	7	50%	1	2.4%	22	20%
Civil Defence	12	85.7%	5	71.4%	19	57.6%	7	50%	25	60%	68	62%
Local Police or Fire	2	14.3%	0	.0%	4	12.1%	3	21%	2	4.8%	11	10%
NIWA	0	.0%	0	.0%	0	.0%	1	7.1%	0	.0%	1	.9%
GNS	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
No one can	0	.0%	0	.0%	0	.0%	0	.0%	5	12%	5	4.5%
No one should	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Other	2	14.3%	0	.0%	4	12.1%	1	7.1%	0	.0%	7	6.4%

Understanding of whether New Zealand has a tsunami warning system

	Yes		No		Don't know	
	N	%	N	%	N	%
Kennedy Park	5	35.7%	2	14.3%	7	50.0%
Te Awanga	2	28.6%	1	14.3%	4	57.1%
Bay View	15	45.5%	0	.0%	18	54.5%
Westshore	4	28.6%	1	7.1%	9	64.3%
Clifton	13	31.0%	8	19.0%	21	50.0%
Total	39	35.5%	12	10.9%	59	53.6%

What the New Zealand public warning notification system consists of

	Radio		TV		Sirens		TXT message		Newspaper		Internet warnings		Don't know		Other	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	3	21.4%	1	7.1%	6	43%	0	.0%	0	.0%	0	.0%	6	43%	1	7.1%
Te Awanga	0	.0%	0	.0%	2	29%	0	.0%	0	.0%	0	.0%	5	71%	0	.0%
Bay View	5	15.2%	2	6.1%	11	33%	0	.0%	0	.0%	0	.0%	18	55%	2	6.1%
Westshore	3	21.4%	0	.0%	7	50%	0	.0%	0	.0%	0	.0%	6	43%	0	.0%
Clifton	4	9.5%	1	2.4%	14	33%	0	.0%	0	.0%	0	.0%	26	62%	0	.0%
Total	15	13.6%	4	3.6%	40	36%	0	.0%	0	.0%	0	.0%	61	55%	3	2.7%

Most effective way of delivering a warning

	Kennedy Park		Te Awanga		Bay View		Westshore		Clifton		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Sirens	10	71%	5	71.4%	25	75.8%	11	78.6%	25	59.5%	76	69.1%
Radio	3	21%	2	28.6%	4	12.1%	3	21.4%	6	14.3%	18	16.4%
Television	0	.0%	0	.0%	0	.0%	0	.0%	2	4.8%	2	1.8%
Internet	0	.0%	0	.0%	0	.0%	0	.0%	1	2.4%	1	.9%
TXT message	0	.0%	0	.0%	1	3.0%	0	.0%	0	.0%	1	.9%
Loud speakers	0	.0%	0	.0%	2	6.1%	0	.0%	0	.0%	2	1.8%
Word of mouth	0	.0%	0	.0%	0	.0%	0	.0%	1	2.4%	1	.9%
Fire service/Police warning people	1	7.1%	0	.0%	0	.0%	0	.0%	2	4.8%	3	2.7%
Loud shouting	0	.0%	0	.0%	1	3.0%	0	.0%	0	.0%	1	.9%
Media coverage	0	.0%	0	.0%	0	.0%	0	.0%	2	4.8%	2	1.8%
Helicopter with loudspeakers	0	.0%	0	.0%	0	.0%	0	.0%	2	4.8%	2	1.8%
Don't know	0	.0%	0	.0%	0	.0%	0	.0%	1	2.4%	1	.9%

Understanding of what the natural signs, or signs that a tsunami may have been generated are

	Receding water		Earthquake		Large wave		Birds flying away		Loud noise of water		Don't know		Other	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	8	57.1%	3	21.4%	2	14%	0	.0%	0	.0%	0	.0%	3	21%
Te Awanga	3	42.9%	2	28.6%	1	14%	1	14%	0	.0%	1	14%	0	.0%
Bay View	24	72.7%	4	12.1%	2	6.1%	2	6.1%	0	.0%	4	12%	3	9.1%
Westshore	11	78.6%	2	14.3%	1	7.1%	1	7.1%	0	.0%	0	.0%	3	21%
Clifton	28	66.7%	5	11.9%	1	2.4%	0	.0%	0	.0%	8	19%	3	7.1%
Total	74	67.3%	16	14.5%	7	6.4%	4	3.6%	0	.0%	13	12%	12	11%

Preferred method for receiving a tsunami warning

		Kennedy Park		Te Awanga		Bay View		Westshore		Clifton		Total	
		N	%	N	%	N	%	N	%	N	%	N	%
Radio	Preferred warning	2	14%	2	29%	1	3.0%	3	21%	6	14.3%	14	13%
	Second choice warning	3	21%	2	29%	15	45%	3	21%	14	33.3%	37	34%
	Third choice warning	0	.0%	0	.0%	2	6.1%	1	7.1%	3	7.1%	6	5.5%
TV	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	2	14%	0	.0%	0	.0%	2	14%	5	11.9%	9	8.2%
	Third choice warning	0	.0%	0	.0%	3	9.1%	2	14%	0	.0%	5	4.5%
Media	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	5	36%	0	.0%	2	6.1%	0	.0%	0	.0%	7	6.4%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Siren	Preferred warning	11	79%	4	57%	27	82%	11	79%	29	69.0%	82	75%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	1	3.0%	0	.0%	0	.0%	1	.9%
TXT	Preferred warning	0	.0%	0	.0%	1	3.0%	0	.0%	0	.0%	1	.9%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Newspaper	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Internet	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%	1	2.4%	1	.9%
	Second choice warning	0	.0%	0	.0%	1	3.0%	0	.0%	0	.0%	1	.9%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Police informing	Preferred warning	1	7.1%	0	.0%	0	.0%	0	.0%	4	9.5%	5	4.5%
	Second choice warning	1	7.1%	1	14%	2	6.1%	0	.0%	5	11.9%	9	8.2%
	Third choice warning	0	.0%	0	.0%	1	3.0%	1	7.1%	0	.0%	2	1.8%
Don't know	Preferred warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Second choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
	Third choice warning	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Other	Preferred warning	0	.0%	1	14%	4	12%	0	.0%	2	4.8%	7	6.4%
	Second choice warning	3	21%	0	.0%	1	3.0%	2	14%	2	4.8%	8	7.3%
	Third choice warning	1	7.1%	0	.0%	0	.0%	0	.0%	1	2.4%	2	1.8%

DURING A TSUNAMI

Actions respondents would take in the event of a distant source tsunami warning

	Go to high ground		Take supplies and go to high ground		Move inland		Take supplies and move inland		Leave		Don't know		Other		Take supplies and leave	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	8	57.1%	0	.0%	4	29%	2	14.3%	0	.0%	0	.0%	0	.0%	0	.0%
Te Awanga	4	57.1%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	3	43%
Bay View	20	60.6%	4	12.1%	5	15%	0	.0%	3	9.1%	0	.0%	0	.0%	1	3.0%
Westshore	4	28.6%	3	21.4%	3	21%	1	7.1%	2	14%	0	.0%	1	7%	0	.0%
Clifton	22	52.4%	2	4.8%	6	14%	2	4.8%	10	24%	0	.0%	0	.0%	0	.0%
Total	58	52.7%	9	8.2%	18	16%	5	4.5%	15	14%	0	.0%	1	.9%	4	3.6%

Actions respondents would take in the event of a possible local source tsunami

	Go to high ground		Take supplies and go to high ground		Move inland		Take supplies and move inland		Leave		Don't know		Other		Take supplies and leave	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	12	86%	0	.0%	2	14.3%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Te Awanga	4	57%	0	.0%	0	.0%	0	.0%	1	14%	0	.0%	0	.0%	2	29%
Bay View	26	79%	4	12.1%	1	3.0%	0	.0%	2	6.1%	0	.0%	0	.0%	0	.0%
Westshore	7	50%	0	.0%	5	35.7%	0	.0%	1	7.1%	0	.0%	1	7.1%	0	.0%
Clifton	32	76%	1	2.4%	3	7.1%	1	2.4%	5	12%	0	.0%	0	.0%	0	.0%
Total	81	74%	5	4.5%	11	10.0%	1	.9%	9	8.2%	0	.0%	1	.9%	2	1.8%

Understanding of time to move to safety following an official tsunami warning

	Don't know		A few minutes		10 minutes to half an hour		1-2 hours		2-5 hours		More than 5 hours		I will follow instructions	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	2	14.3%	5	35.7%	3	21.4%	1	7.1%	1	7.1%	2	14.3%	0	.0%
Te Awanga	5	71.4%	0	.0%	0	.0%	0	.0%	1	14%	0	.0%	1	14.3%
Bay View	8	24.2%	9	27.3%	2	6.1%	2	6.1%	3	9.1%	8	24.2%	1	3.0%
Westshore	5	35.7%	0	.0%	4	28.6%	2	14%	2	14%	1	7.1%	0	.0%
Clifton	11	26.2%	8	19.0%	13	31.0%	1	2.4%	4	9.5%	2	4.8%	3	7.1%
Total	31	28.2%	22	20.0%	22	20.0%	6	5.5%	11	10%	13	11.8%	5	4.5%

Understanding of time to move to safety if at the coast and feel a strong earthquake

	Don't know		A few minutes		10 minutes to half an hour		1-2 hours		2-5 hours		More than 5 hours		I will follow instructions	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Kennedy Park	2	14.3%	6	42.9%	5	35.7%	1	7.1%	0	.0%	0	.0%	0	.0%
Te Awanga	4	57.1%	2	28.6%	1	14.3%	0	.0%	0	.0%	0	.0%	0	.0%
Bay View	10	30.3%	10	30.3%	11	33.3%	2	6.1%	0	.0%	0	.0%	0	.0%
Westshore	4	28.6%	5	35.7%	5	35.7%	0	.0%	0	.0%	0	.0%	0	.0%
Clifton	13	31.0%	22	52.4%	6	14.3%	0	.0%	1	2.4%	0	.0%	0	.0%
Total	33	30.0%	45	40.9%	28	25.5%	3	2.7%	1	.9%	0	.0%	0	.0%

What respondents would expect from camping ground staff in the event of a tsunami

	Nothing		Set of instructions		A warning		Evacuation information	
	N	%	N	%	N	%	N	%
Kennedy Park	1	7.1%	1	7.1%	11	78.6%	1	7.1%
Te Awanga	2	28.6%	0	.0%	5	71.4%	0	.0%
Bay View	5	15.2%	2	6.1%	19	57.6%	7	21.2%
Westshore	2	14.3%	1	7.1%	7	50.0%	4	28.6%
Clifton	8	19.0%	3	7.1%	27	64.3%	4	9.5%
Total	18	16.4%	7	6.4%	69	62.7%	16	14.5%

CHANGES IN PERCEPTION

Knew what a tsunami was before the Boxing Day 2004 tsunami

	Yes		No		Called it a tidal wave		Not really	
	N	%	N	%	N	%	N	%
Kennedy Park	10	71.4%	4	28.6%	0	.0%	0	.0%
Te Awanga	5	71.4%	2	28.6%	0	.0%	0	.0%
Bay View	28	84.8%	5	15.2%	0	.0%	0	.0%
Westshore	12	85.7%	2	14.3%	0	.0%	0	.0%
Clifton	38	90.5%	4	9.5%	0	.0%	0	.0%
Total	93	84.5%	17	15.5%	0	.0%	0	.0%

Since the Boxing Day 2004 tsunami

	Kennedy Park		Te Awanga		Bay View		Westshore		Clifton		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Have learnt more	10	71.4%	2	28.6%	27	81.8%	13	93%	31	73.8%	83	75.5%
Have actively sought	2	14.3%	0	.0%	3	9.1%	1	7.1%	3	7.1%	9	8.2%
Feel more at risk	2	14.3%	2	28.6%	12	36.4%	1	7.1%	8	19.0%	25	22.7%
Feel less at risk	0	.0%	0	.0%	0	.0%	0	.0%	1	2.4%	1	.9%
Have not been affected	4	28.6%	5	71.4%	9	27.3%	6	43%	25	59.5%	49	44.5%
Am more aware	6	42.9%	0	.0%	14	42.4%	7	50%	15	35.7%	42	38.2%

APPENDIX C: Copy of the preparedness survey questions

PREPAREDNESS FOR MANAGING NATURAL HAZARD EVENTS IN THE HAWKE'S BAY TOURISM SECTOR

Interview by: _____ Date: _____ Location: _____

Name of Institution: _____ Type: Hotel / Motel

Respondent (role): _____ Number of rooms: _____ Number of people it accommodates ____

Visitors per day (all, incl. guests): _____ Number of staff: _____ Years with company: _____

Staff hazard training:

1. Have you received training for dealing with emergencies? Yes / No
2. If yes, for what hazards? -

Fire:	Yes / no
Earthquake:	Yes / no
Tsunami:	Yes / no
Storm:	Yes / no
Flooding:	Yes / no
Hurricane:	Yes / no

   Other (give details): _____
3. When was the training? Annual / Induction / Other (give details): _____
4. How was it delivered? _____
5. Is your training ongoing? Yes / No If 'YES" how often are instalments/repeats? _____

Other training:

6. What other training (in general) have you received? _____
7. How was it delivered? _____
8. Is your training ongoing? Yes / No If 'YES" how often are instalments/repeats? _____

Exercises

9. Do you have exercises/drills? Yes / No
10. What for? _____
11. How often? _____

Signage

12. Do you have any hazard signage? Yes / No
13. If 'YES', What type (hazard & content)?
    _____
14. Where are the sign(s)?
    _____

Personal

15. Male / Female
16. Ethnicity _____
17. Personal experience with hazards
    _____

APPENDIX D: Copy of the Tourism Survey tables

RESPONDENT ROLE AND ACCOMMODATION DETAILS

Respondent role

	N	%
Director	1	4.3
Owner	16	69.6
Manager	3	13.0
Receptionist	3	13.0
Total	23	100.0

Accommodation type

	N	%
Motel	19	82.6
Hotel	4	17.4
Total	23	100.0

Number of rooms

	N	%
9	1	4.3
11	1	4.3
13	3	13.0
15	2	8.7
16	1	4.3
18	3	13.0
20	1	4.3
23	1	4.3
29	1	4.3
33	1	4.3
36	1	4.3
38	1	4.3
40	1	4.3
42	1	4.3
44	1	4.3
46	1	4.3
48	1	4.3
109	1	4.3
Total	23	100.0

Number of people that can be accommodated

	N	%
29	1	4.3
32	1	4.3
34	1	4.3
36	1	4.3
43	1	4.3
44	1	4.3
50	1	4.3
53	1	4.3
55	1	4.3
60	2	8.7
65	1	4.3
70	1	4.3
80	2	8.7
85	1	4.3
86	1	4.3
90	1	4.3
96	1	4.3
120	1	4.3
150	1	4.3
200	1	4.3
300	1	4.3
Total	23	100.0

Number of visitors that come through each day

	N	%
12	1	4.3
15	1	4.3
20	3	13.0
25	2	8.7
30	2	8.7
32	1	4.3
40	1	4.3
45	1	4.3
50	3	13.0
60	2	8.7
80	1	4.3
100	1	4.3
102	1	4.3
150	1	4.3
200	1	4.3
1000	1	4.3
Total	23	100.0

Number of staff that are employed

	N	%
2	1	4.3
3	1	4.3
4	4	17.4
5	3	13.0
6	2	8.7
7	1	4.3
10	2	8.7
11	1	4.3
18	2	8.7
20	2	8.7
24	1	4.3
25	1	4.3
45	1	4.3
50	1	4.3
Total	23	100.0

Number of years that respondents have worked for the company

	N	%
.25	2	8.7
1.00	3	13.0
1.50	1	4.3
2.50	3	13.0
3.00	6	26.1
5.00	1	4.3
6.00	1	4.3
7.00	1	4.3
8.00	1	4.3
11.00	2	8.7
12.00	1	4.3
18.00	1	4.3
Total	23	100.0

STAFF HAZARD TRAINING

Training for dealing with emergencies

	N	%
Yes	10	43.5
No	13	56.5
Total	23	100.0

Training for fires

	N	%
Yes	10	43.5
No	13	56.5
Total	23	100.0

Training for earthquakes

	N	%
Yes	4	17.4
No	19	82.6
Total	23	100.0

Training for tsunamis

	N	%
No	23	100.0

Training for storm events

	N	%
Yes	2	8.7
No	21	91.3
Total	23	100.0

Training for flooding

	N	%
Yes	2	8.7
No	21	91.3
Total	23	100.0

Training for hurricanes

	N	%
Yes	1	4.3
No	22	95.7
Total	23	100.0

Training for any other type of emergency

	N	%
No	23	100.0

Regularity of training

	N	%
Annual	2	8.7
Induction	6	26.1
Other	1	4.3
Every 2 years	1	4.3
NA	13	56.5
Total	23	100.0

How training was delivered

	N	%
Delivered by police (ex policeman)	1	4.3
Delivered by the fire department	1	4.3
Delivered by the fire service	3	13.0
Delivered by the fire service and EQC	1	4.3
Delivered by Wormold fire protection company	1	4.3
Given manual to read	1	4.3
NA	13	56.5
Spoke to the fire department	1	4.3
Went to different courses	1	4.3
Total	23	100.0

Is training ongoing

	N	%
Yes	4	17.4
No	6	26.1
NA	13	56.5
Total	23	100.0

How often installments/repeats

	N	%
NA	19	82.6
Every 12 months	4	17.4
Total	23	100.0

OTHER TRAINING (IN GENERAL)

Other types of training (in general)

	N	%
Bar Manager, General Manager	1	4.3
First Aid	18	78.3
Hotel manager certificate	1	4.3
Nothing	3	13.0
Total	23	100.0

How training was delivered

	N	%
Company training officers	1	4.3
Course	1	4.3
Delivered at work (pharmacist)	1	4.3
Delivered by Redcross	1	4.3
Delivered by St Johns	15	65.2
Knowledge based	1	4.3
NA	3	13.0
Total	23	100.0

Is training ongoing

	N	%
Yes	7	30.4
No	13	56.5
NA	3	13.0
Total	23	100.0

How often installments/repeats

	Frequency	Percent
NA	16	69.6
Every 2 years	7	30.4
Total	23	100.0

EXERCISES

Conduct exercises/drills

	N	%
Yes	13	56.5
No	10	43.5
Total	23	100.0

Exercises/drills conducted for

	N	%
Fire	11	47.8
Fire and EQ	2	8.7
NA	10	43.5
Total	23	100.0

How often exercises/drills conducted

	N	%
Every month	2	8.7
Every 2 months	2	8.7
Every 3 months	3	13.0
Every 6 months	5	21.7
NA	10	43.5
Every 12 months	1	4.3
Total	23	100.0

HAZARD SIGNAGE

Has hazard signage in place

	N	%
Yes	22	95.7
No	1	4.3
Total	23	100.0

Content of hazard signage

	N	%
Fire	11	47.8
Fire/EQ	5	21.7
Fire/EQ/tsunami	1	4.3
General in case of emergency	5	21.7
NA	1	4.3
Total	23	100.0

Location of hazard signage

	N	%
In all rooms	22	95.7
NA	1	4.3
Total	23	100.0

PERSONAL INFORMATION

Gender

	N	%
Female	13	56.5
Male	10	43.5
Total	23	100.0

Ethnicity

	N	%
New Zealander	19	82.6
New Zealand European	3	13.0
British	1	4.3
Total	23	100.0

Previous experience of hazards

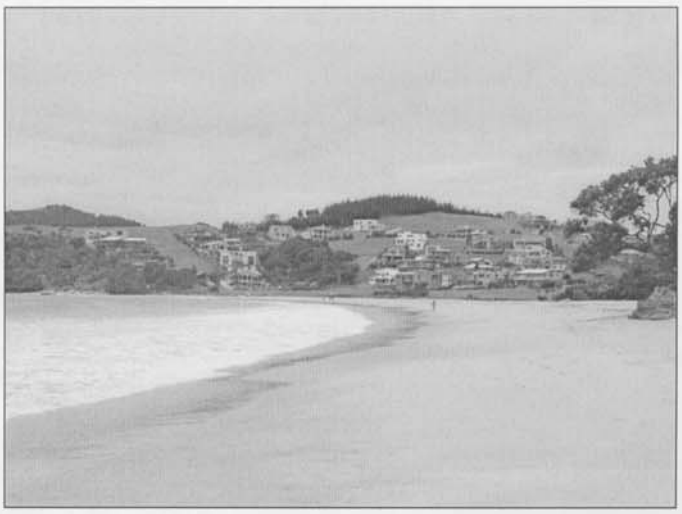
	N	%
Yes	4	17.4
No	19	82.6
Total	23	100.0

Description of previous hazard experience

	N	%
1960 Chilean tsunami	1	4.3
EQ in Dannevirke	1	4.3
Fire	1	4.3
In a boat during the Wahine storm	1	4.3
NA	19	82.6
Total	23	100.0

APPENDIX E: Copy of the 2006 National Coastal Survey

2006
National Coastal Survey



1

Awareness and experience of natural hazards in general.

1. Which are the **two natural hazards** that you think are most likely to affect this community? (Tick two only)

- ☐ 1 Ash fall from a volcanic eruption
- ☐ 2 Coastal erosion (shoreline erosion)
- ☐ 3 Earthquake
- ☐ 4 Flooding (river or storm surge)
- ☐ 5 Forest or bush fire
- ☐ 6 Landslide
- ☐ 7 Storm or cyclone with high winds
- ☐ 8 Tsunami (previously called tidal wave)

2. Have you ever been affected by any of the following events? (Tick all that apply)

- ☐ 1 Chemical spill or gas leak
- ☐ 2 Climate change
- ☐ 3 Earthquake
- ☐ 4 Fire
- ☐ 5 Flood
- ☐ 6 Infrastructural failure (e.g. loss of electricity)
- ☐ 7 Landslide
- ☐ 8 Pandemic
- ☐ 9 Storm with high winds (e.g. cyclone)
- ☐ 10 Tornado
- ☐ 11 Volcanic eruption
- ☐ 12 No events have affected me **(If "No events", go to Question 3)**

2a. **If you have been affected**, to what extent were you affected? (considering property damage, injuries and financial impact). In each row please **tick the one number you feel best represents this impact,** on the scale from 1 to 10.

	Little impact ← → Severe impact									
	1	2	3	4	5	6	7	8	9	10
Chemical spill or gas leak	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Climate change	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Earthquake	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Fire	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Flood	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Infrastructural failure	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Landslide	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Pandemic	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Storm with high winds (e.g. cyclone)	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Tornado	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10
Volcanic eruption	☐1	☐2	☐3	☐4	☐5	☐6	☐7	☐8	☐9	☐10

General tsunami questions

3. What is the most frequent cause of tsunamis in general? (Tick one only)

- ☐ 1 Landslide
- ☐ 2 High tide
- ☐ 3 Hurricane/storm
- ☐ 4 Earthquake
- ☐ 5 Volcanic eruption
- ☐ 6 Don't know

4. Tsunami waves can occur as which of the following: (Tick all that apply):

- ☐ 1 One big wave/surge
- ☐ 2 Multiple big waves/surges
- ☐ 3 One small wave/surge
- ☐ 4 Multiple small waves/surges
- ☐ 5 Multiple big waves/surges and multiple small wave/surges
- ☐ 6 Rapidly rising and falling water level
- ☐ 7 Don't know

5. When was the last tsunami that affected this community? (Tick one only)

- ☐ 1 Never
- ☐ 2 In the last 10 years
- ☐ 3 In the last 100 years
- ☐ 4 In the last 1000 years
- ☐ 5 In the last 10 000 years
- ☐ 6 Don't know

6. When was the last ***damaging*** tsunami that affected this community? (Tick one only)

- ☐ 1 Never
- ☐ 2 In the last 10 years
- ☐ 3 In the last 100 years
- ☐ 4 In the last 1000 years
- ☐ 5 In the last 10 000 years
- ☐ 6 Don't know

7. Do you think that a tsunami could occur: (Tick one only)

- ☐ 1 Within the year
- ☐ 2 In the next 1-10 years
- ☐ 3 In the next 10-100 years
- ☐ 4 Not within 100 years
- ☐ 5 Never
- ☐ 6 Don't know

Tsunami warnings and preparation

8. Have you seen any tsunami hazard zone maps for this community? (Tick one only)

- ☐ 1 Yes
- ☐ 2 Not sure
- ☐ 3 No

9. Do you live in a tsunami inundation (hazard or danger) zone? (Tick one only)

- ☐ 1 Yes
- ☐ 2 No
- ☐ 3 Don't know

10. Which of the following make up the New Zealand's public tsunami warning system? (Tick all that apply).

- ☐ 1 Don't know
- ☐ 2 Sirens
- ☐ 3 Loud speaker announcements
- ☐ 4 Flashing lights
- ☐ 5 Radio and TV announcements
- ☐ 6 Door–to-door visits by emergency services or civil defence staff
- ☐ 7 Other (please specify) _____

11. What do **you** think would be the most effective way of delivering a warning?

_____

_____

12. Who is responsible for issuing tsunami warnings? (Tick all that apply).

- ☐ 1 Don't know
- ☐ 2 Central Government
- ☐ 3 Regional Council
- ☐ 4 Local Council
- ☐ 5 Local Civil Defence group
- ☐ 6 Police or Fire Service
- ☐ 7 NIWA or GNS
- ☐ 8 Other_____

13. The following is a list of signs that might alert you of an arriving ***local*** source tsunami (from a place less than 1 hour travel time away). Rate how unlikely or likely each sign will occur. (Tick one per line)

Sign	Unlikely	Maybe	Likely
a. Siren sounding	☐	☐	☐
b. Loudspeaker/bullhorn from Civil Defence/ Police	☐	☐	☐
c. TV or radio broadcast	☐	☐	☐
d. Relative, friend, or neighbour	☐	☐	☐
e. Ground shaking from an earthquake	☐	☐	☐
f. Sea-level draw down (receding ocean)	☐	☐	☐
g. Unusual waves (wall of water, breaking wave, etc)	☐	☐	☐
h. Unusual sounds	☐	☐	☐

14. Now, consider the same signs as above, but rate how unlikely or likely each sign will occur for an arriving ***distant*** source tsunami (originating from Japan or Alaska, etc). (Tick one per line)

Sign	Unlikely	Maybe	Likely
a. Siren sounding	☐	☐	☐
b. Loudspeaker/bullhorn from Civil Defence/ Police	☐	☐	☐
c. TV or radio broadcast	☐	☐	☐
d. Relative, friend, or neighbour	☐	☐	☐
e. Ground shaking from an earthquake	☐	☐	☐
f. Sea-level draw down (receding ocean)	☐	☐	☐
g. Unusual waves (wall of water, breaking wave, etc)	☐	☐	☐
h. Unusual sounds	☐	☐	☐

15. To what extent do you agree that: (Tick one for each statement)

	Strongly disagree ← (scale) → Strongly agree				
Tsunami are too destructive to bother preparing for	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
A serious tsunami is unlikely to affect me in the future	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
It is unnecessary to prepare for tsunami as assistance will be provided by local/regional councils or Civil Defence	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Preparing for tsunamis is inconvenient for me	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
It is difficult to prepare for tsunamis	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Preparing for tsunamis will reduce damage to my home	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Preparing for tsunamis will improve my everyday living condition	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Preparing for tsunamis will improve my ability to deal with disruption to family/community life	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Preparing for tsunamis will help save lives	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I do not know how I can prepare for a tsunami	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

16. Have you **heard or received** any information about preparing for tsunami hazards from any of the following? (Tick all that apply).

☐ 1 I haven't heard or received any information
☐ 2 Friends
☐ 3 Neighbours
☐ 4 Relatives
☐ 5 Central government
☐ 6 Regional Council
☐ 7 Local Council
☐ 8 Local Civil Defence group
☐ 9 Business establishments
☐ 10 Research organisations (e.g. NIWA, GNS, universities)
☐ 11 My workplace
☐ 12 My child's school
☐ 13 Other, specify _____

17. In the next month or so, do you intend to: (Tick one for each statement)

	No	Possibly	Definitely
Improve your knowledge of how to respond to tsunamis	☐ 1	☐ 2	☐ 3
Increase your ability to respond to tsunamis	☐ 1	☐ 2	☐ 3
Become involved with a local group/neighbourhood to discuss how to respond to tsunamis	☐ 1	☐ 2	☐ 3
Seek information on tsunami risks	☐ 1	☐ 2	☐ 3
Seek information on things to do to respond to tsunamis	☐ 1	☐ 2	☐ 3

18. Have you **asked** any of the following people, groups or organisations for information on how to get ready for tsunami hazards? (Tick all that apply).

☐ 1 No, I haven't asked anyone
☐ 2 Friends
☐ 3 Neighbours
☐ 4 Relatives
☐ 5 Central Government agencies
☐ 6 Regional Council
☐ 7 Local Council
☐ Local Civil Defence group
☐ 9 Business establishments
☐ Research organisations (e.g. NIWA, GNS, universities)
☐ 11 My workplace
☐ 12 My child's school
☐ 13 Other, specify _____

19. Are there official tsunami evacuation routes for this community? (Tick one only)

☐ 1 Yes
☐ 2 No
☐ 3 Don't know

19a. If **yes** please describe _____
_____
_____

19b. If **no** do you think that an official evacuation route should be established? (Tick one only)

☐ 1 Yes
☐ 2 No

20. Are you currently becoming more "tsunami prepared"? (Tick one only)

- ☐ 1 Yes
- ☐ 2 No
- ☐ 3 Don't know

21. Which of the following steps have you taken or are taking to become more tsunami prepared? (Tick one per line)

	No	Yes	Does not apply
a. Developing a family emergency response plan	❑	❑	❑
b. Have a back pack filled with supplies that is ready to take with me	❑	❑	❑
c. Participated in an official tsunami evacuation drill	❑	❑	❑
d. Participated in an unofficial tsunami evacuation drill	❑	❑	❑

22. Please indicate how much you agree or disagree that the following sources of information influenced your willingness to prepare. (Tick one per line)

	Strongly Disagree	⟷			Strongly Agree
a. Public educational meetings	❑	❑	❑	❑	❑
b. World events such as the 2004 Indian Ocean tsunami	❑	❑	❑	❑	❑
c. Neighbourhood educators (door to door)	❑	❑	❑	❑	❑
d. School programs	❑	❑	❑	❑	❑
e. Council newsletters	❑	❑	❑	❑	❑
f. Public tsunami drills	❑	❑	❑	❑	❑

23. Did you know what a tsunami was before the 2004 Boxing Day Tsunami? (Tick one only)

- ☐ 1 Yes
- ☐ 2 No

24. Since the 2004 Boxing Day Tsunami you: (Tick all that apply)

- ☐ 1 Have learned more about tsunamis
- ☐ 2 Have actively sought more information on tsunamis
- ☐ 3 Feel more at risk from tsunamis
- ☐ 4 Feel less at risk from tsunamis
- ☐ 5 Have not been affected
- ☐ 7 Other, please specify_____

During a tsunami

25. Describe how you would respond to a warning of a ***local*** source tsunami (from a place less than 1 hour travel time away).

_____

_____

26. Describe how your response to a warning of a ***distant*** source tsunami (originating from Japan or Alaska, etc) would differ from your response to a local tsunami.

_____

_____

27. If you are at the coast and receive an official tsunami warning how much time do you have to move to safety? (Tick one only)

- ☐ 1 Don't know
- ☐ 2 A few minutes
- ☐ 3 10 minutes to half an hour
- ☐ 4 Half an hour to one hour
- ☐ 5 1-2 hours
- ☐ 6 2-5 hours
- ☐ 7 More than 5 hours

28. If you feel a strong earthquake while at the beach, how much time will you have to move to safety? (Tick one only)

- ☐ 1 Don't know
- ☐ 2 A few minutes
- ☐ 3 10 minutes to half an hour
- ☐ 4 Half an hour to one hour
- ☐ 5 1-2 hours
- ☐ 6 2-5 hours
- ☐ 7 More than 5 hours

29. During a tsunami, how much time can there be between one tsunami wave/surge and the next? (Tick one only)

- ☐ 1 1-15 minutes
- ☐ 2 16-30 minutes
- ☐ 3 Over 30 minutes
- ☐ 4 All of the above
- ☐ 5 Don't know

30. Would you take personal belongings with you during a **local** source tsunami warning? (Tick one only)

- ☐1 Yes
- ☐2 No
- ☐3 Don't know

31. Would you take personal belongings with you during a **distant** source tsunami warning? (Tick one only)

- ☐1 Yes
- ☐2 No
- ☐3 Don't know

32. If you currently have personal survival belongings stored to take with you when a tsunami warning is issued, please list the three most important of these items to your health/welfare?

1. _____

2. _____

3. _____

33. For each statement, tick the box which best describes your response:

	Strongly disagree ← *(scale)* → Strongly agree				
I think tsunami could pose a threat to my personal safety	☐1	☐2	☐3	☐4	☐5
I think tsunami could pose a threat to my daily activities (such as work, leisure or property)	☐1	☐2	☐3	☐4	☐5
The tsunami that may occur here won't be that bad	☐1	☐2	☐3	☐4	☐5
Tsunamis won't affect this area	☐1	☐2	☐3	☐4	☐5
Tsunamis won't affect me	☐1	☐2	☐3	☐4	☐5
The likelihood that major tsunamis will occur here has been greatly exaggerated	☐1	☐2	☐3	☐4	☐5
Tsunamis have affected this area since I have lived here	☐1	☐2	☐3	☐4	☐5
I will be fine if any tsunami hits here in the future	☐1	☐2	☐3	☐4	☐5

34. Please list the component's of your community's tsunami warning system? (Please be specific)

_____

_____

☐ I do not know if my community has a tsunami warning system.
☐ My community has a warning system, but I do not know the components of it.

35. What advice have you been given about what to do during a **tsunami evacuation**? (Please be specific)_____

_____

_____

If you do not have a school aged child or children (year 1-13) then skip to question 38

36. Does your child's school have a disaster preparedness plan that includes tsunamis? (Tick one only)

☐$_1$ Yes
☐$_2$ No
☐$_3$ Don't know

37. Please indicate the extent to which you agree or disagree with each of the following statements:

	Strongly Disagree		⟷		Strongly Agree	Does not Apply
a. I will allow my child to remain at school when a tsunami **warning** is issued	❑	❑	❑	❑	❑	❑
b. I will go and get my child from school when a tsunami **warning** is issued	❑	❑	❑	❑	❑	❑
c. I trust that the tsunami preparedness plan at my child's school will protect my child during a tsunami event	❑	❑	❑	❑	❑	❑

Attitude about community

38. Relating to the householder who is answering this questionnaire are you:

☐$_1$ the owner and this is your primary residence
☐$_2$ renting and this is your primary residence
☐$_3$ the owner and this is your holiday home
☐$_4$ renting and this is your holiday home
☐$_5$ visiting but neither rent nor own

If you live in this community please answer questions 39, 40, and 41.
If you are visiting this community, please answer questions 42 and 43.

39. Following is a list of statements on how you feel about living in this community. Please use the scale below to show how much each statement matches your views. (Tick one per line)

	Strongly disagree ← (scale) → Strongly agree				
	1	2	3	4	5
I feel 'at home' in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am satisfied living in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am a useful member of this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have the same values and beliefs as my neighbours	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I feel I don't belong in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am interested in knowing what goes on in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I would be happy to leave this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I know my neighbours and/or other community members	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have no active involvement in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

40. Please think about your life in this community at present. Choose a number from the scale below that shows how much you agree or disagree with each of the following statements. (Tick one per line)

	Strongly disagree ← (scale) → Strongly Disagree				
	1	2	3	4	5
I feel I have control over the things that happen in my life	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I feel I have control over the things that happen in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
There is no way I can solve some of the problems I have by myself	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I can't do much to change what happens in my life	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I can't do much to change what happens in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Somehow problems in my life usually solve themselves	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

41. What are your main reasons for choosing to **live in** this community? (Choose the TWO most important reasons from the list below).

- ☐ 1 The natural beauty of the coast
- ☐ 2 Sea views
- ☐ 3 Escape from city life
- ☐ 4 Easy access to the beach
- ☐ 5 Fishing and shellfish gathering
- ☐ 6 Boating
- ☐ 7 Recreation (swimming, surfing, walking etc)
- ☐ 8 Sunbathing
- ☐ 9 Other (please describe)_____

If you are visiting this community, please answer questions **42** and **43**.

42. How often do you visit **this community**? (Tick one only)

- ☐ Very infrequently (once a year or less)
- ☐ Infrequently (2-3 times per year)
- ☐ Frequently (4-6 times per year)
- ☐ Very frequently (at least 6 times per year)

43. What are your main reasons for visiting this community? (Choose the TWO most important reasons from the list below).

- ☐ 1 The natural beauty of the coast
- ☐ 2 Sea views
- ☐ 3 Easy access to the beach
- ☐ 4 Fishing and shellfish gathering
- ☐ 5 Boating
- ☐ 6 Recreation (swimming, surfing, walking etc)
- ☐ 7 Sunbathing
- ☐ 8 Other (please describe)_____

All respondents please answer question **44** onwards.

44. To what extent do you agree or disagree with the following statements? Please use the scale below to show much each statement matches your views.

.

	Strongly disagree ← (scale) → Strongly agree				
	1	2	3	4	5
I feel at home in this community	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I know the neighbours	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am interested in community events	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am interested in local environmental issues (e.g. rubbish disposal, beach water quality)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

45. Are you involved as a volunteer with any of the following in this community? (Tick all that apply)

- ☐ 1 Fire Brigade
- ☐ 2 Civil Defence
- ☐ 3 Search and Rescue
- ☐ 4 Surf Lifesaving
- ☐ 5 Rural fire patrol
- ☐ 6 Other (please specify)_____

46. Has your household done any of the following to prepare for a hazard or emergency? (Tick all that apply). If you are a **visitor** to this community, questions **46** and **47** apply to your usual home.

- ☐ 1 Have a working flashlight
- ☐ 2 Protected breakable household items
- ☐ 3 Put strong latches on cabinet doors
- ☐ 4 Stored hazardous materials safely
- ☐ 5 Added edges to shelves to keep things from sliding off
- ☐ 6 Strapped water heater
- ☐ 7 Installed flexible tubing to gas appliances
- ☐ 8 Bolted house to foundation
- ☐ 9 Stockpiled water and food for three days
- ☐ 10 Have a working portable radio and spare batteries
- ☐ 11 Have a working fire extinguisher
- ☐ 12 Have a working smoke detector
- ☐ 13 Have a first aid kit
- ☐ 14 Stored wrench near gas turn-off valve
- ☐ 15 Picked an emergency contact person outside of your local area
- ☐ 16 Someone in family has learned how to put out fires
- ☐ 17 Bought additional insurance (e.g. home)
- ☐ 18 Someone in family has learned to provide first aid
- ☐ 19 Found out if you are in an area particularly vulnerable to a disaster (such as an earthquake, flood or tsunami)
- ☐ 20 Have had home inspected for preparedness
- ☐ 21 If you are a visitor have you checked for emergency supplies where you are staying
- ☐ 22 Talked to family members about what to do if a tsunami hazard warning is heard

47. How often do you check your emergency supplies like food, water and batteries? (Tick one only)

- ☐ 1 Weekly
- ☐ 2 Monthly
- ☐ 3 Yearly
- ☐ 4 Never

48. If you are visiting this community where is your usual place of residence?

_____

49. If you **live** in this community:

a) How long have you lived in this community? _____ Years

b) How long have you lived in your current home? _____ Years

If you are **visiting** this community:

c) How long are you visiting this community? ___days __ weeks

Demographics

The final set of questions concerns information about yourself. The information will be treated with complete confidence, and we will only report on general trends. We need this information to determine how representative our sample is of the general population.

50. Are you? (Tick one only)

- ☐ 1 Male
- ☐ 2 Female

51. Which best describes the situation you are living in now? (Tick one only)

- ☐ 1 Family with children
- ☐ 2 Family without children
- ☐ 3 Alone
- ☐ 4 With non-family
- ☐ 5 Other, specify _____

52. To which ethnic group do you belong? (Tick one only)

- ☐ 1 New Zealand European
- ☐ 2 Māori
- ☐ 3 Pacific Island
- ☐ 4 Chinese
- ☐ 5 Indian
- ☐ 6 Other : (please state)

53. How old were you on your last birthday? (Please fill in): _____ years

54. What is your current employment status? (Tick one only)

- ☐ 1 Employed full-time
- ☐ 2 Employed part-time
- ☐ 3 Not in paid employment
- ☐ 4 Self-employed

55. What is your household's gross annual income? (Tick one only)

- ☐ 1 Under $5,000
- ☐ 2 $5,000 to $15,000
- ☐ 3 $15,001 to $20,000
- ☐ 4 $20,001 to $30,000
- ☐ 5 $30,001 to $40,000
- ☐ 6 $40,001 to $50,000
- ☐ 7 $50,001 to $60,000
- ☐ 8 $60,001 to $90,000
- ☐ 9 $90,001 to $150,000
- ☐ 10 $150,001 to $200,000
- ☐ 11 Over $200,001

56. What is your highest educational qualification? (Tick one only)

- ☐ 1 No school qualifications
- ☐ 2 Secondary school qualifications
- ☐ 3 Trade certificate or professional certificate or diploma
- ☐ 4 University undergraduate degree (such as a Diploma or Bachelors degree)
- ☐ 5 University postgraduate degree (such as a Masters degree or Doctorate)

Thank you for taking the time to complete this questionnaire.

Please post the questionnaire in the envelope provided.

APPENDIX F: Copy of the 2006 National Coastal Survey tables

GENERAL TSUNAMI QUESTIONS

Most frequent cause of tsunamis in general

	Community									
	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Landslide	2	4.0%	2	2.6%	0	.0%	0	.0%	4	2.0%
High Tide	0	.0%	0	.0%	1	2.4%	2	5.3%	3	1.5%
Hurricane/strom	0	.0%	2	2.6%	0	.0%	2	5.3%	4	2.0%
Earthquake	45	90.0%	68	89.5%	38	92.7%	34	89.5%	185	90.2%
Volcanic eruption	2	4.0%	3	3.9%	0	.0%	0	.0%	5	2.4%
Don't know	1	2.0%	0	.0%	2	4.9%	0	.0%	3	1.5%

How tsunami waves can occur

	Community									
	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
One big wave/surge	21	42.0%	29	38.2%	27	65.9%	15	39.5%	92	44.9%
Multiple big waves/surges	33	66.0%	41	53.9%	26	63.4%	26	68.4%	126	61.5%
One small wave/surge	14	28.0%	11	14.5%	8	19.5%	10	26.3%	43	21.0%
Multiple small	22	44.0%	16	21.1%	11	26.8%	12	31.6%	61	29.8%
Multiple big waves/surges	31	62.0%	40	52.6%	18	43.9%	20	52.6%	109	53.2%
Rapidly rising and falling	30	60.0%	30	39.5%	18	43.9%	25	65.8%	103	50.2%
Don't Know	4	8.0%	8	10.5%	1	2.4%	1	2.6%	14	6.8%

Last tsunami that affected community

	Community									
	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Never	0	.0%	15	19.7%	5	12.2%	9	23.7%	29	14.1%
Last 10 years	1	2.0%	1	1.3%	2	4.9%	2	5.3%	6	2.9%
Last 100 years	47	94.0%	30	39.5%	16	39.0%	19	50.0%	112	54.6%
last 1000 years	0	.0%	0	.0%	0	.0%	1	2.6%	1	.5%
Last 10 000 years	0	.0%	2	2.6%	0	.0%	0	.0%	2	1.0%
Don't Know	2	4.0%	27	35.5%	18	43.9%	7	18.4%	54	26.3%

Last *damaging* tsunami that affected community

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Never	4	8.0%	24	31.6%	11	26.8%	10	26.3%	49	23.9%
Last 10 years	0	.0%	0	.0%	2	4.9%	1	2.6%	3	1.5%
Last 100 years	43	86.0%	16	21.1%	8	19.5%	13	34.2%	80	39.0%
last 1000 years	1	2.0%	0	.0%	0	.0%	2	5.3%	3	1.5%
Last 10 000 years	0	.0%	1	1.3%	0	.0%	0	.0%	1	.5%
Don't Know	2	4.0%	34	44.7%	20	48.8%	12	31.6%	68	33.2%

Next tsunami could occur

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Within the year	8	16.0%	7	9.2%	10	24.4%	3	7.9%	28	13.7%
Next 1-10 years	18	36.0%	21	27.6%	8	19.5%	7	18.4%	54	26.3%
Next 10-100 years	14	28.0%	30	39.5%	7	17.1%	16	42.1%	67	32.7%
Not within 100 years	0	.0%	1	1.3%	1	2.4%	1	2.6%	3	1.5%
Never	0	.0%	1	1.3%	0	.0%	0	.0%	1	.5%
Don't Know	9	18.0%	16	21.1%	14	34.1%	11	28.9%	50	24.4%

TSUNAMI WARNINGS AND PREPARATION

Have seen tsunami hazard zone maps for community

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	33	66.0%	17	22.4%	7	17.1%	14	36.8%	71	34.6%
Not sure	2	4.0%	6	7.9%	1	2.4%	1	2.6%	10	4.9%
No	14	28.0%	53	69.7%	32	78.0%	23	60.5%	122	59.5%

Live in a tsunami inundation zone

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	45	90.0%	59	77.6%	34	82.9%	28	73.7%	166	81.0%
No	3	6.0%	2	2.6%	1	2.4%	1	2.6%	7	3.4%
Don't know	1	2.0%	15	19.7%	5	12.2%	8	21.1%	29	14.1%

New Zealand public tsunami warning system

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Don't know	4	8.0%	6	7.9%	6	14.6%	2	5.3%	18	8.8%
Sirens	30	60.0%	66	86.8%	31	75.6%	29	76.3%	156	76.1%
Loud speaker	16	32.0%	15	19.7%	8	19.5%	6	15.8%	45	22.0%
Flashing lights	5	10.0%	1	1.3%	4	9.8%	3	7.9%	13	6.3%
Radio and TV	41	82.0%	60	78.9%	26	63.4%	30	78.9%	157	76.6%
Door-to-door	35	70.0%	13	17.1%	16	39.0%	22	57.9%	86	42.0%
Other	1	2.0%	0	.0%	0	.0%	1	2.6%	2	1.0%

Preferred method for receiving a tsunami warning

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Don't know	1	2.0%	1	1.3%	4	9.8%	0	.0%	6	2.9%
Sirens	28	56.0%	46	60.5%	25	61.0%	22	57.9%	121	59.0%
Loud speaker	11	22.0%	8	10.5%	2	4.9%	5	13.2%	26	12.7%
Flashing lights	2	4.0%	0	.0%	1	2.4%	1	2.6%	4	2.0%
Radio and TV	14	28.0%	25	32.9%	12	29.3%	9	23.7%	60	29.3%
Door-to-door	11	22.0%	14	18.4%	4	9.8%	8	21.1%	37	18.0%
Other	6	12.0%	4	5.3%	5	12.2%	6	15.8%	21	10.2%

Responsible for issuing tsunami warnings

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Don't know	1	2.0%	9	11.8%	10	24.4%	2	5.3%	22	10.7%
Central government	13	26.0%	7	9.2%	10	24.4%	12	31.6%	42	20.5%
Regional Council	10	20.0%	17	22.4%	10	24.4%	10	26.3%	47	22.9%
Local council	13	26.0%	14	18.4%	7	17.1%	11	28.9%	45	22.0%
Local Civil Defence	46	92.0%	54	71.1%	26	63.4%	31	81.6%	157	76.6%
Police or Fire	14	28.0%	32	42.1%	15	36.6%	18	47.4%	79	38.5%
NIWA or GNS	12	24.0%	18	23.7%	10	24.4%	12	31.6%	52	25.4%
Other	1	2.0%	0	.0%	0	.0%	1	2.6%	2	1.0%

Tsunamis are too destructive to bother preparing for

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	27	54.0%	38	50.0%	19	46.3%	18	47.4%	102	49.8%
Disagree	7	14.0%	14	18.4%	6	14.6%	4	10.5%	31	15.1%
Maybe	10	20.0%	11	14.5%	8	19.5%	10	26.3%	39	19.0%
Agree	2	4.0%	6	7.9%	3	7.3%	4	10.5%	15	7.3%
Strongly agree	1	2.0%	2	2.6%	2	4.9%	1	2.6%	6	2.9%

A serious tsunami is unlikely to affect me in the future

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	13	26.0%	30	39.5%	17	41.5%	18	47.4%	78	38.0%
Disagree	9	18.0%	13	17.1%	8	19.5%	7	18.4%	37	18.0%
Maybe	16	32.0%	19	25.0%	10	24.4%	6	15.8%	51	24.9%
Agree	9	18.0%	5	6.6%	1	2.4%	5	13.2%	20	9.8%
Strongly agree	1	2.0%	7	9.2%	2	4.9%	2	5.3%	12	5.9%

It is unnecessary to prepare for tsunamis as assistance will be provided

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	26	52.0%	55	72.4%	25	61.0%	26	68.4%	132	64.4%
Disagree	12	24.0%	8	10.5%	8	19.5%	7	18.4%	35	17.1%
Maybe	6	12.0%	6	7.9%	3	7.3%	2	5.3%	17	8.3%
Agree	3	6.0%	2	2.6%	1	2.4%	2	5.3%	8	3.9%
Strongly agree	1	2.0%	3	3.9%	1	2.4%	0	.0%	5	2.4%

Preparing for tsunamis is inconvenient for me

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	17	34.0%	34	44.7%	19	46.3%	15	39.5%	85	41.5%
Disagree	17	34.0%	16	21.1%	8	19.5%	12	31.6%	53	25.9%
Maybe	5	10.0%	14	18.4%	5	12.2%	9	23.7%	33	16.1%
Agree	5	10.0%	7	9.2%	4	9.8%	1	2.6%	17	8.3%
Strongly agree	3	6.0%	3	3.9%	2	4.9%	0	.0%	8	3.9%

It is difficult to prepare for tsunamis

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	11	22.0%	20	26.3%	9	22.0%	7	18.4%	47	22.9%
Disagree	10	20.0%	16	21.1%	5	12.2%	5	13.2%	36	17.6%
Maybe	14	28.0%	16	21.1%	14	34.1%	11	28.9%	55	26.8%
Agree	6	12.0%	11	14.5%	6	14.6%	5	13.2%	28	13.7%
Strongly agree	7	14.0%	11	14.5%	5	12.2%	10	26.3%	33	16.1%

Preparing for tsunamis will reduce damage to my home

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	17	34.0%	37	48.7%	14	34.1%	13	34.2%	81	39.5%
Disagree	5	10.0%	12	15.8%	10	24.4%	8	21.1%	35	17.1%
Maybe	15	30.0%	13	17.1%	6	14.6%	7	18.4%	41	20.0%
Agree	3	6.0%	4	5.3%	4	9.8%	4	10.5%	15	7.3%
Strongly agree	6	12.0%	8	10.5%	4	9.8%	6	15.8%	24	11.7%

Preparing for tsunamis will improve my everyday living conditions

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	19	38.0%	22	28.9%	13	31.7%	10	26.3%	64	31.2%
Disagree	10	20.0%	14	18.4%	10	24.4%	9	23.7%	43	21.0%
Maybe	13	26.0%	20	26.3%	9	22.0%	11	28.9%	53	25.9%
Agree	0	.0%	10	13.2%	3	7.3%	4	10.5%	17	8.3%
Strongly agree	5	10.0%	8	10.5%	2	4.9%	4	10.5%	19	9.3%

Preparing for tsunamis will improve my ability to deal with disruption to family/community life

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	3	6.0%	9	11.8%	2	4.9%	0	.0%	14	6.8%
Disagree	9	18.0%	7	9.2%	6	14.6%	1	2.6%	23	11.2%
Maybe	13	26.0%	14	18.4%	12	29.3%	13	34.2%	52	25.4%
Agree	11	22.0%	23	30.3%	9	22.0%	12	31.6%	55	26.8%
Strongly agree	10	20.0%	22	28.9%	9	22.0%	12	31.6%	53	25.9%

Preparing for tsunamis will help save lives

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	1	2.0%	8	10.5%	1	2.4%	0	.0%	10	4.9%
Disagree	1	2.0%	3	3.9%	0	.0%	1	2.6%	5	2.4%
Maybe	9	18.0%	7	9.2%	2	4.9%	8	21.1%	26	12.7%
Agree	14	28.0%	19	25.0%	14	34.1%	6	15.8%	53	25.9%
Strongly agree	23	46.0%	37	48.7%	23	56.1%	23	60.5%	106	51.7%

I do not know how I can prepare for tsunamis

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	13	26.0%	15	19.7%	9	22.0%	12	31.6%	49	23.9%
Disagree	10	20.0%	17	22.4%	7	17.1%	5	13.2%	39	19.0%
Maybe	12	24.0%	20	26.3%	10	24.4%	9	23.7%	51	24.9%
Agree	9	18.0%	11	14.5%	8	19.5%	7	18.4%	35	17.1%
Strongly agree	2	4.0%	7	9.2%	4	9.8%	5	13.2%	18	8.8%

Heard or received information on tsunamis

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Haven't heard or received	10	20.0%	30	39.5%	18	43.9%	10	26.3%	68	33.2%
Friends	15	30.0%	11	14.5%	10	24.4%	7	18.4%	43	21.0%
Neighbours	13	26.0%	5	6.6%	10	24.4%	6	15.8%	34	16.6%
Relatives	4	8.0%	8	10.5%	8	19.5%	1	2.6%	21	10.2%
Central Government	5	10.0%	9	11.8%	4	9.8%	11	28.9%	29	14.1%
Regional Council	11	22.0%	19	25.0%	7	17.1%	11	28.9%	48	23.4%
Local Council	23	46.0%	24	31.6%	8	19.5%	9	23.7%	64	31.2%
Local Civil Defense	30	60.0%	24	31.6%	12	29.3%	13	34.2%	79	38.5%
Business Establishment	0	.0%	2	2.6%	1	2.4%	0	.0%	3	1.5%
Research organisations	6	12.0%	9	11.8%	4	9.8%	6	15.8%	25	12.2%
Workplace	4	8.0%	3	3.9%	3	7.3%	0	.0%	10	4.9%
Child's school	6	12.0%	0	.0%	4	9.8%	1	2.6%	11	5.4%
Other	5	10.0%	6	7.9%	2	4.9%	7	18.4%	20	9.8%

Intended actions for dealing with tsunamis

		Wainui		Westshore		Haumoana		Te Awanga		Total	
		N	%	N	%	N	%	N	%	N	%
Improve Knowledge	No	21	42.0%	13	17.1%	8	19.5%	9	23.7%	51	24.9%
	Possibly	21	42.0%	47	61.8%	25	61.0%	21	55.3%	114	55.6%
	Definately	5	10.0%	15	19.7%	5	12.2%	8	21.1%	33	16.1%
Increase ability to respond	No	20	40.0%	15	19.7%	9	22.0%	10	26.3%	54	26.3%
	Possibly	21	42.0%	46	60.5%	21	51.2%	21	55.3%	109	53.2%
	Definately	6	12.0%	13	17.1%	8	19.5%	7	18.4%	34	16.6%
Become involved	No	24	48.0%	39	51.3%	22	53.7%	21	55.3%	106	51.7%
	Possibly	18	36.0%	31	40.8%	14	34.1%	13	34.2%	76	37.1%
	Definately	3	6.0%	4	5.3%	1	2.4%	4	10.5%	12	5.9%
Seek information on risks	No	23	46.0%	27	35.5%	13	31.7%	13	34.2%	76	37.1%
	Possibly	16	32.0%	34	44.7%	21	51.2%	19	50.0%	90	43.9%
	Definately	3	6.0%	13	17.1%	4	9.8%	5	13.2%	25	12.2%
Seek information on responding	No	22	44.0%	14	18.4%	8	19.5%	11	28.9%	55	26.8%
	Possibly	17	34.0%	44	57.9%	23	56.1%	19	50.0%	103	50.2%
	Definately	6	12.0%	15	19.7%	7	17.1%	8	21.1%	36	17.6%

Asked for information on how to get ready for tsunamis

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Haven't ask anyone	26	52.0%	60	78.9%	31	75.6%	29	76.3%	146	71.2%
Friends	6	12.0%	5	6.6%	5	12.2%	2	5.3%	18	8.8%
Neighbours	8	16.0%	3	3.9%	4	9.8%	1	2.6%	16	7.8%
Relatives	2	4.0%	4	5.3%	4	9.8%	1	2.6%	11	5.4%
Central Government	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Regional Council	0	.0%	5	6.6%	1	2.4%	2	5.3%	8	3.9%
Local Council	5	10.0%	7	9.2%	0	.0%	3	7.9%	15	7.3%
Local Civil Defence	10	20.0%	8	10.5%	1	2.4%	5	13.2%	24	11.7%
Business Establishment	0	.0%	1	1.3%	0	.0%	0	.0%	1	.5%
Research organisations	0	.0%	2	2.6%	0	.0%	1	2.6%	3	1.5%
Workplace	1	2.0%	2	2.6%	3	7.3%	0	.0%	6	2.9%
Child's school	1	2.0%	0	.0%	2	4.9%	0	.0%	3	1.5%
Other	1	2.0%	0	.0%	1	2.4%	2	5.3%	4	2.0%

Official tsunami evacuation routes

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	15	30.0%	4	5.3%	11	26.8%	10	26.3%	40	19.5%
No	13	26.0%	8	10.5%	7	17.1%	9	23.7%	37	18.0%
Don't know	20	40.0%	64	84.2%	22	53.7%	19	50.0%	125	61.0%

Evacuation routes should be established

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	26	52.0%	47	61.8%	19	46.3%	22	57.9%	114	55.6%
No	2	4.0%	6	7.9%	3	7.3%	3	7.9%	14	6.8%

Tsunami prepared

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	25	50.0%	32	42.1%	16	39.0%	14	36.8%	87	42.4%
No	19	38.0%	35	46.1%	19	46.3%	21	55.3%	94	45.9%
Don't know	5	10.0%	8	10.5%	3	7.3%	2	5.3%	18	8.8%

Steps to becoming tsunami prepared

		Wainui		Westshore		Haumoana		Te Awanga		Total	
		N	%	N	%	N	%	N	%	N	%
Family emergency plan	No	18	36.0%	32	42.1%	18	43.9%	18	47.4%	86	42.0%
	Yes	23	46.0%	32	42.1%	17	41.5%	15	39.5%	87	42.4%
	Does not apply	7	14.0%	7	9.2%	5	12.2%	1	2.6%	20	9.8%
Prepared supplies	No	35	70.0%	44	57.9%	26	63.4%	26	68.4%	131	63.9%
	Yes	14	28.0%	29	38.2%	12	29.3%	9	23.7%	64	31.2%
	Does not apply	0	.0%	0	.0%	2	4.9%	1	2.6%	3	1.5%
Participated in official drill	No	45	90.0%	67	88.2%	36	87.8%	33	86.8%	181	88.3%
	Yes	1	2.0%	3	3.9%	1	2.4%	1	2.6%	6	2.9%
	Does not apply	2	4.0%	1	1.3%	3	7.3%	1	2.6%	7	3.4%
Participated in unofficial drill	No	39	78.0%	66	86.8%	37	90.2%	31	81.6%	173	84.4%
	Yes	8	16.0%	4	5.3%	0	.0%	4	10.5%	16	7.8%
	Does not apply	1	2.0%	1	1.3%	3	7.3%	1	2.6%	6	2.9%

Influence over willingness to prepare

Public educational meetings

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	12	24.0%	18	23.7%	16	39.0%	15	39.5%	61	29.8%
Disagree	4	8.0%	11	14.5%	3	7.3%	4	10.5%	22	10.7%
Maybe	13	26.0%	15	19.7%	6	14.6%	6	15.8%	40	19.5%
Agree	10	20.0%	9	11.8%	4	9.8%	3	7.9%	26	12.7%
Strongly agree	3	6.0%	6	7.9%	4	9.8%	4	10.5%	17	8.3%

World events such as the 2004 Indian Ocean tsunami

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	3	6.0%	8	10.5%	4	9.8%	1	2.6%	16	7.8%
Disagree	2	4.0%	1	1.3%	2	4.9%	3	7.9%	8	3.9%
Maybe	5	10.0%	19	25.0%	9	22.0%	6	15.8%	39	19.0%
Agree	20	40.0%	20	26.3%	8	19.5%	11	28.9%	59	28.8%
Strongly agree	14	28.0%	20	26.3%	16	39.0%	13	34.2%	63	30.7%

Neighbourhood educators

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	17	34.0%	26	34.2%	16	39.0%	14	36.8%	73	35.6%
Disagree	6	12.0%	4	5.3%	5	12.2%	6	15.8%	21	10.2%
Maybe	10	20.0%	16	21.1%	5	12.2%	4	10.5%	35	17.1%
Agree	7	14.0%	7	9.2%	5	12.2%	5	13.2%	24	11.7%
Strongly agree	0	.0%	2	2.6%	3	7.3%	1	2.6%	6	2.9%

School programmes

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	16	32.0%	26	34.2%	13	31.7%	11	28.9%	66	32.2%
Disagree	2	4.0%	5	6.6%	3	7.3%	7	18.4%	17	8.3%
Maybe	10	20.0%	8	10.5%	7	17.1%	4	10.5%	29	14.1%
Agree	8	16.0%	5	6.6%	8	19.5%	4	10.5%	25	12.2%
Strongly agree	3	6.0%	6	7.9%	3	7.3%	3	7.9%	15	7.3%

Council newsletters

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	7	14.0%	14	18.4%	14	34.1%	12	31.6%	47	22.9%
Disagree	3	6.0%	6	7.9%	3	7.3%	2	5.3%	14	6.8%
Maybe	14	28.0%	12	15.8%	6	14.6%	6	15.8%	38	18.5%
Agree	16	32.0%	15	19.7%	7	17.1%	8	21.1%	46	22.4%
Strongly agree	4	8.0%	12	15.8%	5	12.2%	6	15.8%	27	13.2%

Public tsunami drills

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	19	38.0%	29	38.2%	18	43.9%	16	42.1%	82	40.0%
Disagree	4	8.0%	5	6.6%	3	7.3%	6	15.8%	18	8.8%
Maybe	11	22.0%	12	15.8%	6	14.6%	5	13.2%	34	16.6%
Agree	0	.0%	7	9.2%	6	14.6%	3	7.9%	16	7.8%
Strongly agree	4	8.0%	4	5.3%	1	2.4%	1	2.6%	10	4.9%

Knew what a tsunami was before the 2004 Boxing Day tsunami

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	47	94.0%	70	92.1%	36	87.8%	36	94.7%	189	92.2%
No	1	2.0%	5	6.6%	4	9.8%	2	5.3%	12	5.9%

Since the 2004 Boxing Day tsunami

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Have learned more	42	84.0%	48	63.2%	29	70.7%	24	63.2%	143	69.8%
Have actively sought info	11	22.0%	11	14.5%	8	19.5%	8	21.1%	38	18.5%
Feel more at risk	35	70.0%	46	60.5%	27	65.9%	18	47.4%	126	61.5%
Feel less at risk	0	.0%	2	2.6%	0	.0%	0	.0%	2	1.0%
Have not been affected	10	20.0%	17	22.4%	9	22.0%	12	31.6%	48	23.4%
Other	3	6.0%	1	1.3%	1	2.4%	2	5.3%	7	3.4%

DURING A TSUNAMI

Response to a local-source tsunami warning

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Highground	39	78.0%	56	73.7%	24	58.5%	23	60.5%	142	69.3%
Inland	4	8.0%	8	10.5%	7	17.1%	1	2.6%	20	9.8%
Take supplies	13	26.0%	20	26.3%	8	19.5%	15	39.5%	56	27.3%
Take family and pets	9	18.0%	12	15.8%	7	17.1%	8	21.1%	36	17.6%
Inform friends and neighbours	5	10.0%	6	7.9%	6	14.6%	3	7.9%	20	9.8%
Seek info	1	2.0%	1	1.3%	1	2.4%	1	2.6%	4	2.0%
Evacuate	5	10.0%	3	3.9%	1	2.4%	8	21.1%	17	8.3%
Leave	1	2.0%	8	10.5%	4	9.8%	4	10.5%	17	8.3%
other	0	.0%	3	3.9%	6	14.6%	3	7.9%	12	5.9%

How responses would differ for a distant-source tsunami warning

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
I will follow instructions	9	18.0%	22	28.9%	11	26.8%	9	23.7%	51	24.9%
Pack and take supplies	10	20.0%	11	14.5%	7	17.1%	7	18.4%	35	17.1%
Inform friends and neighbours	3	6.0%	3	3.9%	0	.0%	1	2.6%	7	3.4%
Response will not differ	23	46.0%	31	40.8%	13	31.7%	15	39.5%	82	40.0%
other	6	12.0%	11	14.5%	8	19.5%	7	18.4%	32	15.6%

Time to move to safety following an official tsunami warning

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Don't know	16	32.0%	25	32.9%	16	39.0%	13	34.2%	70	34.1%
Few minutes	8	16.0%	17	22.4%	5	12.2%	6	15.8%	36	17.6%
10mins-half hour	12	24.0%	14	18.4%	7	17.1%	8	21.1%	41	20.0%
half hour-1 hour	7	14.0%	15	19.7%	9	22.0%	1	2.6%	32	15.6%
1-2 hours	1	2.0%	3	3.9%	4	9.8%	5	13.2%	13	6.3%
2-5 hours	2	4.0%	2	2.6%	0	.0%	2	5.3%	6	2.9%
More than 5 hours	1	2.0%	0	.0%	0	.0%	0	.0%	1	.5%

Time to move to safety if a strong earthquake is felt while at the beach

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Don't know	16	32.0%	24	31.6%	17	41.5%	12	31.6%	69	33.7%
Few minutes	22	44.0%	22	28.9%	12	29.3%	14	36.8%	70	34.1%
10mins-half hour	10	20.0%	18	23.7%	10	24.4%	10	26.3%	48	23.4%
half hour-1 hour	1	2.0%	12	15.8%	2	4.9%	0	.0%	15	7.3%
1-2 hours	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
2-5 hours	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
More than 5 hours	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%

Time between one tsunami wave/surge and the next

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
1-15 mins	18	36.0%	28	36.8%	10	24.4%	14	36.8%	70	34.1%
16-30 mins	1	2.0%	3	3.9%	1	2.4%	1	2.6%	6	2.9%
Over 30 mins	1	2.0%	1	1.3%	0	.0%	0	.0%	2	1.0%
All of the above	16	32.0%	12	15.8%	9	22.0%	11	28.9%	48	23.4%
Don't know	14	28.0%	32	42.1%	21	51.2%	12	31.6%	79	38.5%

Take personal belongings during a *local* source tsunami warning

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	24	48.0%	41	53.9%	16	39.0%	21	55.3%	102	49.8%
No	23	46.0%	30	39.5%	17	41.5%	13	34.2%	83	40.5%
Don't know	3	6.0%	4	5.3%	7	17.1%	4	10.5%	18	8.8%

Take personal belongings during a *distant* source tsunami warning

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	44	88.0%	60	78.9%	30	73.2%	33	86.8%	167	81.5%
No	3	6.0%	8	10.5%	6	14.6%	3	7.9%	20	9.8%
Don't know	3	6.0%	7	9.2%	4	9.8%	2	5.3%	16	7.8%

Three most important belongings in personal survival kit

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Water	30	60.0%	46	60.5%	22	53.7%	16	42.1%	114	55.6%
Food	22	44.0%	42	55.3%	19	46.3%	11	28.9%	94	45.9%
Medication	11	22.0%	8	10.5%	7	17.1%	9	23.7%	35	17.1%
Clothing	14	28.0%	24	31.6%	8	19.5%	14	36.8%	60	29.3%
Shelter	4	8.0%	4	5.3%	0	.0%	2	5.3%	10	4.9%
Photo albums and	1	2.0%	1	1.3%	2	4.9%	2	5.3%	6	2.9%
Cash/card/wallet	1	2.0%	1	1.3%	4	9.8%	2	5.3%	8	3.9%
Legal documents	1	2.0%	6	7.9%	0	.0%	5	13.2%	12	5.9%
Radio	5	10.0%	6	7.9%	4	9.8%	4	10.5%	19	9.3%
Other	12	24.0%	19	25.0%	15	36.6%	11	28.9%	57	27.8%

Tsunamis could pose a threat to my personal safety

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	3	6.0%	3	3.9%	1	2.4%	1	2.6%	8	3.9%
Disagree	2	4.0%	5	6.6%	0	.0%	0	.0%	7	3.4%
Maybe	10	20.0%	8	10.5%	6	14.6%	5	13.2%	29	14.1%
Agree	10	20.0%	16	21.1%	10	24.4%	9	23.7%	45	22.0%
Strongly agree	25	50.0%	42	55.3%	24	58.5%	21	55.3%	112	54.6%

Tsunami could pose a threat to my daily activities

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	5	10.0%	4	5.3%	1	2.4%	1	2.6%	11	5.4%
Disagree	2	4.0%	6	7.9%	1	2.4%	3	7.9%	12	5.9%
Maybe	9	18.0%	11	14.5%	5	12.2%	5	13.2%	30	14.6%
Agree	13	26.0%	14	18.4%	10	24.4%	9	23.7%	46	22.4%
Strongly agree	19	38.0%	36	47.4%	23	56.1%	17	44.7%	95	46.3%

The tsunami that may occur here won't be that bad

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	23	46.0%	34	44.7%	20	48.8%	16	42.1%	93	45.4%
Disagree	9	18.0%	16	21.1%	11	26.8%	8	21.1%	44	21.5%
Maybe	14	28.0%	11	14.5%	7	17.1%	5	13.2%	37	18.0%
Agree	1	2.0%	7	9.2%	0	.0%	6	15.8%	14	6.8%
Strongly agree	2	4.0%	4	5.3%	1	2.4%	0	.0%	7	3.4%

Tsunamis won't affect this area

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	35	70.0%	42	55.3%	25	61.0%	16	42.1%	118	57.6%
Disagree	6	12.0%	13	17.1%	8	19.5%	9	23.7%	36	17.6%
Maybe	5	10.0%	8	10.5%	2	4.9%	6	15.8%	21	10.2%
Agree	2	4.0%	6	7.9%	1	2.4%	4	10.5%	13	6.3%
Strongly agree	2	4.0%	4	5.3%	2	4.9%	0	.0%	8	3.9%

Tsunamis won't affect me

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	32	64.0%	42	55.3%	24	58.5%	18	47.4%	116	56.6%
Disagree	11	22.0%	15	19.7%	10	24.4%	8	21.1%	44	21.5%
Maybe	3	6.0%	9	11.8%	3	7.3%	6	15.8%	21	10.2%
Agree	1	2.0%	3	3.9%	0	.0%	3	7.9%	7	3.4%
Strongly agree	3	6.0%	4	5.3%	1	2.4%	0	.0%	8	3.9%

The likelihood that major tsunamis will occur here has been greatly exaggerated

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	20	40.0%	27	35.5%	13	31.7%	14	36.8%	74	36.1%
Disagree	8	16.0%	20	26.3%	13	31.7%	5	13.2%	46	22.4%
Maybe	14	28.0%	14	18.4%	8	19.5%	12	31.6%	48	23.4%
Agree	5	10.0%	8	10.5%	2	4.9%	3	7.9%	18	8.8%
Strongly agree	2	4.0%	3	3.9%	2	4.9%	2	5.3%	9	4.4%

Tsunamis have affected this area since I have lived here

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	19	38.0%	44	57.9%	25	61.0%	21	55.3%	109	53.2%
Disagree	3	6.0%	6	7.9%	5	12.2%	5	13.2%	19	9.3%
Maybe	12	24.0%	7	9.2%	4	9.8%	6	15.8%	29	14.1%
Agree	4	8.0%	6	7.9%	1	2.4%	1	2.6%	12	5.9%
Strongly agree	10	20.0%	7	9.2%	2	4.9%	2	5.3%	21	10.2%

I will be fine if any tsunami hits here in the future

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	20	40.0%	51	67.1%	21	51.2%	17	44.7%	109	53.2%
Disagree	11	22.0%	9	11.8%	7	17.1%	7	18.4%	34	16.6%
Maybe	9	18.0%	6	7.9%	7	17.1%	5	13.2%	27	13.2%
Agree	3	6.0%	3	3.9%	0	.0%	4	10.5%	10	4.9%
Strongly agree	6	12.0%	4	5.3%	3	7.3%	2	5.3%	15	7.3%

Components of community warning system

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Siren	7	14.0%	27	35.5%	12	29.3%	13	34.2%	59	28.8%
Loud speaker	7	14.0%	2	2.6%	0	.0%	1	2.6%	10	4.9%
TV and Radio	6	12.0%	9	11.8%	1	2.4%	7	18.4%	23	11.2%
Door-to-door	9	18.0%	0	.0%	2	4.9%	4	10.5%	15	7.3%
Other	0	.0%	1	1.3%	0	.0%	5	13.2%	6	2.9%
I do not know if my community has a system	19	38.0%	25	32.9%	18	43.9%	16	42.1%	78	38.0%
Community has a system. I don't know the components	18	36.0%	23	30.3%	9	22.0%	3	7.9%	53	25.9%

Advice given about what to do during tsunami evacuation

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Have an emergency supplies	2	4.0%	5	6.6%	4	9.8%	5	13.2%	16	7.8%
Follow instructions	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Evacuate after an earthquake	18	36.0%	13	17.1%	13	31.7%	13	34.2%	57	27.8%
Listen to Radio	1	2.0%	4	5.3%	2	4.9%	1	2.6%	8	3.9%
Other	7	14.0%	11	14.5%	5	12.2%	2	5.3%	25	12.2%
No advice	19	38.0%	47	61.8%	21	51.2%	19	50.0%	106	51.7%

Child's school disaster preparedness plan

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	6	75.0%	2	16.7%	3	20.0%	2	14.3%	13	26.5%
No	0	.0%	2	16.7%	1	6.7%	5	35.7%	8	16.3%
Don't know	2	25.0%	8	66.7%	11	73.3%	7	50.0%	28	57.1%
NA	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%

Allow child to remain at school when a tsunami warning is issued

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	1	11.1%	5	41.7%	4	26.7%	2	18.2%	12	25.5%
Disagree	0	.0%	1	8.3%	1	6.7%	1	9.1%	3	6.4%
Maybe	3	33.3%	1	8.3%	4	26.7%	2	18.2%	10	21.3%
Agree	3	33.3%	1	8.3%	0	.0%	3	27.3%	7	14.9%
Strongly agree	2	22.2%	4	33.3%	6	40.0%	3	27.3%	15	31.9%
Does not apply	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%

Will go and get child from school when a tsunami warning is issued

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	0	.0%	0	.0%	3	20.0%	2	18.2%	5	10.6%
Disagree	2	22.2%	1	8.3%	0	.0%	0	.0%	3	6.4%
Maybe	2	22.2%	3	25.0%	3	20.0%	1	9.1%	9	19.1%
Agree	1	11.1%	1	8.3%	2	13.3%	3	27.3%	7	14.9%
Strongly agree	4	44.4%	7	58.3%	5	33.3%	4	36.4%	20	42.6%
Does not apply	0	.0%	0	.0%	2	13.3%	1	9.1%	3	6.4%

Will trust the schools tsunami plan to protect child

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Strongly disagree	0	.0%	4	33.3%	1	6.7%	2	18.2%	7	15.2%
Disagree	0	.0%	0	.0%	1	6.7%	1	9.1%	2	4.3%
Maybe	1	12.5%	3	25.0%	1	6.7%	0	.0%	5	10.9%
Agree	4	50.0%	1	8.3%	4	26.7%	3	27.3%	12	26.1%
Strongly agree	3	37.5%	4	33.3%	7	46.7%	3	27.3%	17	37.0%
Does not apply	0	.0%	0	.0%	1	6.7%	2	18.2%	3	6.5%

DEMOGRAPHICS

Residence

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Owner/primary residence	44	88.0%	56	73.7%	32	78.0%	31	81.6%	163	79.5%
Renting/primary residence	2	4.0%	17	22.4%	9	22.0%	4	10.5%	32	15.6%
Owner/holiday home	3	6.0%	2	2.6%	0	.0%	3	7.9%	8	3.9%
Renting/holiday home	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Visiting but neither rent nor own	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%

Gender

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Male	25	50.0%	34	44.7%	17	41.5%	22	57.9%	98	47.8%
Female	23	46.0%	41	53.9%	24	58.5%	16	42.1%	104	50.7%

Living situation

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Family with children	15	30.0%	19	25.0%	17	41.5%	17	44.7%	68	33.2%
Family without children	20	40.0%	27	35.5%	13	31.7%	14	36.8%	74	36.1%
Alone	10	20.0%	24	31.6%	8	19.5%	5	13.2%	47	22.9%
With non family	2	4.0%	4	5.3%	3	7.3%	2	5.3%	11	5.4%
Other	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%

Completed 2003 National Coastal Survey

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	25	50.0%	35	46.1%	16	39.0%	16	42.1%	92	44.9%
No	13	26.0%	30	39.5%	22	53.7%	16	42.1%	81	39.5%
Not sure	6	12.0%	5	6.6%	2	4.9%	4	10.5%	17	8.3%

Ethnic group

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
New Zealand European	46	92.0%	62	81.6%	31	75.6%	33	86.8%	172	83.9%
Maori	1	2.0%	5	6.6%	6	14.6%	3	7.9%	15	7.3%
Pacific Islander	0	.0%	1	1.3%	0	.0%	0	.0%	1	.5%
Chinese	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Indian	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
Other	2	4.0%	4	5.3%	3	7.3%	1	2.6%	10	4.9%

Age

	Wainui	Westshore	Haumoana	Te Awanga	Total
	Mean	Mean	Mean	Mean	Mean
Age on last birthday	59	59	50	51	55

Current employment status

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Employed full time	13	26.0%	23	30.3%	16	39.0%	12	31.6%	64	31.2%
Employed part time	6	12.0%	8	10.5%	8	19.5%	8	21.1%	30	14.6%
Not in paid employment	14	28.0%	32	42.1%	8	19.5%	6	15.8%	60	29.3%
Self employed	16	32.0%	9	11.8%	8	19.5%	12	31.6%	45	22.0%

Household gross annual income

	Wainui		Westshore		Haumoana		Te Awanga		Total	
	N	%	N	%	N	%	N	%	N	%
Under $5000	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%
$5000 to $15 000	0	.0%	4	5.3%	0	.0%	0	.0%	4	2.0%
$15 001 to $20 000	1	2.0%	8	10.5%	2	4.9%	4	10.5%	15	7.3%
$20 001 to $30 000	3	6.0%	9	11.8%	1	2.4%	9	23.7%	22	10.7%
$30 001 to $40 000	10	20.0%	8	10.5%	5	12.2%	4	10.5%	27	13.2%
$40 001 to $50 000	6	12.0%	7	9.2%	7	17.1%	3	7.9%	23	11.2%
$50 001 to $60 000	4	8.0%	5	6.6%	7	17.1%	1	2.6%	17	8.3%
$60 001 to $90 000	9	18.0%	17	22.4%	5	12.2%	7	18.4%	38	18.5%
$90 001 to $150 000	8	16.0%	6	7.9%	7	17.1%	4	10.5%	25	12.2%
$150 001 to $200 000	1	2.0%	1	1.3%	1	2.4%	0	.0%	3	1.5%
Over $200 001	2	4.0%	3	3.9%	0	.0%	3	7.9%	8	3.9%