



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

**Cook Islands**



Cook Islands



***SOPAC***



## Section

# 1

## 1. Results Outline

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## 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.

## 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