ICG/PTWS WG-SWP-IV

NATIONAL REGIONAL REPORT SUBMITTED BY:

NEW ZEALAND

PART 1: BASIC INFORMATION

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PART 2: OVERVIEW OF NEW ZEALAND NATIONAL TSUNAMI OPERATING PROCEDURES

4. Local Tsunami

Unlike distant source tsunami (more than 3 hours travel time) and regional source tsunami (1 to 3 hours travel time) official warning for local source tsunami is unlikely to be timely in all areas because of the close proximity of faulting, the continental plate subduction zone, and volcanoes along our coastline. The *National Tsunami Advisory and Warning Plan* (www.mcdem.govt.nz) recognises this reality and states *"SPECIAL CONSIDERATION – LOCAL SOURCE TSUNAMIS. A tsunami generated in conjunction with a nearby large earthquake or undersea landslide may not provide sufficient time to implement official warning procedures. Persons in coastal areas who: experience strong earthquakes (hard to stand up); experience weak earthquakes lasting for a minute or more; observe strange sea behaviour such as the sea level suddenly rising and falling, or hear the sea making loud and unusual noises or roaring like a jet engine; should not wait for an official warning. Instead, let the natural signs be the warning. They must take immediate action to evacuate predetermined evacuation zones, or in the absence of predetermined evacuation zones, go to high ground or go inland"*.

5. Distant Tsunami

5.1 Responsible Organisations

Ministry of Civil Defence & Emergency Management (MCDEM)
MCDEM maintains a National CDEM Warning System (NWS) for the purpose of the dissemination of national level warnings to local authorities, government departments, lifeline utilities and the public. For this purpose it maintains a 24/7 duty system. Via its duty system, MCDEM is responsible for identification and characterization of tsunamigenic events.

GNS Science (GeoNet)
GeoNet is a national geological hazards monitoring and data collection system operated by GNS Science. GeoNet is funded by the Earthquake Commission (New Zealand's government mandated disaster insurer) and Land Information New Zealand. It incorporates distributed data centres and duty officers on 20 minute 24/7 rapid response to earthquakes, volcanic events, landslides and tsunami. GeoNet is MCDEM's official advisor for characterization of tsunamigenic events. The GeoNet Project Director also coordinates a panel of tsunami experts across research and academic institutions in New Zealand. The panel (referred to as the Tsunami Experts Panel) can be activated at any time by GeoNet to assist with interpretation and assessment of data related to a tsunami event.

5.2 Thresholds and Criteria

Initial tsunami advisories or warnings are issued by MCDEM as a default action when information received meet or exceed specific thresholds, and when an event does not meet the thresholds but based on advice received from GeoNet/Tsunami Experts Panel, is considered to hold a potential threat for New Zealand. When an event does not to hold a threat for New Zealand but information otherwise available is considered to potentially lead to public concern, a *National Advisory- No Threat* may be issued. The thresholds for issuing default initial national tsunami advisories or warnings by MCDEM are described in the *National Tsunami Advisory and Warning Plan* found on the MCDEM website www.mcdem.govt.nz

Subsequent national advisories or warnings are issued by MCDEM based on assessment provided by GNS Science and the Tsunami Experts Panel. For National Warnings, further assessment about expected arrival times and threat estimation is included in notifications. Information about expected arrival times is derived from modeling conducted by the PTWC

and moderated by GNS Science. The information is expressed as the estimated time of arrival (ETA) of the first (lead) wave at a given coastal point.

Supplementing PTWC forecasts, GNS Science also applies modeling to provide information about the maximum expected water elevation (amplitude). The amplitudes at shore and threat categories that can be assigned for 42 coastal zones are as follows:

Maximum expected amplitude at shore		Threat definition
	<0.2m	**No threat**
	0.2-1m	**Marine & Beach Threat (incl. harbours, estuaries & small boats)**
	1m-3m	**Marine and Land threat**
	3m-5m	
	5m-8m	
	>8m	

Table 2: Tsunami threat categories

Figure 1: Coastal zones for tsunami threat forecasts

5.3 Other Agencies Response

Following the issue of a national tsunami advisory or warning, local authorities are responsible for local threat assessment and for activating local public alerting mechanisms, following their own procedures, while national agencies activate response plans relevant to their areas of business. MCDEM maintains a Memorandum of Understanding with key media (radio and TV) for the public broadcasting of warnings.

5.4 Dissemination

National tsunami advisories and warnings are disseminated to all local authorities, key national agencies and the media. Information is communicated via the National CDEM

Warning System, using SMS, e-mail and Twitter and FaceBook accounts. The processes applied under the National CDEM Warning System are described in *The Guide to the National CDEM Plan* (www.mcdem.govt.nz).

5.5 Termination

All national tsunami advisories or warnings (except *National Advisory- No Threat*) are followed up by continuous subsequent advisories/warnings until a formal cancellation is issued via the National CDEM Warning System.

5.6 Response to warnings in the SW Pacific Region over the previous 12 months

MCDEM issued a ***National Advisory - Tsunami: No Threat to NZ*** notification on 29 April 2016 in response to an earthquake in Vanuatu

6. National Sea Level Networks

6.1 New Zealand Tsunami Monitoring Network

GNS Science and Land Information New Zealand (LINZ) operate a network of real-time tsunami gauges around the New Zealand coasts and on nearby offshore islands as part of GeoNet, New Zealand's geological hazards monitoring system; see http://www.geonet.org.nz). The network consists of 18 tsunami monitoring stations (Figure 2). These are owned, designed and operated by New Zealand as part of the LINZ-GNS Science partnership. An additional two Australian stations at Norfolk Island and Macquarie Island complement the network. We have recently installed a new station near Charleston (not shown on map) on the west coast of the South Island.

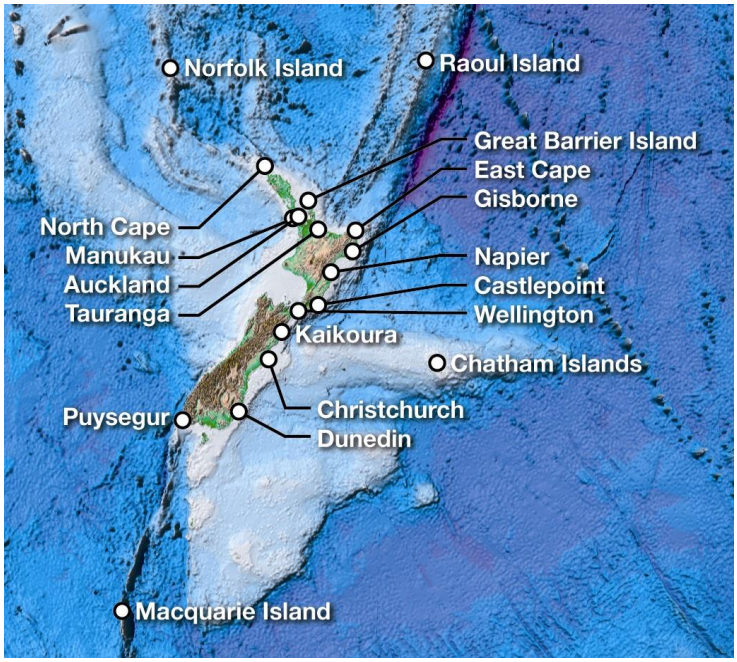

Figure 2: New Zealand Tsunami Monitoring Network.

At each New Zealand station, sea level is measured by two pressure sensors submerged in the ocean. Sea level measurements, sampled at 10 Hz, are transmitted to the GeoNet Data Management Centre in Lower Hutt. Data are available to tsunami warning centres in real-time via the GTS as well as over the Internet via Seedlink (a seismic data exchange protocol).

The National Institute of Water and Atmospheric Research (NIWA), port companies, regional and district councils operate various sea-level gauges which complement the operational near

real-time monitoring undertaken by GeoNet (New Zealand's geological hazard monitoring system).

Real-time raw and de-tided time series are displayed on the GeoNet website: http://www.geonet.org.nz/tsunami/gauges and freely available for download via the GeoNet ftp site: ftp://ftp.geonet.org.nz/tsunami.

6.2 National Institute of Water and Atmospheric Research (NIWA)-coordinated sea-level network

NIWA continues to coordinate on-line presentation of data from an open-coast network of sea-level gauges around New Zealand, (see Figure 3 below) mostly recording at one minute intervals. The network is not real-time, but stations can be interrogated on demand or used for post-event analysis. A daily update on sea levels, tides, storm surge and tsunami from selected sites can be found at: https://www.niwa.co.nz/our-services/online-services/sea-levels

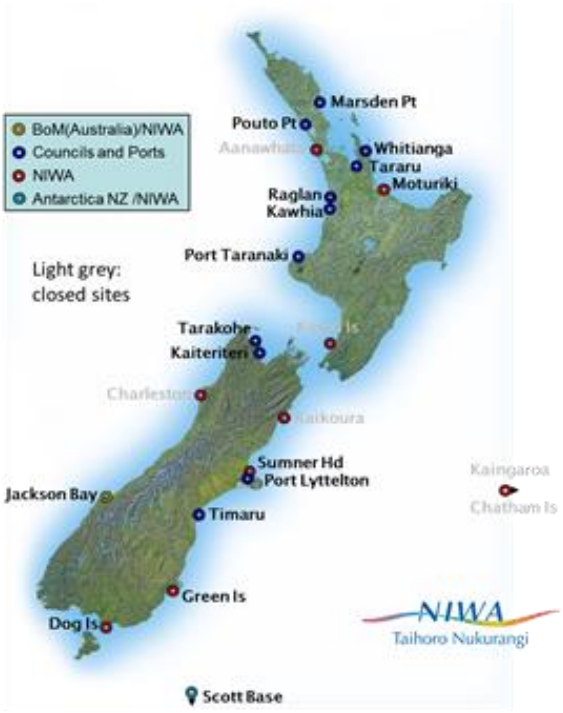

Figure 3: NIWA coordinated sea-level network (with grey labelled sites now closed).

8. URL's of national tsunami-related web sites

www.gns.cri.nz

www.geonet.org.nz/tsunami

www.niwa.co.nz

www.civildefence.govt.nz

PART 2: NATIONAL PROGRAMMES AND ACTIVITIES INFORMATION

9. EXECUTIVE SUMMARY

The New Zealand Tsunami Risk Management Programme continues to make progress towards tsunami mitigation in New Zealand. The programme is led by the Ministry of Civil Defence & Emergency Management (MCDEM) and focuses on understanding and preparing for tsunami across the 4R's. The work conducted under the Programme includes is either completed or on-going items:

- **Knowledge and hazard assessment:** Improving our understanding of tsunami sources relevant to New Zealand and their threat potential. e.g. research on sources, further development of modelling and enhancing ability to warn on local source tsunamis.
- **Warning Systems:** Upgrading of the National CDEM Warning System and providing guidance to local authorities on public alerting systems.
- **Planning:** Development and maintenance of a National Tsunami Advisory and Warning Plan that formally states the warning system for tsunami. Also, providing guidance on tsunami evacuation zones and mass evacuation planning.
- **Public Awareness:** Setting national standards for tsunami signage and tsunami sirens, and establish consistent public education/messages.

10. NARRATIVE

NEW ZEALAND CAPABILITIES IN RELATION TO TSUNAMI MITIGATION

This section is presented in two parts. Firstly, work conducted under the MCDEM sponsored Tsunami Risk Management Programme is described. Secondly work conducted individually or collectively by research agencies (in particular GNS Science and NIWA) is described as individual items.

10.1 Tsunami Risk Management Programme

The Tsunami Risk Management Programme is led by the Ministry of Civil Defence & Emergency Management (MCDEM). It was established in 2007 to focus on improving the quality and effectiveness of warnings, enhancing evacuation planning and standardising signage and public advice.

To ensure inclusiveness in decisions and subsequent acceptance of outcomes under the programme by local authorities, MCDEM leads the National Tsunami Working Group (TWG) to consider and approve a stream of work to improve tsunami resilience in New Zealand. The TWG represents civil defence emergency management at national and local level and is chaired by MCDEM, with the intent to provide strategic and operational advice and guidance to support the various regional work programmes.

The main objective of the TWG is to identify, prioritise and where possible allocate work to manage tsunami risk management within the framework of the 4R's. The TWG prioritise tsunami hazard risk management priorities, and associated research opportunities that will benefit the sector. Work will be balanced by considering competing stakeholder programmes, differing regional profiles of tsunami risk and the greater benefits for New Zealand.

New Zealand provided a detailed reported in the ICG/PTWS XXVI National Report, on work conducted under the Tsunami Risk Management Programme, these are stated below:

- **Review of the Tsunami Hazard Risk in New Zealand 2013 Report**

Report published Following August 2013.The updated report can be found on the MCDEM website www.mcdem.govt.nz

- **Review of the Tsunami Risk in New Zealand 2015 Report**
  The 2013 review did not focus on an update of risk component to New Zealand. The 2015 report provides updates on the risk to NZA and was completed in conjunction with NZIER.
- **Public Alerting Guidance**
  Updated guidance on *Public Alerting: Options Assessment* published in 2014 is available on the MCDEM website: www.mcdem.govt.nz
- **National Tsunami Siren Standard**
  The National Standard for Tsunami Sirens is available on the MCDEM website: www.mcdem.govt.nz

Recent work conducted under the New Zealand Tsunami Risk Management Programme and by other local and national agencies is as follows:

- **Public Alerting Capability**
  A project is underway looking into an additional channel to the suite of channels that we already use in order to warn the public in an emergency. This project involves mobile phone based technology that will be used on a 'push' basis which means all mobile phones in a specifically targeted area will receive the alert message. The project also involves a multi-channel alert publishing platform, used by agencies to launch alerts.

- **Exercise Tangaroa**
  Exercise Tangaroa is a national New Zealand, Tier 4 exercise under the National CDEM Exercise Programme and the first full exercise held under the Interagency National Exercise Programme. The Exercise will take place over three days (on 31 August, 14 September, and 28 September 2016) and will be based on a regional source tsunami scenario. This will test New Zealand's preparations for, response to, and recovery from, a national tsunami impact.

- **National Tsunami Advisory and Warning Plan Update**
  The *National Tsunami Advisory and Warning Plan* was updated further by MCDEM in mid-2016 to reflect internal (MCDEM) corrective actions following the 2015 Chile earthquake and tsunami. The Plan is available on the MCDEM website: www.mcdem.govt.nz

- **Guideline on Tsunami Evacuation**
  The Tsunami Evacuation Zones: Directors' Guideline for CDEM Groups [DGL 08/16] was updated and released in February 2016. Key updates and/or additions to the guidance include tsunami management arrangements and relationship to other guidance e.g. mass evacuation; information on sources and dynamics of the tsunami hazard; clarifying the relationships between levels of modelling, and the defining and establishing of evacuation zoning; establishing links to the Resource Management Act (RMA) and the New Zealand Coastal Policy Statement 2010. For example, avoiding facilities for vulnerable groups in high risk areas and having layouts for new developments that will support evacuation needs; advice on vertical evacuation options (evacuation to upper floors or roofs of mid-to-high rise buildings or purpose-built structures, i.e. towers, within the evacuation zone) are to be considered where the distance to high ground precludes effective evacuation based on tsunami threat models for that area; clarifying either a natural warning (when response times are short), or an official warning (and in which case evacuation zones are prescribed based on the threat level, i.e. anticipated wave size); public education and priority messaging; and

advice for ports, shipping and people in boats. The guidance is available on the MCDEM website: www.mcdem.govt.nz

Improving Tsunami Warning Capabilities Study

The TWG has provided support to GNS Science to complete a scoping exercise on information required to make informed, science based decisions on tsunami warning capability. This work is due for completion in December 2016.

Fiordland Tsunami Risk Working Group

Establishment of a working group to support understanding and planning regarding the potential risk to Milford (or Doubtful) Sounds from a tsunami generated by a large landslip. This is led by the local CDEM Group and supported by MCDEM and GNS Science.

East Coast LAB Tsunami Working Group

A regionally led working group working to increase community understanding and engagement with regard to local source tsunami risk. This region of New Zealand is at risk of a tsunami generated from rupture of the Hikurgani Trough, off the east coast of the North Island of New Zealand.

A link to the East Coast LAB website can be found on the MCDEM website: www.mcdem.govt.nz

Tsunami Short Course

GNS Science created hosted the first "Planning for a Tsunami Crisis Short Course" in June 2016. The two-day course covers tsunami science, tsunami impacts and tsunami risk management and includes a half-day filed trip. A range of speakers from scientific agencies, and central and local government supported the course. The target audience is emergency managers, researchers, lifeline sectors and others with an interest in managing tsunami risk. It is anticipated this course will be scheduled as an annual or biennial event.

New Sea Level Gauge

A new seal level gauge has been installed on the West Coast of the South Island. The site will have the same dual pressure sensor installation as the other LINZ-GNS sites (operated as a part of GeoNet).

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