

**SOPAC Member Countries  
National Capacity Assessments:  
Tsunami Warning and Mitigation Systems**

**Cook Islands**



Cook Islands



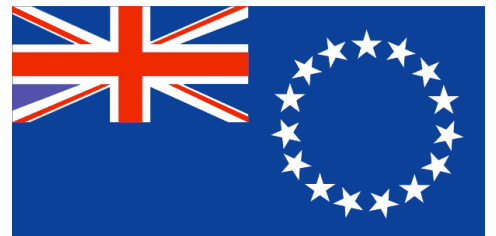
***SOPAC***





# SOPAC Member Countries National Capacity Assessments: Tsunami Warning and Mitigation Systems

**COOK ISLANDS**  
**Rarotonga, 10 – 13 June 2008**





## Document Control

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## Acronyms

ADB	Asian Development Bank
AFTN	Aeronautical Fixed Telecommunications Network
AGD	Australian Attorney-General's Department (Australia)
AM	Amplitude Modulated
ATWS	Australian Tsunami Warning System
AusAID	Australian Agency for International Development
Bureau	Australian Bureau of Meteorology
CIAA	Cook Islands Airport Authority
CIMS	Cook Islands Meteorological Service
CTBT	Comprehensive (Nuclear) Test Ban Treaty
D	Document (e.g. Document 39 = D39)
DCP	Data Collection Platform
DFAT	Australian Department of Foreign Affairs and Trade
DRM	Disaster Risk Management
DRMNAP	Disaster Risk Management National Action Plan
EEZ	Exclusive Economic Zone
EMA	Emergency Management Australia
EMCI	Emergency Management Cook Islands
EMWIN	Emergency Managers Weather Information Network
EOCs	Emergency Operations Centres
FM	Frequency Modulated
GA	Geoscience Australia
GEF	Global Environment Facility
GIS	Geographic Information Systems
GTS	Global Telecommunications System
HF	High Frequency
ICG	Intergovernmental Coordination Group
IOC	Intergovernmental Oceanographic Commission
ISDR	International Strategy for Disaster Reduction
ITIC	International Tsunami Information Centre
ITSU	ICG for the Tsunami Warning System in the Pacific
LiDAR	Light Detection and Ranging
MoU	Memorandum of Understanding
Mw	Moment Magnitude
NDRM	National Disaster Risk Management
NEOC	National Emergency Operations Centre
NGOs	Non-Government Organisations
NOAA	National Oceanic and Atmospheric Administration, USA
NTC	National Tidal Centre of the Australian Bureau of Meteorology
NZ	New Zealand
NZAID	New Zealand's International Aid and Development Agency
OFDA	Office of United States Foreign Disaster Assistance
PEACESAT	Pan-Pacific Education And Communication Experiments by SATellite
PGSP	Pacific Governance Support Programme
PICs	Pacific Island Countries
PIFS	Pacific Islands Forum Secretariat
PM	Prime Minister
PTWC	Pacific Tsunami Warning Centre
PTWS	Pacific Tsunami Warning and Mitigation System
RANET	Radio and Internet for the Communication of Hydro-Meteorological Information for Rural Development

## Acronyms (Continued)

SMS	Short Message Service
SOPAC	Pacific Islands Applied Geoscience Commission
SOPs	Standard Operating Procedures
TAF	The Asia Foundation
UNDAC	United Nations Disaster Action Committee
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
UTC	Coordinated Universal Time
VHF	Very High Frequency
VSAT	Very Small Aperture Terminal
WMO	World Meteorological Organisation



## Section

# 1

## 1. Results Outline



# 1. Results Outline

## 1.1. Executive Summary

The National Capacity Assessment of Pacific Islands Applied Geoscience Commission (SOPAC) Member Countries: Tsunami Warning and Mitigation Systems project aims to work in collaboration with the member countries of SOPAC to assess their capacity to receive, communicate and respond effectively to tsunami warnings. The Tsunami Capacity Assessment of the ability of the Cook Islands to receive, communicate and effectively respond to tsunami warnings took place in a workshop held from 10 – 13 June 2008 in Rarotonga, Cook Islands.

The workshop was facilitated by a team of visiting experts and attended by some thirty-five Cook Islands Government agency representatives, Non-Government Organisations (NGOs), regional and international organisations and the private sector to discuss key areas of tsunami warning and mitigation in the Cook Islands by completing a comprehensive questionnaire in session, presentations and site visits.

As well as outlining the Cook Island's current status, strengths and opportunities for improvement with regard to tsunami warning and mitigation, a list of recommendations were formulated by the Visiting Assessment Team in consultation with national participants. The aim of these recommendations is to guide further capacity development programs to target improvements in the Cook Island's tsunami warning and mitigation system.

The seismicity of the plate boundary zone between the Pacific and Australian Plates and the Pacific Ring of Fire mean the Cook Islands are susceptible to tsunami generated by regional and distant (or ocean wide) events. The Cook Islands have not experienced a tsunami in recent times that has caused significant damage to infrastructure or loss of life. Historical reports of an earthquake on the Tonga Trench and the resulting tsunami in November 1865 (Okal, Borrero and Synolakis, 2004) claims that run-up heights reached two metres in Rarotonga. The Tonga trench, which extends northward to  $-150^{\circ}$ , is the most significant source of tsunamigenic earthquakes for the Cook Islands (Thomas and Burbidge, 2009). The trench's orientation means that it directs the majority of the tsunami energy towards the southern island group (Thomas and Burbidge, 2009). The Cook Islands has also experienced recorded tsunami from distant sources such as the Kuril Islands.

Recurring priorities raised by participants in the Cook Islands Tsunami Capacity Assessment included assessment of the tsunami risk for the Cook Islands, improved warning dissemination to the community through available communication channels, finalisation of the Cook Islands National Disaster Risk Management (NDRM) Plan 2006 (this is currently being revised and will be replaced by a 2009 version) and improved Standard Operating Procedures (SOPs) and community education.

The workshop's resulting recommendations reflected the priorities raised by workshop participants. In brief, very high priority recommendations made include:

- That the responsibility for analysing and interpreting tsunami messages and data and issuing tsunami warnings for the Cook Islands is formally delegated to Cook Islands Meteorological Service (CIMS);
- Complete the review, adoption and commence implementation of the Disaster Risk Management (DRM) Act and Plan;

- Development of an information management system/database to act as a central depository to ensure all national disaster risk management data is available for use during an event;
- Review options to ensure the National Emergency Operations Centre (NEOC) is appropriately located and resourced;
- Develop, approve, share and maintain national tsunami warning and response SOPs for each agency involved in the tsunami warning and response process;
- Development of a National Tsunami Emergency Plan for the Cook Islands in consultation with all relevant agencies;
- Investigate and implement (in a multi-hazard framework) improved mechanisms for dissemination of tsunami warnings to the population outside of waking hours;
- An interagency, multi-hazard approach is taken to continue to build on tsunami community awareness programs;
- Ensure relevant staff and volunteers are trained and tested on their ability to implement tsunami warning and response procedures in a real-time event;
- Use the tsunami hazard studies that have been completed for the Southwest Pacific Nations to date, any historical tsunami records and Geographic Information Systems (GIS) data to identify low-lying communities which may be potentially prone to tsunami impacts; and
- Build the capacity and profile of Emergency Management Cook Islands (EMCI).

Central to ensuring timely and effective tsunami warnings for the Cook Islands community is the formal confirmation of responsibilities for interpretation and dissemination of international Pacific Tsunami Warning Centre (PTWC) tsunami messages nationally. It is highly feasible for CIMS staff, who are scientifically oriented, to be trained to assume the role. CIMS is 24/7, has established international and national communications links and warning dissemination mechanisms and well established links with media and other agencies.

A positive of the Cook Islands disaster risk management system is the country's recently completed Disaster Risk Management National Action Plan (DRM NAP, D22). The Cook Islands also has a well developed cyclone warning and mitigation system and a willingness to move forward with planning for other hazards. The nation has reasonably robust communications infrastructure, strong relationships with regional and international development partners, committed agency staff and a strong and resilient community.

Cook Islands workshop participants are encouraged to use this National Tsunami Capacity Assessment report to guide both national projects and aid funded projects to achieve targeted improvements on the Cook Islands tsunami warning and mitigation system. In turn, this will assist in improving systems for other natural hazards. Contingent on the availability of human and financial resources, the Australian Bureau of Meteorology (the Bureau) and project partners will aim to work with potential donors to bring the findings of this project to their attention on a country and regional scale. This will be done in the hope of further capacity development projects being undertaken.

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## 1.2. Recommendations (including priority and resource intensity)

Table 2 outlines the priority and resource intensity for recommendations made to improve the Cook Island's tsunami warning and mitigation system. Both the priority and resource intensity are based on the consensus of the visiting Tsunami Capacity Assessment team after discussions held within the Tsunami Capacity Assessment Workshop. It is recognised that Table 3 may not reflect the opinions of all individuals involved in the workshop as priorities vary depending on personal responsibilities and areas of interest. Each recommendation is important in its own right to achieve holistic improvements in the Cook Island's tsunami warning and mitigation system.

The priority ranking and resource intensity scale used as a basis for allocating a priority and resource intensity to each recommendation is explained in Table 1. The Very High priority recommendations should be seriously considered as requiring urgent completion. Low resource intensity recommendations are considered the 'low-hanging fruit' that are achievable with very few additional resources.

**Table 1: Priority ranking and resource intensity scale**

PRIORITY	RESOURCE INTENSITY
<b>Very High</b>	<b>Low</b> – Recommendation currently being progressed or could possibly be progressed within the capacity of existing in-country resources (funds and staff).
<b>High</b>	<b>Medium</b> – Recommendation could be progressed by existing staff or with a low to moderate number of additional staff and/or expertise and a moderate level of additional in-country funds. May or may not require external funding.
<b>Medium</b>	<b>High</b> – Recommendation would require a high level of additional staff and/or expertise and funds. External funding support is likely to be required.
<b>Low</b>	<b>Very High</b> – Recommendation would require a very high level of additional staff and funds. External funding support will be required.

**Table 2: Priority and anticipated resource intensity for completion of recommendations made for improving the Cook Island's tsunami warning and mitigation system.**

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	That the full authority and responsibility for analysing and interpreting tsunami messages and data and issuing tsunami warnings for the Cook Islands is formally delegated to CIMS. Warning procedures should be pre-agreed by key government stakeholders and include a tsunami warning decision making matrix that outlines what action will be taken for each PTWC message received. It is highly feasible for CIMS staff (who have strong science backgrounds) to be trained to assume the role. CIMS are 24/7, have well established communications systems and warning dissemination mechanisms and media links.	Low	Tsunami Warning	Tsunami specific	12
Very High	Complete review, adoption and commence implementation of the DRM Act and Plan to clearly outline responsibility and authority for mitigation, preparedness (including effective early warnings), response and rehabilitation.	Low	Governance and Coordination	Multi-hazard	2
Very High	Develop an information management system/database to act as a central depository to ensure all national DRM data is available for use during an event (for example, Ministry of Works GIS data etc.).	High	Communications	Multi-hazard	16
Very High	Review options to ensure the NEOC is appropriately located and resourced (including communications equipment and links with outer islands and Vaka (Council)) to allow for timely transition into action and effective real-time operation. Ensure NEOC SOPs are up to date.	High	Tsunami Emergency Response	Multi-hazard	22

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	Develop, approve, share and maintain national tsunami warning and response SOPs for each agency involved in the tsunami warning and response process.	High	Governance and Coordination	Tsunami specific	5
Very High	<p>Complete tsunami warning SOPs incorporating:</p> <ul style="list-style-type: none"> <li>a. Finalisation and documentation of back-up arrangements for CIMS for receipt and dissemination of tsunami warnings by a second 24/7 agency with a robust communications system;</li> <li>b. Warning templates in Cook Islands Maori and English, including no threat bulletins, cancellations, marine user warnings and action prompts advising the community on action to take pre, during and post the tsunami event;</li> <li>c. Agreed and regularly maintained distribution lists;</li> <li>d. Use of available scientific information (models, sea level data etc.) to localise the threat (for example, arrival times, forecast points and what part of the island group will be affected). As the warning system matures, progressively move towards identifying differing levels of tsunami threat (for example, low threat (very small wave), marine threat (small wave), marine and land threat (larger waves)); and</li> <li>e. Regular and ongoing system tests.</li> </ul>	High	Tsunami Warning	Tsunami specific	13

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	Develop a National Tsunami Emergency Plan (under the NDRM Plan) for the Cook Islands in consultation with all relevant agencies. Technical assistance and possibly an in-country working group are required to develop this plan. The plan should cover a tsunami risk profile, preparedness for and response to tsunami as well as recovery.	High	Governance and Coordination	Tsunami specific	4
Very High	Investigate and implement (in a multi-hazard framework) improved mechanisms for dissemination of tsunami warnings to the population outside of waking hours, particularly remote villages. For example, a combination of Short Message Service (SMS) and dedicated High Frequency (HF) or Very High Frequency (VHF) radio as well as using Church bells etc.	High	Communications	Multi-hazard	20

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	<p>CIMS, EMCI, Police, the Red Cross, with Village/Island Councils take a combined, multi-hazard approach to continue building on tsunami community awareness programs including:</p> <ul style="list-style-type: none"> <li>a. A focus on communities at risk where possible;</li> <li>b. Tsunami Safety Rules separated into two categories (1) Be prepared for a tsunami – with messages such as plan a tsunami evacuation route in your village and (2) Take action in the case of a tsunami – with messages such as stay out of dangerous areas until the all clear is given by the authority. Include these Tsunami Safety Rules on warnings to the community;</li> <li>c. Enhancement of key messages to explain the different scale of tsunami with words such as “even a small tsunami that does not wash onto land could cause danger to swimmers and damage to marine vessels”;</li> <li>d. Continue with plans to integrate tsunami education into current programs (such as Disaster Awareness Week) and school curriculum;</li> <li>e. Identify community / business sectors that may require tailored programs (e.g. tourism and hotels);</li> </ul>	High	Public and Stakeholder Awareness and Education	Tsunami specific	30

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	<p>Recommendation 30 <i>Continued</i>:</p> <ul style="list-style-type: none"> <li>f. Consider translation into Cook Islands Maori;</li> <li>g. Consider the use of electronic media for delivery of educational messages (e.g. television and radio);</li> <li>h. Incorporate post tsunami event education (even if no effect was noticeable). It is important to educate the public that it was not a false alarm to maintain confidence in the tsunami warning system;</li> <li>i. Network with regional / international agencies, such as the International Tsunami Information Centre (ITIC) regarding funds and adapting existing international materials;</li> <li>j. Incorporate delivery of tsunami awareness activities into annual work plans and budget proposals; and</li> <li>k. Build evaluation into awareness programs to review the effectiveness of the program.</li> </ul>	High	Public and Stakeholder Awareness and Education	Tsunami specific	30
Very High	Ensure relevant staff and volunteers are trained and tested on their ability to implement tsunami warning and response procedures in a real-time event by completing a training needs analysis of knowledge and skills in key agencies. Based on this analysis, develop, design and implement a competency based training program to address each agencies identified training gaps. Include in training program development a mechanism to ensure outer island Disaster Controllers are trained on a yearly basis.	High	Governance and Coordination	Tsunami specific	6

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	Use the tsunami hazard studies that have been completed for the Southwest Pacific Nations to date, any historical tsunami records and GIS data to identify low-lying communities which may be potentially prone to tsunami impacts. Commence tsunami mitigation, response and evacuation planning using local knowledge. As part of this process consider critical infrastructure and lifeline support facilities (including interdependencies) and put plans in place to ensure minimal services after a tsunami or other natural disaster.	Medium	Tsunami Hazard, Vulnerability, Risk and Mitigation	Tsunami specific	25
Very High	Build the capacity and profile of EMCI through staffing, volunteers, partnerships and by taking advantage of the free media to ensure they are able to meet their commitments under the DRM Act.	Medium – Very High (Depending on action taken)	Tsunami Emergency Response	Multi-hazard	21
High	Incorporate tsunami warning and mitigation into Working Group/Committee structures at the National level as covered under the reviewed NDRM Arrangements. This national structure should also be used for post tsunami real event and testing debriefing to capture lessons learned and update plans and SOPs ensuring continuous improvement (from a warning, response and recovery perspective).	Low	Governance and Coordination	Tsunami specific	1
High	Share the findings of this report with international and regional organisations (those involved in existing cooperation with the Cook Islands and others) to provide guidance on targeting future capacity development programs and projects.	Low	Regional and International Coordination	Multi-hazard	8
High	Continue active participation in the Southwest Pacific Tsunami Working Group (WG5) of the Intergovernmental Coordination Group (ICG) Pacific Tsunami Warning and Mitigation System (PTWS).	Medium	Regional and International Coordination	Tsunami specific	7

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
High	Investigate gaining access to a deep ocean tsunami model scenario database (including appropriate training regarding how to use the database) to enable further determination of more specific threat information for the Cook Islands.	Medium	Tsunami Warning	Tsunami specific	14
High	All agencies with satellite phones have them permanently on and operating with fixed external antennas when phone is in the agency. Phones should be tested routinely and kept in credit at all times.	Medium	Communications	Multi-hazard	18
High	Each key tsunami warning and response agency obtain an Iridium phone for international and national voice and SMS backup capability.	Medium	Communications	Multi-hazard	19
High	Prepare evacuation plans for urban centres, villages and special requirement sectors (such as tourism) and incorporate these plans into the Cook Islands National Tsunami Emergency Plan and associated agency SOPs.	Medium	Tsunami Emergency Response	Tsunami specific	24
High	Incorporate media education into a multi-hazard program to assist the media to understand the tsunami hazard and warning procedures, therefore passing the correct information onto the community.	Medium	Public and Stakeholder Awareness and Education	Multi-hazard	31
High	Conduct multi-hazard community vulnerability and capacity assessments to define the level of risk and potential mitigation and preparedness options.	High	Tsunami Hazard, Vulnerability, Risk and Mitigation	Multi-hazard	27
High	Implement DRM NAP (D22, 2008-2015) Stage 1 which has been costed for three years and is due to commence on 1st July 2009.	Very high	Governance and Coordination	Multi-hazard	3

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Medium	Actively cooperate with regional and international agencies that can assist with conducting scientific research and technical capacity building (e.g. in GIS skills) in the Cook Islands including development of a protocol to ensure copies of scientific research reports are received.	Low	Research Expertise	Tsunami specific	9
Medium	Ensure that any future project agreements with international donors for upgrade or installation of new monitoring equipment includes sharing of seismic and sea level data internationally in real-time and suitable data formats (such as Seedlink, a seismic data exchange protocol). This will facilitate improvements in accuracy of messages from international tsunami watch/warning providers.	Low	Tsunami Monitoring Infrastructure	Tsunami specific	10
Medium	Network with educational institutions to attempt to establish a student project on keeping tsunami records for the Cook Islands and investigating past stories and traditional warning signs.	Low	Tsunami Hazard, Vulnerability, Risk and Mitigation	Tsunami specific	29
Medium	Maintain existing infrastructure, investigate use of possible third party real time data sharing (for example, Pearl Farmers) and investigate future options for installation of additional sea level gauges.	Medium	Tsunami Monitoring Infrastructure	Multi-hazard	11
Medium	Upgrade in-country EMWIN systems and installation of another EMWIN (Satellite or Internet) and HF radio at EMCI.	Medium	Communications	Multi-hazard	17

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Medium	Regularly test the tsunami warning system (including a local Tonga Trench exercise) and response procedures by conducting multi-agency exercises to facilitate coordination across Government and expose gaps and shortcomings. Exercises should include post exercise debriefs to ensure continuous improvement. It is preferable that exercises are conducted on an annual basis (at least at the strategic level) with full deployment exercises conducted every second year at all levels (National, District and Village).	Medium	Tsunami Emergency Response	Tsunami specific	23
Medium	Consider running an integrated messaging system that manages SMS, e-mail fax and voice messaging to serve as the database for all emergency contacts (including satellite phones) and could be expanded to include public subscription. This system should maintain the details of active staff at all agencies their roles and operational status and be accessed by the web.	High	Communications	Multi-hazard	15
Medium	Acquire the necessary baseline data for population centres as part of a multi-hazard mapping activity. This will include acquiring high resolution topography (Light Detection and Ranging (LiDAR)) data particularly of low-lying populated areas as well as high resolution bathymetry data to assist in multi-hazard assessments, modelling and mapping (e.g. storm surge, tsunami, climate change).	Very High	Tsunami Hazard, Vulnerability, Risk and Mitigation	Multi-hazard	26
Medium	Investigate future, long-term options for completing tsunami inundation modelling in partnership with regional and international bodies, particularly for population and infrastructure centres.	Very High	Tsunami Hazard, Vulnerability, Risk and Mitigation	Tsunami specific	28



## Section

# 2

## 2. Project Background



## 2. Project Background

### 2.1. About the Project

The National Capacity Assessment of SOPAC Member Countries: Tsunami Warning and Mitigation Systems project aims to work in collaboration with the member countries of SOPAC to assess their capacity to receive, communicate and respond effectively to tsunami warnings. The Bureau is the lead implementing agency, in partnership with the Australian Attorney-General's Department (AGD), (formerly Emergency Management Australia (EMA)), SOPAC, and with the assistance of the Intergovernmental Oceanographic Commission (IOC) a division of the United Nations Educational, Scientific and Cultural Organization (UNESCO). The project is funded by the Australian Agency for International Development (AusAID) under the Pacific Governance Support Programme (PGSP). It is implemented under an agreement (Schedule 5 to the Record of Understanding 14304, June 2006) between AusAID and the Bureau). The fourteen SOPAC member countries participating in the project are the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, the Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, the Solomon Islands, Tonga, Tuvalu and Vanuatu.

### 2.2. Broad Project Aim

By undertaking an assessment of the capacity of individual nations to manage tsunami events, the project aims to better guide donor funding towards achieving targeted improvements in the tsunami warning and mitigation systems in the respective countries.

### 2.3. Key Project Output

The key deliverable of the project is a comprehensive set of reports, including one national report specific to each country, detailing the strengths and opportunities for improvement of the country with regard to tsunami warning and mitigation. The national report for each country also includes recommendations to address priority issues. These reports will then feed into a consolidated Regional report that will aim to identify common issues across the Region with regard to tsunami warnings and mitigation.

### 2.4. Project Methodology

National assessments in each SOPAC member country are conducted by visiting teams including experts in the fields of tsunami warnings, emergency management, disaster risk reduction and data and warning communications. The visiting team meets with in-country experts during four-day workshop involving government agencies, the private sector, NGOs and regional and international organisations involved in tsunami and disaster risk management.

The workshop aims to complete a questionnaire covering all aspects of tsunami warning and mitigation and gather information to support questionnaire responses. This information then feeds into the national report. Consultation with individual countries before completion of the report is an integral part of the report writing process.

The questionnaire for the Pacific Island Countries (PICs) is a modified version of that used for the Indian Ocean equivalent project. The Indian Ocean questionnaire was jointly developed by UNESCO/IOC, SOPAC, the World Meteorological Organisation (WMO) and the International Strategy for Disaster Reduction (ISDR). Details of the Indian Ocean equivalent project can be found at <http://ioc3.unesco.org/indotsunami/nationalassessments.htm>

## 2.5. Underlying Policy Objectives of the Australian Tsunami Warning System Project

The Bureau in partnership with Geoscience Australia (GA) and AGD, has recently completed a four-year project to establish the Australian Tsunami Warning System (ATWS). One of the three policy objectives of the ATWS project was “To contribute to the facilitation of tsunami warnings for the South West Pacific” (DFAT, 2006). The Tsunami Capacity Assessment project and this report, contributes to the achievement of this policy objective. Also, as part of the implementation of the ATWS, Australia has and will continue to contribute to the facilitation of more effective tsunami advisory bulletins to Pacific Island nations through the provision of seismic and sea level observations to the PTWC in Hawaii.

## 2.6. Tsunami warnings in the Pacific

Tsunami messages for the Pacific Ocean are issued by the PTWC in Hawaii as the United States of America (USA) contribution to the Pacific Tsunami Warning and Mitigation System (PTWS). Individual countries are then responsible for using this advice to distribute national tsunami warnings to their communities. PTWC messages can be Tsunami Warnings, Tsunami Watches, Tsunami Advisories and Tsunami Information Bulletin/Statement. For the purpose of this report, products from the PTWC will be referred to generically as ‘tsunami messages’. A full definition of each PTWC product products can be found at [http://www.prh.noaa.gov/ptwc/about\\_messages.php](http://www.prh.noaa.gov/ptwc/about_messages.php)

## 2.7. International Tsunami Forums

Under the auspices of the IOC, the ICG/PTWS (formerly known as ICG for the Tsunami Warning System in the Pacific (ITSU)) was first convened in 1968 (IOC, 2009). This is an international cooperative effort involving many IOC Member States of the Pacific Region. The ICG/PTWS meets regularly to review progress and coordinate activities resulting in improvements of the service (IOC, 2009).

The Working Group on Tsunami Warning and Mitigation in the Southwest Pacific Ocean was formed at the ICG/PTWS-XXI meeting in Melbourne in early May 2006 with the aim of enhancing tsunami warning and mitigation in the Southwest Pacific Ocean. The membership of the working group is composed of representatives from IOC Member States and other countries in the region (as members and observers). SOPAC provides secretariat support. The Working Group is currently chaired by a representative of New Zealand, with vice-chairs from Fiji and Samoa.

The Working Group has a number of Terms of Reference and this project is directly relevant to the following Terms of Reference:

- To evaluate capabilities of countries in the Southwest Pacific Region for providing end-to-end tsunami warning and mitigation services;

- To ascertain requirements from countries in the Southwest Pacific Region for the tsunami warning and mitigation services;
- To facilitate capacity building and the sharing of tsunami information in the region;
- To support the further development of the virtual centre of expertise in a multi-hazards context within SOPAC in line with the Regional Early Warning Strategy; and
- To facilitate the inclusion of tsunami hazard and response information into curricula, and development and dissemination of education materials.





## Section

# 3

### 3. Country Background and the Tsunami Threat



## 3. Country Background and the Tsunami Threat

### 3.1. About the Cook Islands

The Cook Islands is a self-governing island state 'in free association with New Zealand (NZ)', an arrangement dating from August 1965. Under the terms of the free association, Cook Islanders hold New Zealand citizenship and the right of free access to New Zealand (DFAT, 2009). The country consists of 15 islands scattered over two million square kilometres of the Pacific Ocean. With a land area of just 240 square kilometres, the islands range from low coral atolls to the mountainous Rarotonga, the largest island of the group and home to the capital, Avarua (Cook Islands Travel, 2009). Speaking Cook Islands Māori and English, the population is 19,569 (2006 Census) with the majority of the population (72.3 per cent) residing on Rarotonga (DFAT, 2009). The Cook Islands has experienced significant population decline since 1996, with large numbers of Cook Islanders migrating to NZ, Australia and other countries in search of employment opportunities (DFAT, 2009).

The Cook Islands is a Parliamentary Democracy. The Head of State is Her Majesty Queen Elizabeth the Second, represented by His Excellency Sir Fredrick Goodwin (DFAT, 2009). The Head of Government is the Prime Minister, the Honourable Jim Marurai MP.

Relatively limited natural resources, remoteness from major trade and industrial centres, and a diminishing labour force each pose a challenge to the Cook Islands economy (DFAT, 2009). The small but successful tourism industry developed in the country is a high priority development area. Priority is also given to development of the marine resources within Cook Islands' large Exclusive Economic Zone (EEZ), including black pearl farming (DFAT, 2009).

The Cook Islands is a founding member of the Pacific Islands Forum and is a member of a number of other regional and international organisations in which it takes an active role (DFAT, 2009).



Figure 1: The Cook Islands (Source: Cook Islands NDM Plan 2006)

### 3.2. Tsunami Threat Sources and Tsunami History in the Cook Islands

An overview of potential tsunami threat sources and tsunami history in the Cook Islands is outlined below. This information should be treated as general background and does not attempt to provide a comprehensive picture of tsunami hazard and vulnerability and associated risk for the Cook Islands. Such a study is outside the scope of this project.

The Cook Islands NDRM Plan 2006 (D2) lists hazards and their perceived levels of risk. In this plan tsunami are rated as high risk. Cyclones and Public Health Crisis are rated as an extreme risk.

The seismicity of the plate boundary zone between the Pacific and Australian Plates and the Pacific Ring of Fire means the Cook Islands are susceptible to tsunami generated by regional and distant (or ocean wide) events (from sources 1000 km, >1000 km respectively). There is no local subduction trench that would generate local tsunami. The impact of any future tsunami on the Cook Islands would be variable and dependant on the shape of the seafloor between the source and the affected area (Thomas, Burbidge and Cummings, 2007, D13) with much of the Cook Islands being surrounded by the very deep ocean a few kilometres offshore.

The Cook Islands have not experienced a tsunami in recent times that has caused significant damage to infrastructure or loss of life. Historical reports of an earthquake on the Tonga Trench and the resulting tsunami in November 1865 (Okal, Borrero and Synolakis, 2004) claims that run-up heights reached two metres in Rarotonga. Okal, Borrero and Synolakis, 2004 concluded that “a repeat of the 1865 wave taking place at high tide would reach more than two metres above the high-water mark, which in modern days could inflict significant damage to harbour and shore infrastructure”.

The most notable tsunami recorded on the Rarotonga sea level gauge (operated by the National Tidal Centre (NTC) of the Bureau) in recent times was a tsunami generated by a magnitude 8.1 earthquake near the Kuril Islands (Refer Figure 2a) on 15 November 2006 at 11:14 Coordinated Universal Time (UTC) (1:14am local time in Rarotonga). A maximum wave height (peak-to-trough) of approximately 0.4 metres was recorded on the Rarotonga sea level gauge (Refer Figure 4a, 4b and 4c). The period of the wave was initially measured at 10 minutes but later harbour resonances reduced this to 6 minutes. The Cook Islands received an advisory message for this tsunami from PTWC.

Other tsunami messages and tsunami recorded in the Cook Islands include:

- The 3 May 2006 Tonga Trench (Refer Figure 2) event (Magnitude 7.9, 15:26:39 UTC) was felt at Atiu and Avarua in the Cook Islands (USGS, 2008). A tsunami was generated with recorded wave heights (peak-to-trough) of 0.28 metres at the Rarotonga sea level gauge in the Cook Islands. This event was used throughout the tsunami capacity assessment of the Cook Islands as a case study.
- The Cook Islands received a Tsunami Watch for an event generated on the South Solomons Trench (Refer Figure 2b) on 1 April 2007 (Magnitude 8.1, 20:39:56 UTC). No discernable signal was detected in the sea level gauge 6 minute data.
- The detected wave from the 19 March 2009 Tonga Trench (Refer Figure 2) event (Magnitude 7.4, 18:18UTC) had a wave height of 0.174 metres with a period of 6 mins. The wave arrived 1 hour 42 minutes after the earthquake, nine to ten minutes earlier than predicted.

Thomas, Burbidge and Cummings, 2007 completed *A Preliminary Study into the Tsunami Hazard faced by Southwest Pacific Nations*. 187 Scenarios for an 8.5 moment magnitude (Mw) and 39 9.0 Mw earthquakes were used to investigate normalised offshore (to a notional depth of 50 metres) wave amplitudes for tsunami caused by earthquakes along subduction zones. For the Mw 8.5 events the Cook Islands was placed in Category 2 (normalised amplitude of 25 - 75cm). For the Mw 9.0 events, the Cook Islands were placed in Category 4 (normalised amplitude of 150 - 250cm).

A further study completed by Thomas and Burbidge (2009) attempts to answer the question “which Pacific nations might experience offshore amplitudes large enough to potential result in hazardous inundation, what are the probabilities of experiencing these amplitudes and from which subduction zones might these tsunami originate”. The report states that the Tonga trench, which extends northward to  $-15^{\circ}$ , is the most significant source of tsunamigenic earthquakes for the Cook Islands. The trench’s orientation means that it directs the majority of the tsunami energy south of the northern island group. Therefore the hazard at the 2000 year return period for the northern Cook Islands is lower than that for the southern islands. Thomas and Burbidge state the 2000 year maximum amplitudes are of the order of 1.7 metres for the northern islands and up to 2.8 metres in parts of the southern group, while the 100 year maximum amplitudes range from about 0.3 to 0.4 metres.

Investigation of the Bureau’s deep ocean model-based tsunami prediction system conducted by Dr. Jane Warne (ATWS Project Network Design Manager) again demonstrates that the nearest regional subduction zone threat sources for the Cook Islands are the Tonga and Kermadec Trenches to the west of the Cook Islands (Figure 2b). Travel times vary but are typically between 1.7 to 2.7 hours. There is also limited threat from the South Solomon Trench (Figure 2b, travel times 6 to 8 hours) and the New Hebrides Trench (Figure 2b, travel times 4 to 5 hours). More remote source, such as the Kuril Trench and Peru-Chile Trench (Figure 2a) pose a real tsunami threat to the Cook Islands for major earthquakes of at least magnitude 8.0 and above. These sources are more than 10 hours away. Adequate time for warning and evacuation would therefore exist from an efficient tsunami warning system.



Figure 2a: The subduction zones (in orange) of the Pacific Ocean



Figure 2b: The location of the Cook Islands and other Pacific Island Countries in relation to regional and local subduction zones (in orange)

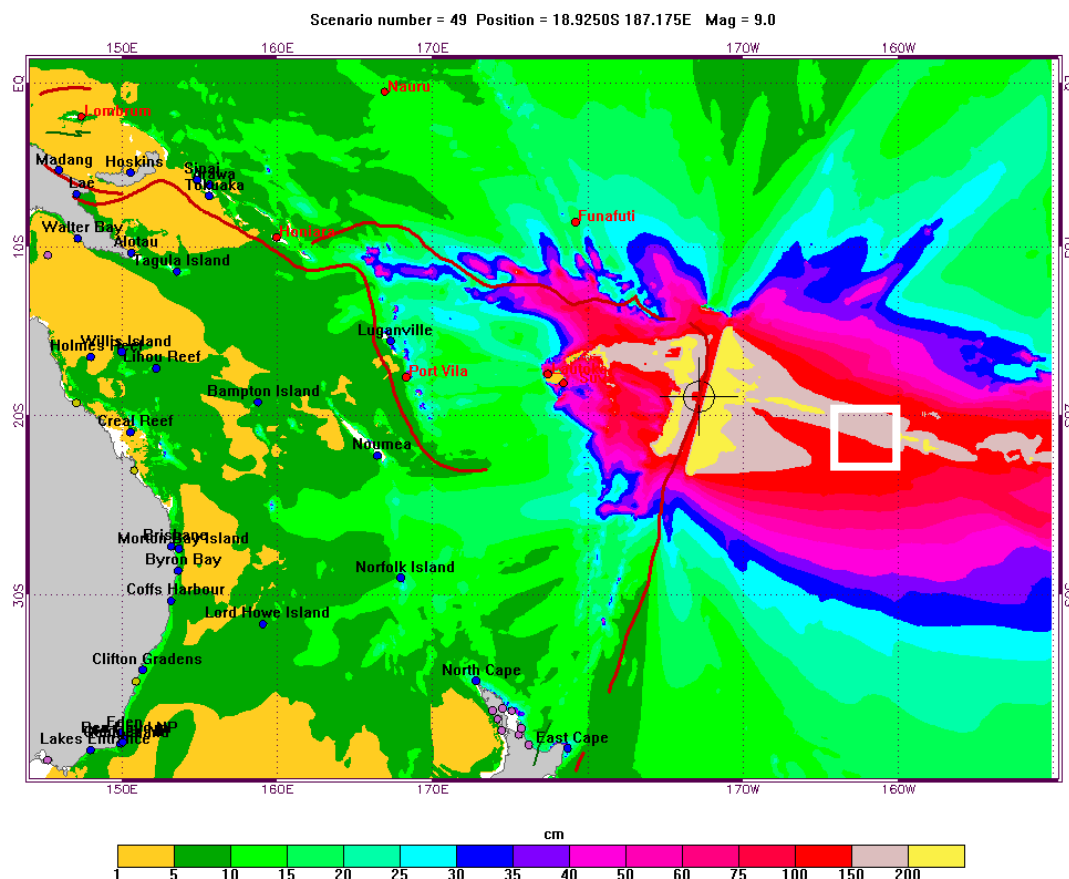


Figure 3: A deep water tsunami model scenario for a magnitude 9 earthquake occurring on the central Tonga Trench. The Cook Islands are located within the white square. (Source: Greenslade *et al.*, 2007).

### AVATIU, RAROTONGA, COOK ISLANDS

LAT 21° 12.0' S LONG 159° 47.2' W

ONE MINUTE OBSERVATIONS & PREDICTIONS TO 02:54 16 NOV 2006 UTC

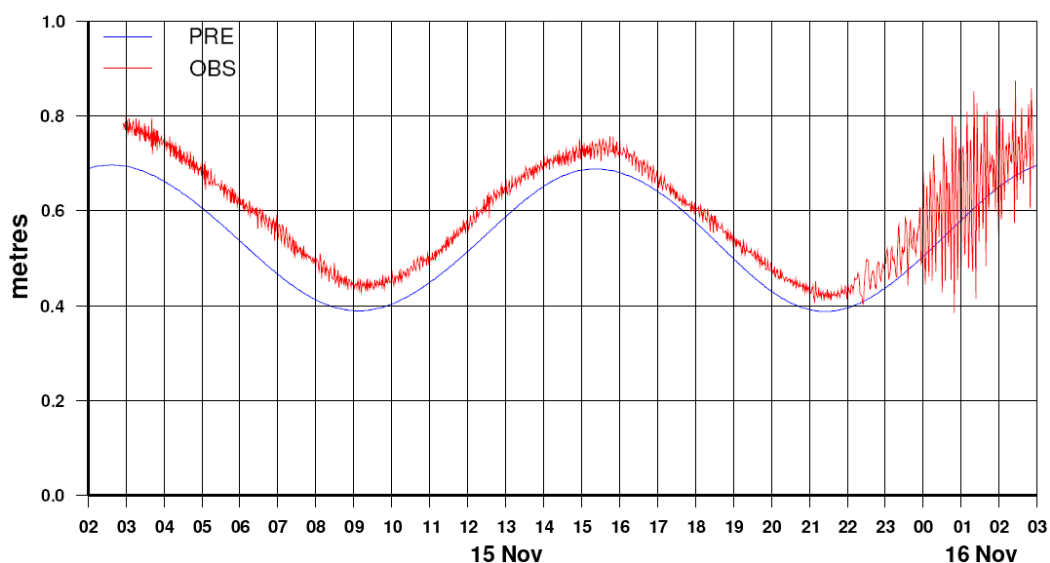
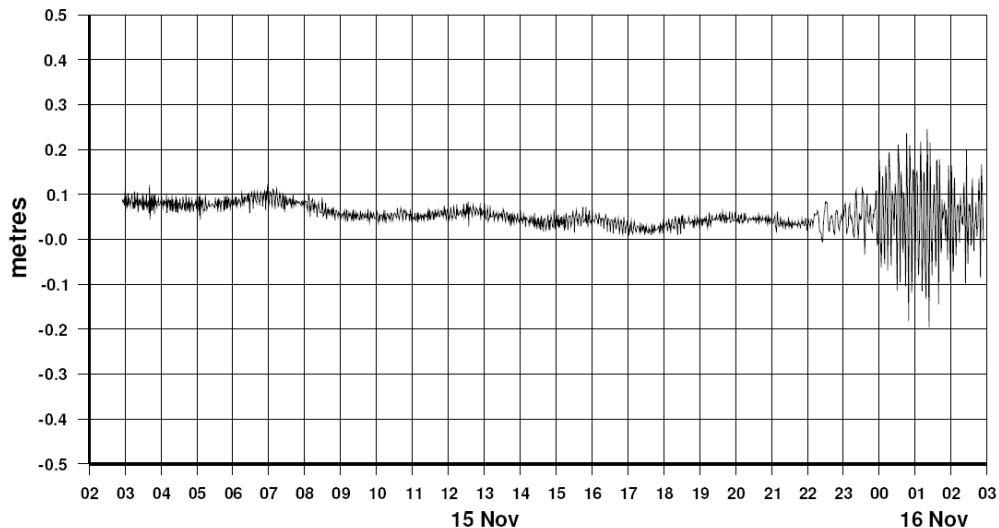


Figure 4a: 1 minute sea level observations and predictions recorded at Avatiu, Rarotonga, Cook Islands at 22:16 UTC on 15 November 2006 (local time 12:16pm 15 November 2006) (Source: National Tidal Centre, Australian Bureau of Meteorology)

## AVATIU, RAROTONGA, COOK ISLANDS

LAT 21° 12.0' S LONG 159° 47.2' W

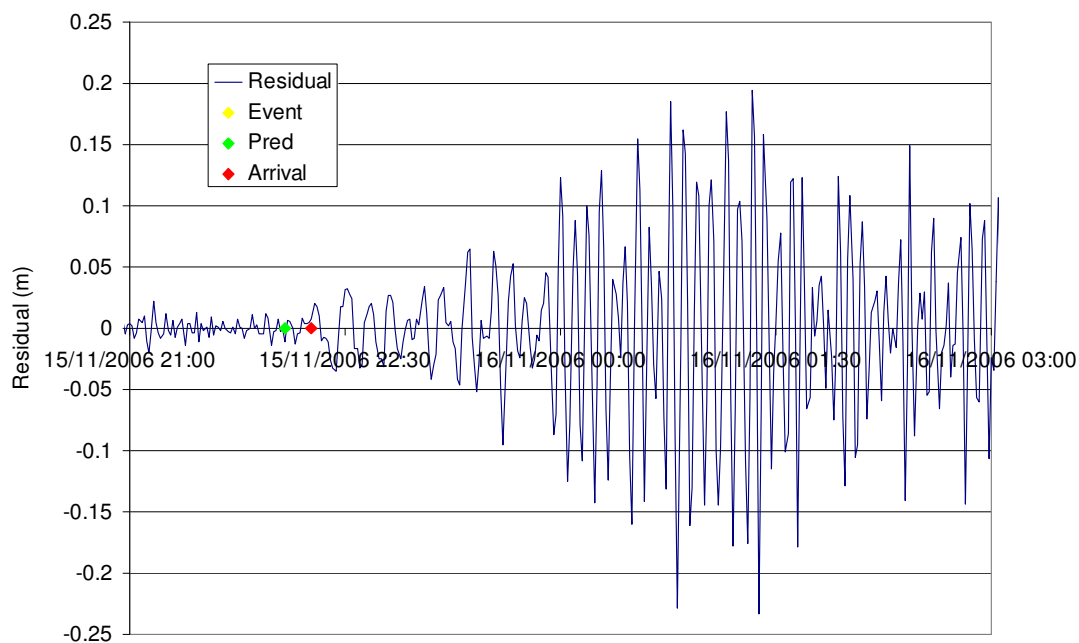
ONE MINUTE RESIDUALS TO 02:54 16 NOV 2006 UTC



National Tidal Centre - Bureau of Meteorology

Produced 03:14 16 Nov 2006 UTC

**Figure 4b:** 1 minute sea level residuals (variation between predicted and observed) recorded at Avatiu, Rarotonga, Cook Islands at 22:16 UTC on 15 November 2006 (local time 12:16pm 15 November 2006) (Source: National Tidal Centre, Australian Bureau of Meteorology)



**Figure 4c:** 1 minute sea level calculated residuals (variation between predicted and observed) recorded at Avatiu, Rarotonga, Cook Islands at 22:16 UTC on 15 November 2006 (local time 12:16pm 15 November 2006) (Source: Australian Bureau of Meteorology). Note the tsunami arrived 10 mins after predicted arrival.





## Section

# 4

## 4. The Cook Islands Tsunami Capacity Assessment



## 4. The Cook Islands Tsunami Capacity Assessment

### 4.1. Date and Location

The Tsunami Capacity Assessment of the ability of the Cook Islands to receive, communicate and effectively respond to tsunami warnings took place from 10 – 13 June 2008 at the Catholic Church Basement, Rarotonga.

### 4.2. Visiting Assessment Team and Participants

The Visiting Assessment Team was made up of those outlined in Annexure 2. The focal points in the Cook Islands for the completion of this project were Mr Arona Ngari, Director, CIMS and Mr Charles Carlson, Director, EMCI. Much of the planning for the workshop was completed by Mr William Tuivaga (Training & Awareness Coordinator, EMCI) and others in the EMCI team. A full list of workshop participants can be found in Annexure 1.

Whilst in the Cook Islands, Data Communications Expert Mr Bryan Hodge (accompanied by Mr Noel Puzey, Team Leader, Visiting Assessment Team) visited the Rarotonga sea level gauge. The gauge was inspected and upgraded to one minute real time data capability.

### 4.3. Workshop Summary

For a copy of the full agenda for the workshop see Annexure 3.

#### 4.3.1. Day 1 (10 June 2008) (Formal agenda – morning only)

Commissioner Pat Tasker, from the Cook Islands Police Force welcomed workshop participants. Participants also received a welcome address from Mr Charles Carlson. Mr Noel Puzey made an opening address on behalf of the Visiting Assessment Team.

A presentation was given by Noel Puzey introducing the Tsunami Capacity Assessment and the tsunami phenomenon in general. Mr Michael Bonte-Graptin (Risk Assessment Specialist, Visiting Assessment Team) then provided an overview of the tsunami hazard in the Southwest Pacific region and potential tsunami sources for the Cook Islands. Arona Ngari then presented on the receipt of tsunami warnings from the PTWC in the Cook Islands.

In the afternoon the workshop participants commenced discussing and recording answers to the questionnaire (Attachment 1a).

#### 4.3.2. Day 2 (11 June 2008) (Formal agenda – morning only)

In the morning of Day 2 Mr Bryan Hodge (Data Communications Expert, Visiting Assessment Team) provided a presentation on data communications for tsunami warning systems in the Pacific. Noel Puzey then presented an overview of tsunami warning systems from detection, to PTWC warnings and then to the Cook Islands community.

Focus Groups were then run, looking at Cook Islands priorities for enhancement of the countries current tsunami warning and mitigation system. For the remainder of the day the workshop participants continued to discuss and record answers to the questionnaire (Attachment 1a).

An evening icebreaker function with Cook Islands participants was held in collaboration with the Cook Islands Government, SOPAC and the Bureau. This icebreaker was a joint event with DRM NAP (D22) members. This meeting was also being held in the Cook Islands at the same time.

#### **4.3.3. Day 3 (12 June 2008) (Formal agenda – morning only)**

In the morning of Day 3, Ms Prue Harley (Emergency Management Expert, Visiting Assessment Team) presented on tsunami awareness and preparedness in Australia. Workshop participants continued to discuss and record answers to the questionnaire (Attachment 1a), including an analysis of the Cook Islands strengths, weaknesses, opportunities and threats to the country's tsunami warning and mitigation system.

#### **4.3.4. Day 4 (13 June 2008) (Formal agenda – morning only)**

The final presentation was given to the EMCI Director and staff as well as the full NDRM Council at its bi-monthly meeting. The presentation included a project overview, an overview of the tsunami threat to Cook Islands, strengths, needs and recommendations of the Cook Islands tsunami warning and mitigation system. This presentation was preceded by the presentation from the DRM NAP (D22, 2008 – 2015) team that had been in the Cook Islands for over for two weeks and were also presenting their preliminary findings. Both presentations tied in well together and demonstrated common themes throughout. The Council meeting took place in the Prime Minister's board room and included representatives from the majority of key departments.

#### 4.4. Workshop Photos (Rarotonga, June 2008)



Tsunami Capacity Assessment Workshop participants



Noel Puzey presents to the group on tsunami characteristics



Tsunami Capacity Assessment Workshop participants complete focus groups on Cook Islands priorities



Tsunami Capacity Assessment Workshop participants convene in the Catholic Church Basement





## Section

# 5

## 5. Assessment Results



## 5. Assessment Results

### 5.1. Status of Key System Components

The Tsunami Capacity Assessment Workshop results are summarised below in Table 3 in which the status of key components of the Cook Islands tsunami warning and mitigation system are outlined (as at the date the Tsunami Capacity Assessment Workshop was held in June 2008, updates between then and the publication of this report are as marked).

**Table 3: Summary of current status of key components of the Cook Islands tsunami warning and mitigation system as at June 2008 (updates as marked)**

#### Rating

Yes - fully realised
Partially realised
No - not realised

Key Component	Rating	Discussion
<b>Authority, Coordination and NGO Role</b>		
Legislation in place for tsunami warnings and response	<b>Partially</b>	<p>DRM Act 2007 (D1). Responsibility for tsunami warnings is not specifically mentioned in this Act or in the NDRM Plan 2006 (D2). This Plan is not finalised and based on pre-2007 legislation.</p> <p><b>Update May 2009</b> – The 2007 DRM Act is currently being amended (planned to be passed this calendar year) and DRM Regulations are being developed. The 2006 NDRM Plan is currently being reviewed and will be replaced by the 2009 NDRM Arrangements.</p>
Tsunami coordination committee or effort at a national and local level	<b>Partially</b>	<p>No tsunami coordination committee exists. The NDRM Council exists. The 2006 DRMP outlines Advisory Committees responsible for different aspects of DRM. EMCI roles are to develop, maintain and implement the NDRM Plan and all necessary sub-plans, coordinate across village, district or island levels, coordinate debriefings and support other agencies in preparing and maintaining agency plans.</p> <p><b>Update May 2009</b> – Under the new NDRM Arrangements being developed (2009) the NDRM Committee can establish working groups on advice of the Chair, the Director of EMCI.</p> <p>At the local level the DRM Act states that each Island Council must establish a DRM Committee and a Disaster Coordinator and develop a DRM Plan.</p> <p><b>Update May 2009</b> – At the local level, under reviewed arrangements, districts and outer islands will have their own DRM Committees and volunteer Disaster Coordinators.</p>

Key Component	Rating	Discussion
<b>Authority, Coordination and NGO Role (Continued)</b>		
Agency responsibilities clearly defined	<b>No</b>	Tsunami warning and mitigation system responsibilities are not well defined in either the legislation or current plans. This includes responsibilities for tsunami warnings and the lead emergency response agency (although general emergency response roles are outlined in the 2006 NDRM Plan).
NGOs have a defined role in tsunami warning dissemination, preparedness and awareness and emergency response	<b>Partially</b>	NGOs have no defined role in tsunami warning dissemination. The Red Cross have approximately 30 people, both paid and volunteers. They provide first aid training and survival courses. This is in collaboration with EMCI. The Red Cross are quick to respond in an event and have satellite phones that can be used. External emergency response assistance is sort through the France and NZ etc.
<b>International and Regional Cooperation</b>		
Country represented at an international and regional level to aid cooperation in tsunami warning and mitigation efforts	<b>Yes</b>	Cook Islands became a member of the IOC in 2006 and are involved in ICG/PTWS and Southwest Pacific Working Group. Involved in Regional Disaster Managers and Meteorological Director network. Linked with a number of international and regional bodies to assist in DRM. Specifically for tsunami the Cook Islands have signed an Memorandum of Understanding (MoU) with Australia relating to tsunami warning systems and climate monitoring networks (D5).
<b>Priorities</b>		
Priorities established for implementation of tsunami warning and mitigation system at a national level	<b>Yes</b>	<p>Through the tsunami capacity assessment workshop the priorities of the group were expressed. All attendees agreed that first priorities are risk/hazard assessment and a tsunami warning action list and plan was required. Priorities listed include:</p> <ul style="list-style-type: none"> <li>• Assess the risk of tsunami for the Cook Islands;</li> <li>• Warning dissemination to the community (currently a large gap between agencies and the community);</li> <li>• Finalisation of the Cook Islands NDRM Plan and hazard sub-plans;</li> <li>• Review the communication methods;</li> <li>• Tsunami SOPs for all agencies who have a role in response to tsunami warning;</li> <li>• Increasing the awareness of tsunami in the community;</li> <li>• Training for Cook Island agencies involved; and</li> <li>• Emergency response plans for tsunami at community level (including schools).</li> </ul>
<b>Multi-hazard Approach</b>		
Tsunami warning capabilities are being established within a multi-hazard framework	<b>Yes</b>	Legislation now exists to foster a multi-hazard approach. Cook Islands has completed a DRM NAP (D22, 2008 – 2015) supported by SOPAC, United Nations Development Program (UNDP) and Pacific Islands Forum Secretariat (PIFS) and are in the process of prioritising actions from this plan.

Key Component	Rating	Discussion
<b>Research Expertise</b>		
Active research is being undertaken within the country for seismology and tsunami to strengthen the tsunami warning and mitigation system	<b>No</b>	Not in-country.
<b>Tsunami monitoring infrastructure</b>		
Existence of seismograph stations and integration of real time data from these stations into the tsunami warning process	<b>Partially</b>	One Comprehensive (Nuclear) Test Ban Treaty (CTBT) seismic station exists on Rarotonga (owned by NZ National Radiation Laboratory via a MoU with CTBT). This is operated by CIMS. In principle this data is available to the Cook Islands tsunami warning centre in real time but is not analysed locally and fed into warnings.
Existence of sea level stations and integration of real time data from these stations into the tsunami warning process	<b>Partially</b>	One (Bureau NTC sea level gauge exists (Rarotonga) with real time information (one minute reporting), available via the Global Telecommunications System (GTS) for the Cook Islands and the international community. Cook Islands does get this data from GTS for marine and aviation weather. This data is also available to the Cook Islands via the Bureau's Registered User Website. A USA tidal gauge is also co-located with the Bureau gauge with satellite transmitter for data (National Oceanic and Atmospheric Administration (NOAA) Data Collection Platform (DCP)). This data is not fed into Cook Islands specific tsunami warnings at present.  <b>Update April 2009</b> - A separate Bureau system, powered from solar has also been installed as a back up to the Bureau NTC site and reports on a one minute interval.
Sharing of seismic and sea level data internationally to facilitate improvement of PTWC tsunami messages for the region	<b>Yes</b>	CTBT seismic station is part of international network. Sea level station is available to the international community via the GTS and the Bureau's Registered User Website.

Key Component	Rating	Discussion
<b>Warnings</b>		
Nation receives PTWC messages	<b>Yes</b>	CIMS is designated agency for receiving PTWC messages. They have 12 staff on an 8 person roster. Received by Emergency Managers Weather Information Network (EMWIN), internet (alarmed e-mail, primary means of receiving message) and SMS to EMCI, CIMS and the Police Commissioner.
24/7 operational staff at warning receipt and dissemination location	<b>Yes</b>	CIMS is staffed 24/7. Police are 24/7 and are the 'warning dissemination agency' at present.
Disseminate national tsunami warnings as guided by a Standard Operating Procedure	<b>No</b>	SOPs detail procedure to pass this warning on to Police and Cook Islands Airport Authority (CIAA) Supervisor. CIMS takes PTWC messages and removes unnecessary info and disseminates to islands by using cyclone distribution mechanisms (media by radio and television) without any formal requirement to do so. For cyclone warnings the Ministry of Police has delegated the responsibility for dissemination to CIMS, primarily through the media, after they are received from Fiji and after approval from the Police and the Prime Minister (PM) is gained.  <b>Update May 2009</b> - The National Tsunami Emergency Response Plan and SOPs (to be developed) will outline responsibilities for warning dissemination. Interaction between CIMS and the Police for issuing of tsunami warnings requires clarification.
System redundancies in place for receipt of PTWC messages and dissemination of national warnings	<b>Partially</b>	CIMS is backed up by CIAA (not 24/7 coverage). CIAA receive the PTWC message by Aeronautical Fixed Telecommunications Network (AFTN). CIAA inform CIMS and the Police Operations Centre if they receive a PTWC message.
Redundant 24/7 methods available for dissemination of warnings to community (e.g. public radio, sirens etc.)	<b>No</b>	Available but not utilised for tsunami. Amplitude Modulated (AM) radio on Cook Islands (four stations on Rarotonga, only two operate 24/7) is transmitted via satellite to five islands in northern group and rebroadcast on Frequency Modulated (FM) transmitter on the island. Local island has ability to add to or transmit own message on their own FM transmitter (some islands are not aware of this). Other islands in southern group can hear AM transmitted from Rarotonga. Other smaller communities have short wave radio access. Tsunami siren installed at Puaikura Council on western Rarotonga. Church Bells used also in Puaikura. Bells are usually very effective at spreading a message. Church bells not formally used for tsunami or cyclone. Text SMS at Rarotonga and to Aitutaki (no other islands). See above for radio information. Television on Rarotonga only. Some northern islands have own television network (local content and also international content). Southern Cook Islands has broadband internet.

Key Component	Rating	Discussion
<b>Warnings (Continued)</b>		
Effective warning dissemination to remote communities	<b>No</b>	Further development of procedures required (as above).
Communications coverage of whole country that is effectively utilised for the dissemination of tsunami warning messages	<b>No</b>	Communications to all the islands exists but is not utilised for tsunami (as above).
Issue of marine tsunami warnings and guidance for vessels, harbours and ports	<b>Partially</b>	Telecom Cook Islands rebroadcast high seas forecasts and warnings from Fiji. They can also add cyclone and tsunami warnings for rebroadcast when required. This is done with CIMS assistance in the case of cyclones and tsunami.
<b>Emergency Response and Evacuation</b>		
Disaster preparedness and emergency response system has been reviewed and opportunities for improvement and training identified	<b>Yes</b>	Cook Islands has completed a DRM NAP (D22, 2008 – 2015) supported by SOPAC, UNDP and PIFS. Cook Islands are currently preparing their list of priorities for implementation.
Tsunami emergency response, evacuation and recovery plan exists	<b>No</b>	None as yet but the Cook Islands plan to have one in the near future, based on the same format as the existing cyclone plan (1996/1997). <b>Update May 2009</b> – The 2006 NDRM Plan is currently being reviewed and will be replaced by the 2009 NDRM Arrangements. EMCI will then be responsible for the development of a National Tsunami Emergency Response Plan and SOPs detailing roles and responsibilities of organisations. Agency/organisation plans are considered vital.
The designated agency for evacuation is identified and have authority by law	<b>Yes</b>	Police are the designated agency for issuing public evacuations for most hazards and they would be the group that issue evacuations for tsunami warnings (after consultation with the PM). <b>Update May 2009</b> – The DRM Act and arrangements will further confirm these responsibilities.

Key Component	Rating	Discussion
<b>Emergency Response and Evacuation (Continued)</b>		
Plans have been made for safe evacuation of population centres including aspects such as maps, routes and signage	<b>No</b>	<p>This has not been completed for tsunamis. The Police currently make the decisions on how long people need to evacuate an area with a given hazard. No evacuation plans have been developed on a large scale, however three primary schools on Rarotonga have tsunami evacuation plans and routes. These have been tested and are exercised in the schools. No large scale evacuation plans, maps, routes and signage exist.</p> <p><b>Update May 2009</b> – Working on covering all schools and working towards developing advanced GIS capabilities in country which will allow mapping of safety centres etc.</p>
Procedures are tested and exercised to improve the response through better planning and preparedness	<b>Partially</b>	<p>EMCI schedule a full scale exercise to be conducted once a year on a national basis. It alternates between a table-top exercise one year and an operational exercise the next. These exercises are usually cyclone or plane crash and are completed in partnership with the CIAA and Police.</p> <p><b>Update May 2009</b> – The Cook Islands participated in Exercise Pacific Wave 2006 and 2008.</p>
Land use policies and building codes are in place to mitigate against the tsunami hazard	<b>Partially</b>	<p>Legislation that governs building standards as well as building codes is in place. Parts of these relate specifically to cyclones. These are generally only practised in Rarotonga, not the outer islands. Difficult to enforce. Building permits are generally only seen as a means of securing bank loans.</p>
<b>Tsunami hazard, vulnerability and risk</b>		
Completion of studies to assess the tsunami hazard in the country or Region	<b>Yes</b>	<p>Some research of 1865 event by E. Okal University of North-western USA. GA has completed a preliminary tsunami hazard study for the Southwest Pacific as well as a probabilistic study (both including the Cook Islands). Limited tsunami history record exists for the Cook Islands.</p>
Local risk assessments have been completed for at risk communities	<b>No</b>	<p>No tsunami specific work has been carried out as yet. Translating the studies that exist into community risk profiles has not occurred. However, technical agencies are building GIS capacity and identifying low lying areas and elements at risk.</p>
Adequate data exists and local inundation modelling has been completed for population centres	<b>No</b>	<p>No tsunami inundation modelling has been completed and there is no in-country capacity to undertake this work. Some storm surge modelling has been completed under the Asian Development Bank (ADB) Climate Proofing study). High resolution bathymetry is available for Manahiki Lagoon, Aitutaki and some areas on Rarotonga (Avarua harbour to Avatiu wharf) other areas are covered by hydrographic charts. Topography data exists in 15 metre contour intervals for Rarotonga (other islands in group unclear). Coastal areas on Rarotonga are covered by two metre contours, which would need to be revised in parts. This data is held by Ministry of Works (D14). Very limited high resolution topography data available for identification of low-lying areas and/or inundation modelling (only a small area around Avatiu has high resolution topography as part of ADB Climate Proofing study (Avatiu wharf area).</p>

Key Component	Rating	Discussion
<b>Public and stakeholder awareness and education</b>		
Measures have been taken to ensure the public understand and take action in the event of a tsunami warning being issued	<b>Partially</b>	The Cook Islands produce large cyclone action posters. Plans exist to develop tsunami posters also. These are put up in public places and in schools. Tsunami education programs have included natural tsunami warning signs as well as what to do in the event of a tsunami. More work is required to ensure people are aware of natural tsunami warning signs rather than going down to the waters edge to watch tsunami.
Community level education and preparedness programs exist for tsunami	<b>Partially</b>	EMCI and CIMS commenced a tsunami awareness program in early in 2008 that went for three months. This involved going into a subdistrict in Rarotonga (four villages and three primary schools) and holding community discussions and giving presentations about tsunami (one evening for each community). Concurrently, a media campaign commenced which targeted the whole of Rarotonga. A Cook Islands television advertisement was produced and aired for three months (NZ\$1050/month). The advertisement talked about what a tsunami was, what they looked like and how they behaved as well as what to do and not do in the event of a tsunami. Exercise and traditional knowledge documentaries have also been completed. Funding is a problem.
Training programs for the national media exist for natural hazard and tsunami	<b>No</b>	There is no specific training program for the media. Attempts are being made to provide the media with more graphics to use for hazards. This is already done for weather.

## 5.2. Case Study – Tonga Trench Tsunami Event

Throughout the Tsunami Capacity Assessment Questionnaire completed in the Cook Islands, the country's response to The Tonga Trench event (magnitude 7.9, 160km northeast of Nuku'alofa (Tonga), 15:26:39 UTC, Wednesday 3 May 2006 (5.26am Cook Islands time)) was reviewed. The aim of this review was to gain an understanding of the operation of the system in a real time event. The findings of these case studies are outlined below.

This event was felt at Atiu and Avarua in the Cook Islands (USGS, 2008). A tsunami was generated with recorded wave heights (peak-to-trough) of 0.07 metres at the Raratonga sea level gauge in the Cook Islands (USGS, 2008). In spite of this, the Cook Islands noticed no obvious effects of the tsunami (such as damage to infrastructure). PTWC messages for this Tonga Trench tsunami event did not mention the Cook Islands. The last bulletin that the Cook Islands received higher than an advisory for was the Tsunami Watch they received for the Solomon Islands event (Magnitude 8.1, 20:39:56 UTC, Sunday 1 April 2007). The Cook Islands took no national action, such as issuing advice to the community, for either the 2006 Tonga or 2007 Solomon Islands events.

For the Tonga event the earthquake was recorded on the Cook Islands CTBT Seismic Station but the data was not analysed locally. Agencies did not access sea level data for use during this event. The PTWC messages for this event were received (advisory only for the Cook Islands) within about 15 – 20 minutes of the earthquake occurring. No national tsunami warning was issued for the Cook Islands and no response actions were undertaken. The country did not have a tsunami response plan in place at the time. Even if they did, because no watch or warning was issued for the Cook Islands, it is unlikely that the plan would have been implemented.

The Cook Islands have only ever issued one tsunami warning to their population in 1998. The Cook Islands were included in the international warning, which was cancelled three hours later. A warning was then sent out through the media to advise the community to move to higher ground. There was a general lack of action taken by the community and backlash the next day because people did not "see the wave".

### 5.3. Strengths, Opportunities for Improvement and Recommendations to Progress the Tsunami Agenda in the Cook Islands

Based on the discussions during the workshop with in-country participants and the supporting documentation collected during the visit, the visiting team formulated the following strengths, opportunities for improvement and recommendation under key topics which they believe will progress the tsunami agenda in the Cook Islands.

**Table 4 – Strengths, opportunities for improvement and recommendations under key topics**

<b>5.3.1. Governance and Coordination</b>	
<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• Government recognises the importance of planning/awareness for natural hazards and tsunami and agencies are enthusiastic and willing to learn about tsunami.</li> <li>• The DRM Act 2007 (D1) is in place. <b>(Update May 2009</b> - The 2007 DRM Act is currently being amended (planned to be passed this calendar year) and DRM Regulations are being developed).</li> <li>• D1 develops the NDRM Council (consisting of eight high level government officials) to formulate policy for DRM and direct the implementation of the NDRM Plan.</li> <li>• The NDRM Plan 2006 (D2) sets out arrangements for DRM in the Cook Islands. <b>(Update May 2009</b> - The 2006 NDRM Plan is currently being reviewed and will be replaced by the 2009 NDRM Arrangements).</li> <li>• EMCI exists (as established by D1). Formally known as the National Disaster Management Office under the Police Department. Reviewed and relocated to the Office of the Prime Minister in 2005. Current capacity of two staff. Its key roles are to develop, maintain and implement the NDRM Plan and all necessary sub-plans, coordinate across village, district or island levels, coordinate debriefings and support other agencies in preparing and maintaining responding agency plans.</li> <li>• The National Sustainable Management Plan 2007-2010 (D10) exists with Goal 6 being for a safe, secure and resilient community. With a Key Strategic Targets being to “Establish a coordinated and effective national disaster risk reduction and disaster management system”.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of agreed understanding of the role of each agency in the event of tsunami.</li> <li>• Lack of funding available for staff and other resources to address areas of importance in DRM, including tsunami.</li> <li>• Lack of staff training and expertise for staff that are responsible for implementation of awareness programs, training, development of SOPs, policies and procedures.</li> <li>• Coordination method at community level is mandated by the DRM Act 2007 (D1) and is materialising slowly. The outer islands are in the process of completing DRM Plans but few are finished. Focussed primarily on cyclones but are expected to be all-hazard plans. This requires a substantial body of work.</li> <li>• 2006 NDRM Plan (D2) requires review in line with the 2007 DRM Act (D1) and the reestablishment of bodies such as the Advisory Committees (formally the Mitigation, Preparedness and Recovery advisories committees) needs to be considered. This is to be done under the EMCI Institutional Strengthening Project (2008) funded by New Zealand's International Aid and Development Agency (NZAID). Further changes are also likely due to restructuring of Vakas (Councils) on Rarotonga after dismissal by the Minister. The 2006 NDRM Plan annexure on warnings and tsunami response procedures are both incomplete. <b>(Update May 2009</b> - The 2006 NDRM Plan is currently being reviewed and will be replaced by the 2009 NDRM Arrangements).</li> </ul>

***Governance and Coordination (Continued)*****Strengths (Continued):**

- The NDRMC can establish Advisory Committees as required (D1). **(Update May 2009** – Under the new NDRM Arrangements being developed (2009) the DRM Committee can establish working groups on advice of the Chair, the Director of EMCI.
- The DRM Act (D1) states that each Island Council shall establish a DRM Committee and a Disaster Coordinator and develop a DRM Plan.
- The Churches and NGOs also play a key role in DRM in accordance with their interests, charters and capabilities. Their close links with communities are of particular value in public awareness and education programs relating to DRM.
- **Updated April 2009** - Cook Islands has completed a DRM NAP (D22, 2008 – 2015) and are currently preparing their list of priorities for implementation.

**Opportunities for Improvement (Continued):**

- Technical assistance and possibly an in-country working group are required to develop a National Tsunami Emergency Plan to boost efforts towards implementing an effective tsunami warning and mitigation system in the Cook Islands. Later, the maintenance of the system can be incorporated into the revised Advisory Committee structure.
- Implementation of recommendations from the DRM NAP (D22, 2008 – 2015).

**Recommendations:**

1. Incorporate tsunami warning and mitigation into Working Group/Committee structures at the national level as covered under the reviewed NDRM Arrangements. This national structure should also be used for post tsunami real event and testing debriefing to capture lessons learned and update plans and SOPs ensuring continuous improvement (from a warning, response and recovery perspective).
2. Complete review, adoption and commence implementation of the DRM Act and Plan to clearly outline responsibility and authority for mitigation, preparedness (including effective early warnings), response and rehabilitation.
3. Implement DRM NAP (D22, 2008-2015) Stage 1 which has been costed for three years and is due to commence on 1<sup>st</sup> July 2009.
4. Develop a National Tsunami Emergency Plan (under the NDRM Plan) for the Cook Islands in consultation with all relevant agencies. Technical assistance and possibly an in-country working group are required to develop this plan. The plan should cover a tsunami risk profile, preparedness for and response to tsunami as well as recovery.
5. Develop, approve, share and maintain national tsunami warning and response SOPs for each agency involved in the tsunami warning and response process.
6. Ensure relevant staff and volunteers are trained and tested on their ability to implement tsunami warning and response procedures in a real-time event by completing a training needs analysis of knowledge and skills in key agencies. Based on this analysis, develop, design and implement a competency based training program to address each agencies identified training gaps. Include in training program development a mechanism to ensure outer island Disaster Controllers are trained on a yearly basis.

**5.3.2. Regional and International Coordination**

<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• Cooperation with a number of international agencies including SOPAC (DRM Planning, Risk Assessment), PTWC, Bureau NTC, AGD, NZAID, Global Environment Facility (GEF) (climate change adaptation), UNDP, ADB and CTBT.</li> <li>• Signed MoU between the Government of the Cook Islands and the Government of Australia relating to tsunami warning systems and climate monitoring networks (D5). This MoU outlines arrangements for sharing of data with the Cook Islands and internationally with the PTWC for tsunami purposes.</li> <li>• The Government of the Cook Islands have a Country Programme Action Plan (2008-2012) with UNDP Samoa Multi Country Office (D13). This includes provision to assist in enhancing crisis prevention and recovery.</li> <li>• The Cook Islands Joint Country Strategy represents agreement between the Government of the Cook Islands and its two main donor partners, New Zealand and Australia, on a framework for development cooperation for the period 2008-2017 (approved July 2008, D15).</li> <li>• EMCI are involved with NZAID on an Institutional Strengthening Project.</li> <li>• The Asia Foundation (TAF) and the Office of United States Foreign Disaster Assistance (OFDA) and SOPAC assist with disaster training.</li> <li>• EMCI has had association with United Nations Disaster Action Committee (UNDAC) in supplying regional disaster response to other Nations in the Pacific.</li> <li>• Participation on the Southwest Pacific Tsunami Working Group (WG5) of the ICG PTWS.</li> <li>• The Cook Islands became a member of the IOC on 21 January 2006.</li> <li>• Involved in Regional Disaster Managers and Meteorological Director network. Linked with a number of international and regional bodies to assist in DRM.</li> </ul>	<ul style="list-style-type: none"> <li>• Rigorous regional post event debriefing and review and provision of feedback to ICG/PTWS and PTWC.</li> </ul>
<b>Recommendations:</b>	
<ol style="list-style-type: none"> <li>7. Continue active participation in the Southwest Pacific Tsunami Working Group (WG5) of the ICG PTWS.</li> <li>8. Share the findings of this report with international and regional organisations (those involved in existing cooperation with the Cook Islands and others) to provide guidance on targeting future capacity development programs and projects.</li> </ol>	

**5.3.3. Research Expertise****Strengths:**

- None identified throughout this process.

**Opportunities for Improvement:**

- There is no in-country research agency or organisation or any active research being undertaken in seismology or tsunami warning and mitigation.

**Recommendations:**

9. Actively cooperate with regional and international agencies that can assist with conducting scientific research and technical capacity building (e.g. in GIS skills) in the Cook Islands including development of a protocol to ensure copies of scientific research reports are received.

**5.3.4. Tsunami Monitoring Infrastructure**

<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• One CTBT seismic station exists on Rarotonga (owned by NZ National Radiation Laboratory via a MoU with CTBT). This is operated by CIMS. The data from this station is in principal, available to the Cook Islands.</li> <li>• Data from the one CTBT seismic station is available in real time to the international network.</li> <li>• One (Bureau NTC) sea level gauge exists (Rarotonga) with real time information (one minute reporting), available via the GTS for the Cook Islands and the international community. This data is also available to the Cook Islands via the Bureau's Registered User Website. A USA tidal gauge is also co-located with the Bureau gauge with satellite transmitter for data (NOAA DCP). Some data used off the GTS for marine and aviation weather.</li> <li>• <b>Update April 2009</b> – A separate Bureau system, powered from solar has also been installed as a back up to the Bureau NTC site and reports on a one minute interval.</li> </ul>	<ul style="list-style-type: none"> <li>• Seismic data from the one CTBT seismic station is available locally but not analysed. No in-country capacity to use this data at this stage.</li> <li>• No sea level data is fed into Cook Islands specific tsunami warnings at present.</li> </ul>
<b>Recommendations:</b>	
<ol style="list-style-type: none"> <li>10. Ensure that any future project agreements with international donors for upgrade or installation of new monitoring equipment includes sharing of seismic and sea level data internationally in real-time and suitable data formats (such as Seedlink, a seismic data exchange protocol). This will facilitate improvements in accuracy of messages from international tsunami watch/warning providers.</li> <li>11. Maintain existing infrastructure, investigate use of possible third party real time data sharing (for example, Pearl Farmers) and investigate future options for installation of additional sea level gauges.</li> </ol>	

**5.3.5. Tsunami warnings**

<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• Warning mechanism for cyclones well developed and understood.</li> <li>• CIMS, which operates 24/7, receives PTWC tsunami messages via EMWIN, internet (alarmed e-mail, primary means of receiving message) and SMS. CIMS then contacts the following people when watches or warnings are received for the Cook Islands: <ul style="list-style-type: none"> <li>○ The Director of CIMS or his deputy;</li> <li>○ The Air Traffic Control Tower of the CIAA or the Supervisor of the Fire Rescue;</li> <li>○ The Police Commissioner or his Deputy; and</li> <li>○ The Supervisor on duty at the Police Office.</li> </ul> <p>It is then expected that they follow their own SOPs.</p> </li> <li>• CIMS takes PTWC messages and removes unnecessary info and disseminates to community by using cyclone distribution mechanisms (media by radio and television) without any formal requirement to do so. For cyclone warnings the Ministry of Police has delegated the responsibility for dissemination to CIMS, primarily through the media, after they are received from Fiji and after approval from the Police and the PM is gained.</li> <li>• CIAA Air Traffic Control, who do not operate 24/7, also receives PTWC bulletins via AFTN and can act as backup for CIMS to forward messages onwards.</li> <li>• International SMS tsunami messages are received by EMCI, CIMS and the Police Commissioner.</li> <li>• A tsunami siren has been installed at Puaikura Council on eastern Rarotonga. Church bells are also used.</li> <li>• Marine warning systems are working reliably and effectively in alignment with international obligations and protocols.</li> <li>• Telecom Cook Islands rebroadcast high seas forecasts and warnings from Fiji. Cyclone warnings are added for rebroadcast when required. Also, Maritime Surveillance Australia have an operations centre on Rarotonga and work closely with the Harbour Master.</li> </ul>	<ul style="list-style-type: none"> <li>• The NDRM Plan (D2) does not outline the lead agency responsible for tsunami warnings. Roles and responsibilities with regard to issuing tsunami warnings to the Cook Islands community are not defined.</li> <li>• Although SOPs exist for CIMS regarding passing on tsunami messages from PTWC, no procedures (contact lists, warning dissemination process etc.) exist regarding interpretation of these warnings for the Cook Islands, determination of the threat level and dissemination of national tsunami warnings to the community (no tsunami warning cancellation procedures exist).</li> <li>• No interpretation can be made at this stage for differing levels of tsunami threat. For example, low threat (very small wave), marine threat (small wave), marine and land threat (larger waves).</li> <li>• Lack of knowledge and understanding to translate PTWC warnings into the national context. For example, which islands and communities would be affected by certain earthquake magnitudes and epicentre locations.</li> <li>• The Marine warning system is not used to disseminate tsunami warnings.</li> <li>• No 24/7 back-up is currently in place for CIMS. CIAA is not 24/7. The CIAA Hurricane and Tsunami Safety Orders (D3) are procedures for passing tsunami messages onto national and international aviation authorities but do not detail any back-up arrangements for CIMS.</li> <li>• The National Distant Source Tsunami Plan (D9) is a NZ plan. The Cook Islands could benefit from close liaison on their procedures with NZ and other countries to enhance procedure development.</li> <li>• No system exists to ensure tsunami warnings efficiently and effectively reach all of the Cook Islands population, including islands and remote communities.</li> <li>• The Cook Islands do not issue No Threat bulletins for tsunami that will not impact on the Cook Islands or earthquakes that do not have the potential to generate tsunami. Even if the Cook Islands are not at threat, media can misinterpret the PTWC information. This has the potential to cause panic. Telling the community they are not at threat is important, particularly when awareness of tsunami is increased in the Cook Islands community. This will also test the system and enhance community awareness when there is a long time between events.</li> </ul>

***Tsunami warnings (Continued)*****Recommendations:**

12. That the full authority and responsibility for analysing and interpreting tsunami messages and data and issuing tsunami warnings for the Cook Islands is formally delegated to CIMS. Warning procedures should be pre-agreed by key government stakeholders and include a tsunami warning decision making matrix that outlines what action will be taken for each PTWC message received. It is highly feasible for CIMS staff (who have strong science backgrounds) to be trained to assume the role. CIMS are 24/7, have well established communications systems and warning dissemination mechanisms and media links.
13. Complete tsunami warning SOPs incorporating:
  - a. Finalisation and documentation of back-up arrangements for CIMS for receipt and dissemination of tsunami warnings by a second 24/7 agency with a robust communications system;
  - b. Warning templates in Cook Islands Maori and English, including no threat bulletins, cancellations, marine user warnings and action prompts advising the community on action to take pre, during and post the tsunami event;
  - c. Agreed and regularly maintained distribution lists;
  - d. Use of available scientific information (models, sea level data etc.) to localise the threat (for example, arrival times, forecast points and what part of the island group will be affected). As the warning system matures, progressively move towards identifying differing levels of tsunami threat (for example, low threat (very small wave), marine threat (small wave), marine and land threat (larger waves)); and
  - e. Regular and ongoing system tests.
14. Investigate gaining access to a deep ocean tsunami model scenario database (including appropriate training regarding how to use the database) to enable further determination of more specific threat information for the Cook Islands.

**5.3.6. Communications**

<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• Communications Infrastructure is reasonably robust. Cellular networks cover the population areas around Rarotonga.</li> <li>• CIMS has numerous redundant international communications systems to receive incoming PTWC warnings.</li> <li>• AM radio (four stations on Rarotonga, only two of which operate 24/7) is rebroadcast to outer five islands in the northern group via satellite and FM repeaters that accommodate local content/input. Other islands in the southern group can hear AM transmitted from Rarotonga. Other smaller communities have short wave radio access.</li> <li>• CIMS is a compliant GTS node.</li> <li>• The local carrier is willing to work with an SMS distribution system. Capability to use this on Rarotonga and Aitutaki. Not available to other islands in the group.</li> <li>• Use of Iridium phones in Government and NGO agencies distributed throughout the Cooks. Red Cross have a satellite phone network and Telecom uses satellite phones as a backup system.</li> <li>• Receiving data via EMWIN at CIMS (second receiver at EMCI was not operational at the time of the workshop) and Internet Satellite. No RANET (Radio and Internet for the Communication of Hydro-Meteorological Information for Rural Development) system exists.</li> <li>• Tsunami warnings are received via the GTS, EMWIN, AFTN and SMS. They are acknowledged to PTWC via e-mail. Alarmed e-mail is considered the most reliable, but SMS provides useful early warning.</li> <li>• Telecom has provided phone lines to each identified evacuation centre to be activated during an emergency (D14).</li> <li>• Television exists on Rarotonga only. Some northern islands have own television network (local content and also international content).</li> <li>• Southern Cook Islands has broadband internet.</li> </ul>	<ul style="list-style-type: none"> <li>• VHF and HF networks are not being used for routine inter island communications. HF is available as a standby for standard telecommunication links to outer islands. VHF radios are used for communications between marine groups, patrol boats and Police.</li> <li>• In general, ongoing communications costs are major obstacles in communications.</li> <li>• In particular, ongoing operating costs for Very Small Aperture Terminal (VSAT) and Satellite (Inmarsat C) phone systems in the Cook Islands is considered restrictively high.</li> <li>• No central database is kept for satellite phone numbers.</li> <li>• Satellite phones were often switched off and used only in emergency.</li> <li>• Further scope for satellite training is evident. Cook Islands are unaware of the capabilities offered in the region (e.g. No PEACESAT (Pan-Pacific Education And Communication Experiments by SATellite) used).</li> <li>• E-mail, international SMS and internet all rely on the same communications link. If the link fails, all three are no longer likely to be available immediately via the backup mechanisms.</li> </ul>

***Communications (Continued)*****Recommendations:**

15. Consider running an integrated messaging system that manages SMS, e-mail fax and voice messaging to serve as the database for all emergency contacts (including satellite phones) and could be expanded to include public subscription. This system should maintain the details of active staff at all agencies their roles and operational status and be accessed by the web.
16. Develop an information management system/database to act as a central depository to ensure all national DRM data is available for use during an event (for example, Ministry of Works GIS data etc.).
17. Upgrade in-country EMWIN systems and installation of another EMWIN (Satellite or Internet) and HF radio at EMCI.
18. All agencies with satellite phones have them permanently on and operating with fixed external antennas when phone is in the Agency. Phones should be tested routinely and kept in credit at all times.
19. Each key tsunami warning and response agency obtain an Iridium phone for international and national voice and SMS backup capability.
20. Investigate and implement (in a multi-hazard framework) improved mechanisms for dissemination of tsunami warnings to the population outside of waking hours, particularly remote villages. For example, a combination of SMS and dedicated HF or VHF radio as well as using Church bells etc.

**5.3.7. Tsunami Emergency Response (including evacuation)**

<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• Strong community resilience exists due to high exposure to natural hazards such as cyclones.</li> <li>• Legislation is adopted (2007, D1) to underpin emergency response and evacuation. <b>(Update May 2009 –</b> The 2007 DRM Act is currently being amended (planned to be passed this calendar year) and DRM are being developed).</li> <li>• NDRM Plan 2006 (D2) exists but requires review. This plan lists emergency response functions, lead agencies and supporting agencies (but not for specific hazards). <b>(Update May 2009 –</b> The 2006 NDRM Plan is currently being reviewed and will be replaced by the 2009 NDRM Arrangements).</li> <li>• The Police have the legislated lead role and experience in evacuation for all hazards. The Police would issue evacuation orders for tsunami warnings (after consultation with the PM).</li> <li>• The Police have SOPs for tsunami (not provided to the assessment team during the workshop).</li> <li>• The Red Cross (mandated by the Red Cross Society Act 2001) activates quickly in response to emergency in the Cook Islands and external emergency response assistance is sort through France and NZ etc.</li> <li>• EMCi schedule a full scale exercise once a year on a national basis. It alternates between a table-top exercise one year and an operational exercise the next. These exercises are usually cyclone or plane crash and are completed in partnership with the CIAA and Police. <b>(Update May 2009 –</b> The Cook Islands participated in Exercise Pacific Wave 2006 and 2008).</li> <li>• A Cyclone Contingency Plan exists. Lead response agencies for other hazards are responsible for creating testing, reviewing and updating relevant contingency plans as well as organisational plans to assist them in meeting their responsibilities.</li> <li>• Under the NDRM Plan 2006 recovery is a responsibility of the national government in cooperation with the National Planning Unit (D2). The Recovery Coordinator is appointed during a disaster and the NDRM Council may also establish a Recovery Advisory Committee (based on Initial Damage Assessments). The Recovery Advisory Committee only operates during the response and recovery phase and is responsible for the development of a recovery plan.</li> </ul>	<ul style="list-style-type: none"> <li>• NDRM Plan 2006 (D2) requires review and does not outline the lead response agency for tsunami. The responsibility for developing a “contingency plan” for tsunami is therefore not defined.</li> <li>• A tsunami response, evacuation and recovery plan does not exist. The Cook Islands have plans to develop this in line with the Cyclone Plan.</li> <li>• There is a lack of SOPs for all responding agencies.</li> <li>• EMCi has many responsibilities but limited staff.</li> <li>• Response and evacuation plans for other sectors such as tourism do not exist.</li> <li>• Further relevant tsunami training of response staff is required.</li> <li>• The NEOC SOPs require updating and require sections specific for other hazards in addition to cyclones (e.g. tsunami).</li> <li>• Lead time for tsunami evacuation has not been assessed and no large scale evacuation plans, maps, routes and signage exist (except for three Rarotonga Primary Schools that have tsunami plans and evacuation routes).</li> <li>• GIS is not generally used for emergency response although the Cook Islands are working towards establishing this capability. SOPAC has carried out some training in GIS for DRM.</li> <li>• There has been no comprehensive process to identify critical infrastructure and lifeline support facilities (including interdependencies) and put plans in place to ensure minimal services after a tsunami or other natural disaster. The airport, one of the two hospitals and many safety and Police centres are located on low lying areas that could potentially be inundated by tsunami and storm surge. Some critical infrastructure GIS information exists from USA army study of critical infrastructure.</li> <li>• A permanent location for the NEOC, including resources and communications links, needs to be established to enable effective activation and emergency management during an event. This location must have established communications links with Outer Island and Vaka (Council) Emergency Operations Centres (EOCs).</li> </ul>

***Tsunami Emergency Response (including evacuation) (Continued)***

<b>Strengths (Continued):</b>	<b>Opportunities for Improvement (Continued):</b>
<ul style="list-style-type: none"> <li>• The NEOC is located in the Telecom Cook Islands Headquarters Building in Avarua and is staffed by Police officers, other designated staff, liaison officers from key government agencies the National Controller (who activates the centre). The NEOC SOPs (D6) outlines the authorities, responsibilities and general procedures for the NEOC. No specific tsunami information exists in this document (D6).</li> <li>• Working towards each Island having a DRM Committee, Disaster Coordinator, EOC and DRM Plan. The Mangaia DRM Plan (2005, D7) and DRM Structure (D8) is an example of an island arrangement.</li> <li>• Schools play an important part in emergency response in the Cook Islands as many of them as used as safety shelters. The education gazette (D14) outlines consultation between EMCI and school principals regarding their role in disasters and emergencies.</li> <li>• Declaration of a State of Emergency can be made by the NDRM Council and a declaration of a state of Disaster can be declared by the Prime Minister (D1).</li> </ul>	<ul style="list-style-type: none"> <li>• (Refer above)</li> </ul>
<b>Recommendations:</b>	
<ol style="list-style-type: none"> <li>21. Build the capacity and profile of EMCI through staffing, volunteers, partnerships and by taking advantage of the free media to ensure they are able to meet their commitments under the DRM Act.</li> <li>22. Review options to ensure the National Emergency Operations Centre (NEOC) is appropriately located and resourced (including communications equipment and links with outer islands and Vaka (Council)) to allow for timely transition into action and effective real-time operation. Ensure NEOC SOPs are up to date.</li> <li>23. Regularly test the tsunami warning system (including a local Tonga Trench exercise) and response procedures by conducting multi-agency exercises to facilitate coordination across Government and expose gaps and shortcomings. Exercises should include post exercise debriefs to ensure continuous improvement. It is preferable that exercises are conducted on an annual basis (at least at the strategic level) with full deployment exercises conducted every second year at all levels (National, District and Village).</li> <li>24. Prepare evacuation plans for urban centres, villages and special requirement sectors (such as tourism) and incorporate these plans into the Cook Islands National Tsunami Emergency Plan and associated agency SOPs.</li> </ol>	

**5.3.8. Tsunami Hazard, Vulnerability, Risk and Mitigation**

<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• Tsunami is rated a high level of risk in the NDRM Plan 2006 (D2). GA has completed preliminary and probabilistic studies into the tsunami hazard in the Southwest Pacific. These studies included the Cook Islands.</li> <li>• General awareness of the Tonga Trench as the main regional tsunami threat source.</li> <li>• High resolution bathymetry is available for Manahiki Lagoon, Aitutaki and some areas on Rarotonga (Avarua harbour to Aviatu wharf) other areas are covered by hydrographic charts. Topography data exists in 15 metre contour intervals for Rarotonga (other islands in group unclear). Coastal areas on Rarotonga are covered by two metre contours, which would need to be revised in parts. Held by Ministry of Works (D14).</li> <li>• Some research of 1865 event by E. Okal University of Northwestern USA. No formal record of past tsunami is kept.</li> <li>• Information in D17 states existing legislation that governs building standards are provided for in the Building Control and Standards Act, 1991 and the Building Controls Standards Regulations, 1991. This legislation provides for the National Building Code 1990 for the Cook Islands. Cyclone building restrictions exist in building codes. These are generally only practised in Rarotonga and are difficult to enforce.</li> <li>• Some sea walls exist to protect from storm surge. These may be useful for tsunami.</li> <li>• Under the NDRM Plan 2006 the Central Policy and Planning Unit work closely with the Mitigation Advisory Committee for the development of the hazard mitigation plans to identify hazards, evaluate hazards and prioritise risks.</li> <li>• Plans relevant to mitigation include: <ul style="list-style-type: none"> <li>○ National Development Plan and Country Strategy;</li> <li>○ Climate Change Adaptation Strategy;</li> <li>○ Preventive Infrastructure Master Plan Completed by ADB (D17); and</li> <li>○ Technical agencies are building GIS capacity.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerable islands/communities are not assessed and no tsunami risk studies have been carried out.</li> <li>• Very limited high resolution topography data available for identification of low-lying areas and/or inundation modelling (only a small area around Avatiu has high resolution topography as part of ADB Climate Proofing study).</li> <li>• There is no capacity to complete inundation modelling in-country.</li> <li>• No formal record of past tsunami is kept.</li> <li>• Although there are building codes in place these are generally only practised in Rarotonga and are hard to enforce. The Department of Health, Ministry of Works and Ministry of Environment are the key agencies involved.</li> <li>• Traditional land ownership rights make finding building and possibly evacuation sites restrictive at times.</li> <li>• No tsunami specific inundation modelling work has been carried out, but storm-surge inundation model was developed for Aviatu as part of ADB Climate Proofing study.</li> </ul>

*Tsunami Hazard, Vulnerability, Risk and Mitigation (Continued)***Recommendations:**

25. Use the tsunami hazard studies that have been completed for the Southwest Pacific Nations to date, any historical tsunami records and GIS data to identify low-lying communities which may be potentially prone to tsunami impacts. Commence tsunami mitigation, response and evacuation planning using local knowledge. As part of this process consider critical infrastructure and lifeline support facilities (including interdependencies) and put plans in place to ensure minimal services after a tsunami or other natural disaster.
26. Acquire the necessary baseline data for population centres as part of a multi-hazard mapping activity. This will include acquiring high resolution topography (Light Detection and Ranging (LiDAR)) data particularly of low-lying populated areas as well as high resolution bathymetry data to assist in multi-hazard assessments, modelling and mapping (e.g. storm surge, tsunami, climate change)
27. Conduct multi-hazard community vulnerability and capacity assessments to define the level of risk and potential mitigation and preparedness options.
28. Investigate future, long-term options for completing tsunami inundation modelling in partnership with regional and international bodies, particularly for population and infrastructure centres.
29. Network with educational institutions to attempt to establish a student project on keeping tsunami records for the Cook Islands and investigating past stories and traditional warning signs.

**5.3.9. Public and Stakeholder Awareness and Education**

<b>Strengths:</b>	<b>Opportunities for Improvement:</b>
<ul style="list-style-type: none"> <li>• Traditional Maori warning signs for cyclones are passed down through generations (e.g. fruit tree changes). The visiting assessment team did not identify any such traditional warning signs used for tsunami.</li> <li>• Tsunami and earthquake are taught in Geography and Science classes in school. Rarotonga Principals attended a Principal's meeting and discussed how DRM could be added to the curriculum in an all-hazards approach. They are looking at developing a year-long program on DRM as a subject.</li> <li>• Annual Disaster Awareness Week (week beginning 10 October).</li> <li>• Preparedness (awareness, education and training) in the Cook Islands is coordinated by EMCI with the support of the Preparedness Advisory Committee.</li> <li>• The Red Cross collaborates and supports EMCI with community awareness.</li> <li>• A tsunami awareness program was commenced early in 2008 by EMCI and CIMS (3 month duration). This involved going into a subdistrict in Rarotonga and holding community discussions and giving presentations about tsunami (one evening for each community). This includes recognising natural warning signs. Funding became an issue after three months.</li> <li>• Concurrently, a media campaign commenced which targeted the whole of Rarotonga. A television ad was produced and aired for three months (NZ\$1050/month). The ad talked about what a tsunami was, what they looked like and how they behaved as well as what to do in the event of a tsunami. An exercise documentary and traditional knowledge documentary have also been completed for natural hazards. A radio talk-back program was also run. Funding became an issue after three months.</li> <li>• Disaster Risk Management, Operational Exercise and GIS training has been conducted and supported by a number of international agencies.</li> </ul>	<ul style="list-style-type: none"> <li>• Funding is a barrier to ongoing community education programs with regard to tsunami.</li> <li>• There is a lack of awareness in the community and government of tsunami facts.</li> <li>• There is no specific training for the media on the nature of tsunami or what to do when they receive a tsunami warning although the relationship with the media is good.</li> <li>• The Cook Islands would like to have their own all hazard, all language version of 'What's the Plan Stan' (NZ Civil Defence program for school children) and would be interested in adapting tools/programs/activities from other countries for the Cook Islands. E.g. brochures, tsunami awareness presentations etc. But funding is a significant problem.</li> <li>• The Cook Islands would like to document the traditional warning signs that ancestors used</li> <li>• Further plans that have not come to fruition as yet include tsunami posters, school evacuation drills, website resources.</li> <li>• Further training is required of warning and response agencies.</li> </ul>

*Public and Stakeholder Awareness and Education (Continued)***Recommendations:**

- 30.** CIMS, EMCI, Police, the Red Cross, with Village/Island Councils take a combined, multi-hazard approach to continue building on tsunami community awareness programs including:
- a.** A focus on communities at risk where possible;
  - b.** Tsunami Safety Rules separated into two categories (1) Be prepared for a tsunami – with messages such as plan a tsunami evacuation route in your village and (2) Take action in the case of a tsunami – with messages such as stay out of dangerous areas until the all clear is given by the authority. Include these Tsunami Safety Rules on warnings to the community;
  - c.** Enhancement of key messages to explain the different scale of tsunami with words such as “even a small tsunami that does not wash onto land could cause danger to swimmers and damage to marine vessels”;
  - d.** Continue with plans to integrate tsunami education into current programs (such as Disaster Awareness Week) and school curriculum;
  - e.** Identify community / business sectors that may require tailored programs (e.g. tourism and hotels);
  - f.** Consider translation into Cook Islands Maori;
  - g.** Consider the use of electronic media for delivery of educational messages (e.g. television and radio).
  - h.** Incorporate post tsunami event education (even if no effect was noticeable). It is important to educate the public that it was not a false alarm to maintain confidence in the tsunami warning system.
  - i.** Network with regional / international agencies, such as ITIC regarding funds and adapting existing international materials;
  - j.** Incorporate delivery of tsunami awareness activities into annual work plans and budget proposals; and
  - k.** Build evaluation into awareness programs to review the effectiveness of the program.
- 31.** Incorporate media education into a multi-hazard program to assist the media to understand the tsunami hazard and warning procedures, therefore passing the correct information onto the community.

## 5.4. Additional Workshop Benefits

In addition to this report, additional benefits of the Tsunami Capacity Assessment Workshop in the Cook Islands were:

- Facilitation of working relationships between agencies and organisations involved in tsunami warning and mitigation within the Cook Islands;
- Exchange of information on national activities and capabilities within the Cook Islands; and
- Enhanced working relationships between the Cook Islands participants, the Bureau, AGD and SOPAC.

## 5.5. Next Steps

The Cook Islands will receive three key material outcomes from the Tsunami Capacity Assessment project:

1. The completed questionnaire in electronic format with scanned copies of all supporting documentation collected in-country;
2. A comprehensive National Report in a standard format which aims to summaries information collected from the visits and is consumable for non-technically minded recipients (this document); and
3. A copy of the final regional Report which will outline common themes across the region.

At the agreement of the country project results will be posted on websites such as the Bureau, SOPAC and Pacific Disaster Net.

Once approved by the country the Bureau will facilitate dissemination of reports to regional and international donors and other stakeholders to ensure maximum exposure of results. Contingent on the availability of human and financial resources, the Australian Bureau of Meteorology and project partners will aim to work with potential donors to bring the findings of this project to their attention on a country and regional scale. This will be done to facilitate further capacity development projects being undertaken based on the results of this project.

Cook Islands workshop participants are encouraged to use this National Tsunami Capacity Assessment report to guide both national projects and aid funded projects to achieve targeted improvements of the Cook Islands tsunami warning and mitigation system. In turn, this will assist in improving systems for other natural hazards.



## Section

# 6

## 6. Annexure



## 6. Annexure

### 6.1. Annexure 1 – Record of Participants

Participant	Agency	No #
Robert Heather	Vaka Puaikura Disaster Coordinator	1
Aporo Miria	Ruaau – Vaka Puaikura	2
Avaiki Aperau	Ruaau – Vaka Puaikura	3
Teremoana Ve'a	Ruaau – Vaka Puaikura	4
Nuku Rangi	Akhoa – Vaka Puaikura	5
Matatua Taru	Akhoa – Vaka Puaikura	6
Alan Fariu	Akhoa – Vaka Puaikura	7
Teariki (Nat) Unuka	Murienua – Vaka Puaikura	8
Mau Raina	Murienua – Vaka Puaikura	9
Tuakura Te'au Snr	Murienua – Vaka Puaikura	10
Ross Bridson	Te Aponga Uira	11
Paava Pitomaki	Vaka Takitumu	12
Mark Vaikai	Airport Authority	13
Archer Hosking	Vaka - Te Au O Tonga	14
Tony Wearing	Airport Authority	15
MP-Honorable John Tangi	Tupapa/ Maraerenga – Member of Parliament	16
Tianoa Joseph	Takuvaine/ Tutakimoa – Vaka Te Au O Tonga	17
Annie Taoro	Cook Is Investment Corp.	18
John Tini	Cook Is Investment Corp.	19
Louie Teiti	Ministry Of Works	20
Iotia Atera	Ministry Of Works	21
George Taraare	Matavera – Vaka Takitumu	22
Sila Tangimetua	Matavera – Vaka Takitumu	23
MP-Honorable Cassey Eggelton	Matavera – Member of Parliament	24
Jonah Tisam	CEO – Office of the leader of the Opposition	25
Willie John	Vaka Te Au O Tonga	26
Kaitara Nicholas	Telecom Cook Is.	27
Ngatama Aniterea	Telecom Cook Is.	28
MP-Honorable Albert Nicholas	Avatiu/ Palmerston Is Member of Parliament	29
MP-Honorable William Heather Jnr.	Ruaau – Member of Parliament	30
MP-Honorable Mau Munukoa	Nikao/ Panama Member of Parliament	31
Charles Carlson	EMCI - Director	32
William Tuivaga	EMCI - Trainer	33
Arona Ngari	C.Is. Meteorological Services -Director	34
Manavaroa Taio	Ruaau - Vaka Puaikura	35

## 6.2. Annexure 2 – The Visiting Assessment Team

Team Position	Name	Position within Organisation	Organisation	Contact Details
Natural Hazard Warning Expert and Team Leader	Noel Puzey	Senior Meteorologist WA – RFC	Australian Bureau of Meteorology	<a href="mailto:N.Puzey@bom.gov.au">N.Puzey@bom.gov.au</a> Phone: +61 8 9263 2258 Fax: +61 8 9263 2261
Emergency Management Expert	Prue Harley	A/g Assistant Director Tsunami Warning Implementation	Attorney-General's Department	<a href="mailto:prue.harley@ag.gov.au">prue.harley@ag.gov.au</a> Phone: +61 2 6141 4531
Data Communications Expert	Bryan Hodge	Data Communications Specialist	Australian Bureau of Meteorology	<a href="mailto:b.hodge@bom.gov.au">b.hodge@bom.gov.au</a> Ph. +61 3 9669 4858 Fax. +61 3 9669 4803
Regional Expert	Michael Bonte-Graptin	Risk Assessment Specialist	Pacific Islands Applied Geoscience Commission	<a href="mailto:Michael@sopac.org">Michael@sopac.org</a> Ph. +679 (338) 1377 Fax. +679 (337) 0040

### 6.3. Annexure 3 – Agenda, Cook Islands Tsunami Capacity Assessment Workshop

## National Capacity Assessment of the Cook Islands' Tsunami Warning and Mitigation System

### WORKSHOP AGENDA 10 – 12 June 2008

#### DAY 1: Tuesday 10 June 2008

#### SESSION 1: WELCOME, PRIORITIES AND ORGANISATION

**LOCATION:** Catholic Basement

**CHAIR:** Noel Puzey, Australian Bureau of Meteorology

Time	Item	Questionnaire Reference	Duration	Participation
9.00 – 9.30am	<b>Welcome Address</b> <i>William Tuivaga – Training and Awareness Coordinator, EMCi</i> <i>Noel Puzey, Team Leader, Visiting Assessment Team</i>	NA	0.5hr	Open
9.30 – 10.00am	<b>Presentation – Visiting Assessment Team</b> <ul style="list-style-type: none"> <li><i>Introduction to the tsunami capacity assessment project &amp; tsunami hazard in the Cook Islands</i></li> </ul> <b>Presenters: Noel Puzey &amp; Michael Bonte-Grapentin</b>	NA	0.5hrs	Open
10.00 – 10.15am	<b>Coffee / tea break</b>	NA	15mins	Open
10.15 – 11.00am	<b>Presentation – Cook Islands tsunami warning &amp; mitigation</b> <ul style="list-style-type: none"> <li><i>Tsunami warning and mitigation in the Cook Islands</i></li> </ul> <b>Presenter: Arona Ngari, Manager, CIMS</b>	NA	45mins	Open

Time	Item	Questionnaire Reference	Duration	Participation
11.00 – 11.30am	<b>Focus Groups</b> <ul style="list-style-type: none"> <li><i>Cook Islands' <b>priorities</b> for implementing an effective tsunami warning and mitigation system</i></li> </ul>	Section 4	0.5hrs	Open
11.30 – 12.30pm	<b>Capacity assessment of organisations involved, coordination committees and legislation</b>			
	<ul style="list-style-type: none"> <li><b>Organisations involved</b> in tsunami warning and mitigation in the Cook Islands</li> </ul>	Section 2, Part A	1hr	Open
	<ul style="list-style-type: none"> <li><b>Coordination committees</b> for tsunami warning and mitigation at National, and community level in the Cook Islands</li> </ul>	Section 2, Part B		
	<ul style="list-style-type: none"> <li><b>Legislation</b> relevant to tsunami warnings and emergency response</li> </ul>	Section 2, Part C		
12.30pm	Lunch and close	NA	-	Open
<b>SESSION 2: VISITS / MEETINGS WITH INDIVIDUAL AGENCIES</b>				
<b>LOCATION: EMCI office or the office of the particular agency</b>				
1.30 – 4.00pm	To be confirmed	NA	2.5hrs	To be confirmed

**DAY 2: Wednesday 11 June 2008****SESSION 3: TSUNAMI WARNINGS AND COMMUNITY AWARENESS****LOCATION:** Catholic Basement**CHAIR:** Noel Puzey, Australian Bureau of Meteorology

Time	Item	Questionnaire Reference	Duration	Participation
9.00 – 9.30am	<b>Presentation: Tsunami Warnings &amp; Communication</b> <i>Presenters: Noel Puzey &amp; Bryan Hodge</i>	NA	0.5hrs	Open
9.30 – 10.30am	<b>Capacity assessment of tsunami warnings in the Cook Islands</b>			
	• <i>International communication cooperation</i>	Section 7, Part A	1hr	Open
	• <i>National tsunami warning centre</i>	Section 7, Part B		
	• <i>Receipt of advisories from PTWS</i>	Section 7, Part C		
	• <i>Procedures for dissemination of tsunami warnings</i> <i>Nationally, once received from PTWS</i>	Section 7, Part D & E		
10.30 – 10.45am	<b>Coffee / tea break</b>	NA	15mins	Open
10.45 – 11.30pm	<b>Capacity assessment of tsunami warnings in the Cook Islands (continued...)</b>			
	• <i>Issuing warnings for marine vessels, harbours and ports</i>	Section 7, Part F & G	45mins	Open
	• <i>Case Study – Receipt of international advisories and dissemination of warnings nationally for the 3 May 2006 Tongan Trench Event</i>	Section 7 Case Study		
	• <i>Summary – Strengths, weaknesses, opportunities and threats to tsunami warnings in the Cook Islands</i>	Section 7, Part H		

Time	Item	Questionnaire Reference	Duration	Participation
11.30 – 12.30pm	<b>Capacity assessment of public and stakeholder awareness and education regarding tsunami in the Cook Islands</b>			
	• <i>Assessment of public awareness</i>	Section 10, Part A	1hr	Open
	• <i>The role of public awareness in understanding warnings and taking action</i>	Section 10, Part B		
	• <i>Public awareness and education programs</i>	Section 10, Part C		
	• <i>Media education programs</i>	Section 10, Part C		
12.30pm	Lunch and close	NA	-	Open
<b>SESSION 4: VISITS / MEETINGS WITH INDIVIDUAL AGENCIES</b>				
<b>LOCATION: EMCI office or the office of the particular agency</b>				
1.30 – 4.00pm	To be confirmed	NA	2.5hrs	To be confirmed

**DAY 3: Thursday 12 June 2008****SESSION 5: TSUNAMI EMERGENCY RESPONSE****LOCATION: Catholic Basement****CHAIR: Noel Puzey, Australian Bureau of Meteorology**

Time	Item	Questionnaire Reference	Duration	Participation
9.00 – 9.30am	<b>Presentation: Community Awareness &amp; Capacity Building in Australia</b> <i>Presenter: Prue Harley</i>	NA	0.5hrs	Open
9.30 – 11.00am	<b>Capacity assessment of emergency response to tsunami in the Cook Islands</b>			
	<ul style="list-style-type: none"> <li>Assessing the capacity of the disaster management system in the Cook Isl and identifying training needs</li> </ul>	Section 8, Part A	1hr	Open
	<ul style="list-style-type: none"> <li>Emergency response and recovery plans</li> </ul>	Section 8, Part B		
	<ul style="list-style-type: none"> <li>Evacuation (including evacuation legislation)</li> </ul>	Section 8, Part C		
11.00 – 11.15am	<b>Coffee / tea break</b>	NA	15mins	Open
11.15 – 12.30pm	<b>Capacity assessment of emergency response to tsunami in the Cook Islands</b>			
	<ul style="list-style-type: none"> <li>GIS use for emergency response</li> </ul>	Section 8, Part D	1.25hrs	Open
	<ul style="list-style-type: none"> <li>Testing and exercising</li> </ul>	Section 8, Part E		
	<ul style="list-style-type: none"> <li>Consideration of critical infrastructure</li> </ul>	Section 8, Part F		
	<ul style="list-style-type: none"> <li>Tsunami mitigation efforts</li> </ul>	Section 8, Part G		
	<ul style="list-style-type: none"> <li>The role of NGOs in tsunami warning and mitigation</li> </ul>	Section 8, Part H		
	<ul style="list-style-type: none"> <li>Case Study – Preparedness and response for the 3 May 2006 Tongan Trench Event</li> </ul>	Section 8 Case Study		
12.30pm	<b>Acknowledgements, Next Steps &amp; Close followed by Lunch</b>	NA	-	Open

**DAY 4: Friday 13 June 2008****SESSION 6: PRESENTATION & REVIEW OF PRELIMINARY FINDINGS****LOCATION:** EMCI Office**CHAIR:** Noel Puzey, Australian Bureau of Meteorology

Time	Item	Questionnaire Reference	Duration	Participation
9.00 – 10.00am	<b>Preliminary summary presentation</b> from the Visiting Assessment Team – the Cook Islands strengths, needs, preliminary recommendations, priority review and next steps <i>Presenter: Noel Puzey</i>	NA	1hr	Key stakeholders and assessment team – EMCI, Met Office, Airport Authority and Police
10.00 – 10.30am	<b>Discussion and Feedback</b> from on preliminary summary presentation and the assessment process in general.	NA	0.5hrs	
10.30am	<b>Close</b>	NA	-	

## 6.4. Annexure 4 – Supporting Documents Log

Ref.	Document Name	Copy Obtained (Y/N)	Format (H = Hard Copy) (E = Electronic)
D1	Disaster Risk Management Act 2007	Y	E
D2	Cook Islands National Disaster Risk Management Plan 2006 (draft)	Y	E
D3	Cook Islands Airport Authority Hurricane and Tsunami Safety Orders (HATSO)	Y	E
D4	Cook Islands Meteorological Service Standard Operating Procedures for distant generated Tsunami	Y	E
D5	MOU Australia and Cook Islands tsunami and climate monitoring	Y	E
D6	Cook Islands NEOC National Emergency Operations Centre SOP's (may not be current version)	Y	E
D7	Mangaia Disaster Management Plan August 2005	Y	E
D8	Mangai Disaster Structure schematic	Y	E
D9	National Distant Source Tsunami Contingency Plan Aug 06 draft (essentially NZ document with little change to Cook Islands)	Y	E
D10	National Sustainable Development Plan 2007-2010 (Goal 6 most relevant)	Y	H, E (Only front page)
D11	Cook Islands News Daily dated 9 June 2008 (newspaper) – front page article on Tsunami Assessment team	Y	H, E (Only front page)
D12	ADB Climate Proofing Pacific report	Y	E
D13	Cook Islands CPAP FINAL 30 May 2008	Y	E
D14	Cook Islands Education Gazette	Y	E
D15	Cook Islands Tripartite Strategy (2008 – 2017) with NZAID and AusAID	Y	E
D16	Cook Islands Coastal Vulnerability Assessments: A small Pacific Island Nation's Experience	Y	E
D17	Preventive Infrastructure Master Plan Completed by ADB	Y	E

Ref.	Document Name	Copy Obtained (Y/N)	Format (H = Hard Copy) (E = Electronic)
D18	PDF of presentation by Charles Carlson (Director,, EMCI) 14 <sup>th</sup> Regional Disaster Managers Meeting, Nadi, Fiji 2008	Y	E
D19	EMCI presentation "Resilient Cook Islands" 13 <sup>th</sup> Regional Disaster Managers Meeting, Majuro, Marshall Islands 2007.	Y	E
D20	Cook Islands Red Cross Profile	Y	E
D21	The Earthquake and tsunami of 1865 November 17: evidence for far-field tsunami hazard from Tonga (Okal, Borrero and Synolakis, 2004).	Y	E
D22	Cook Islands Disaster Risk Management National Action Plan (Final)	Y	E

## 6.5. Annexure 5 – Definitions

### Used in reports for SOPAC Member Countries National Capacity Assessment: Tsunami Warning and Mitigation Systems

Source: United Nations, International Strategy for Disaster Reduction, 2009

#### Capacity

A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster.

*Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability.*

#### Capacity building

Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk.

*In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society.*

#### Disaster

A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.

*A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.*

#### Disaster risk management

The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

#### Disaster risk reduction (disaster reduction)

The reduction of disaster risks and adverse impacts of natural hazards, through systematic efforts to analyse and manage the causes of disasters, including through avoidance of hazards, reduced social and economic vulnerability to hazards, and improved preparedness for adverse events

## Early warning

The provision of timely and effective information, through identified institutions, that allow individuals exposed to a hazard, to take action to avoid or reduce their risk and prepare for effective response.

*Early warning systems include of three primary elements: (i) forecasting of impending events; (ii) processing and dissemination of warnings to political authorities and population; and (iii) undertaking appropriate and timely actions.*

## Emergency management

The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation. *Emergency management involves plans, structures and arrangements established to engage the normal endeavours of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as disaster management.*

## Geographic information systems (GIS)

Analysis that combine relational databases with spatial interpretation and outputs often in form of maps. A more elaborate definition is that of computer programmes for capturing, storing, checking, integrating, analysing and displaying data about the earth that is spatially referenced.

*Geographical information systems are increasingly being utilised for hazard and vulnerability mapping and analysis, as well as for the application of disaster risk management measures.*

## Hazard

A potentially damaging physical event, phenomenon and/or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

*Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological and biological) and/or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity, frequency and probability.*

## Land-use planning

Branch of physical and socio-economic planning that determines the means and assesses the values or limitations of various options in which land is to be utilized, with the corresponding effects on different segments of the population or interests of a community taken into account in resulting decisions.

*Land-use planning involves studies and mapping, analysis of environmental and hazard data, formulation of alternative land-use decisions and design of a long-range plan for different geographical and administrative scales.*

*Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion, and in the siting of service routes for transport, power, water, sewage and other critical facilities.*

## Mitigation

Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

### Natural hazards

Natural processes or phenomena occurring in the biosphere that may constitute a damaging event.

*Natural hazards can be classified by origin namely: geological, hydrometeorological or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing.*

### Preparedness

Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary removal of people and property from a threatened location.

### Prevention

Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.

*Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters. In the context of public awareness and education, related to disaster risk reduction changing attitudes and behaviour contribute to promoting a "culture of prevention".*

### Public awareness

The processes of informing the general population, increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster.

*Public awareness activities support changes in behaviour leading towards a culture of prevention. This involves public information, dissemination, education, radio or television broadcasts and the use of printed media, as well as, the establishment of information centres and networks and community and participation actions.*

### Recovery

Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

*Recovery (rehabilitation and reconstruction) affords an opportunity to develop and apply disaster risk reduction measures.*

**Relief / response**

The provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration.

**Resilience / resilient**

The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

**Risk**

The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human induced hazards and vulnerable conditions.

*Conventionally risk is expressed by the notation*

*Risk = Hazards x Vulnerability*

*Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability.*

*Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.*

**Risk assessment/analysis**

A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend.

*The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios.*

**Structural / non-structural measures**

Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure.

*Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts.*

## **Vulnerability**

A set of conditions and processes resulting from physical, social, economic, and environmental factors, which increase the susceptibility of a community to the impact of hazards.

## 6.6. Annexure 6 – References

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## 7. CD Attachment



## 7. Attachment 1 – CD of Supporting Documents

- a. Assessment Questionnaire
- b. Supporting Documents
- c. Presentations

