



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

**Vanuatu**



Vanuatu



**SOPAC**



# 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 Vanuatu to receive, communicate and effectively respond to tsunami warnings took place in a workshop held from 22 – 25 April 2008 in Port Vila, Vanuatu.

The workshop was facilitated by a team of visiting experts and attended by some 50 Vanuatu Government agency representatives, Non-Government Organisations (NGOs), international organisations and the private sector to discuss key areas of tsunami warning and mitigation in Vanuatu by completing a comprehensive questionnaire in session, presentations and site visits.

As well as outlining Vanuatu'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 Vanuatu'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 that Vanuatu is susceptible to tsunami generated by local, regional and distant (or ocean wide) events (from sources 100km, 1000km, >1000km respectively). On the 26 November 1999, at 13:21 Coordinated Universal Time (UTC) (27 November 1999 at 12:21am local time), central Vanuatu was struck by a large offshore earthquake (Moment Magnitude (Mw) 7.5) generated on the New Hebrides trench followed by a tsunami that killed five people and caused significant damage to nearshore structures, mainly at Martelli Bay, south Pentecost Island (Ioualalen, M., et al. 2006, D37). On 2 January, 2002 at 17:22 UTC (3 January 2002 at 4:22am local time), a magnitude Mw 7.2 earthquake (USGS, 2009) struck Port Vila, Efate. Fifteen minutes after the main shock a tsunami struck Port Vila Harbour (Shorten, 2002). Fortunately the tsunami occurred at low tide and did not cause any significant flooding or damage. Local tsunami threat sources for Vanuatu are the New Hebrides, South Solomon and Kermadec Trenches (Warne, 2008). Tsunami travel time to Vanuatu from the New Hebrides trench could be as little as 15 minutes.

Participants in the workshop stated a number of urgent priority areas that need to be addressed and these are presented in Table 3 below. Very high priority recommendations articulated in this report include:

- Continuation of efforts to approve and implement the Vanuatu Disaster Risk Reduction and Disaster Management Arrangements to establish a robust planning framework for all aspects of the Tsunami Warning System within Vanuatu as well as other hazards;
- Review of the National Disaster Management Act (2000) to include legislation regarding the establishment of emergency management structures at the provincial and community level as well as reviewing the legislation regarding monitoring and warning for tsunami and other hazards;
- Develop a tsunami community awareness programme that includes “natural tsunami warning signs” in light of Vanuatu's local tsunami threat sources;

- Incorporate tsunami considerations into working groups established under the Vanuatu National Disaster Risk Reduction and Disaster Management Arrangements (once approved);
- Production of tsunami hazard maps based on existing available studies and data;
- Complete, approve and implement a tsunami “disaster support plan”, tsunami SOPs for all agencies and plans at local levels;
- Investigation and implementation of improved warning dissemination methods to the community;
- Pursue the strategies identified in the Geo-Hazard Unit's Business Plan to facilitate the development of a 24/7 operational capability for the Geo-Hazard Unit in the new Vanuatu Meteorological Service (VMS) building;
- Development of a tsunami capacity development program, including training and exercising for emergency managers, NGO's, Red Cross/Peace Corps and VMS staff and that this be done in a competency-based framework;
- Regular exercising of all aspects of the warning system;
- Ensure key agencies (VMS, Geo-Hazards Unit and National Disaster Management Office (NDMO) are adequately resourced and activated (24/7 or on call) to respond to the tsunami threat; and,
- The Geo-Hazards Unit continue to pursue development of a robust and sustainable national seismic network.

The visiting team and workshop participants noted that Vanuatu has a National Disaster Act that articulates the establishment and functions of the National Disaster Committee (NDC), NDMO and National Disaster Operations Centre (NDOC). It also noted that the Act addresses the need for Provincial Disaster Plans. All of the above provide a sound foundation for the enhancement of the tsunami warning and disaster risk management system.

The visiting team and workshop participants conclude that the highest priority and a significant first step, towards enhancing the tsunami warning and disaster management system, is the adoption of the Vanuatu National Disaster Risk Reduction and Disaster Management Arrangements (draft 2008 is currently with Government for approval) and with that, the establishment of a robust planning framework for all aspects of the tsunami warning system within Vanuatu. This includes development, approval and implementation of a tsunami “disaster support plan”. The physical relocation of the Geo-Hazards Unit, NDMO and VMS into the same office will greatly aid collaboration on all hazards, including tsunami, in an operational and peacetime context.

The visiting team also noted that Vanuatu should be congratulated on their proactive and committed approach to improving disaster risk management arrangements in their country. This is particularly evident through the development and implementation of the Vanuatu Disaster Risk Reduction and Disaster Management National Action Plan 2006 – 2016 (DRM NAP).

Vanuatu workshop participants are encouraged to use this National Tsunami Capacity Assessment report to guide both national projects and externally funded projects to achieve targeted improvements on the Vanuatu tsunami warning and mitigation system. In turn, this will assist in improving systems for other natural hazards such as earthquakes and cyclones.

Contingent on the availability of human and financial resources, the Australian Bureau of Meteorology (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 Vanuatu'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 as well as subsequent in-country review undertaken in July 2009. It is recognised that these rankings 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 Vanuatu'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 Vanuatu'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 Geo-Hazards Unit, NDMO and VMS operations be enhanced to allow for the 24/7 receipt of tsunami information and activation of tsunami response operations via redundant communications means including an Short Message Service (SMS) alert from the Pacific Tsunami Warning Centre (PTWC) and that the key individuals within these agencies be identified to receive the SMS alert.	Low	Communications	Tsunami specific	23
Very High	That through the implementation of the Vanuatu Disaster Risk Reduction and Disaster Management Arrangements and DRM NAP particular attention is paid to the development of strong links between activities at the national, provincial and local level.	Low	Governance & Coordination	Multi-hazard	4
Very High	Incorporate the benefits of implementation of improvements in the tsunami warning system across all hazards.	Low	Governance & Coordination	Multi - hazard	5
Very High	Review of the National Disaster Management Act (2000) and ensure consistency between this and other Acts. Include legislation regarding the establishment of emergency management structures at the provincial and community level which are responsible for emergency planning and operational readiness. Also review the legislation regarding monitoring and warning for tsunami and other hazards.	Low	Governance & Coordination	Multi hazard	2



Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	Ensure the current initiatives to approve and implement the Vanuatu Disaster Risk Reduction and Disaster Management Arrangements continue to establish a robust planning framework for all aspects of the tsunami warning system within Vanuatu as well as other hazards.	Low	Governance & Coordination	Multi-hazard	1
Very High	Because local tsunami pose a significant threat to Vanuatu ensure that environmental cues are included as a key message when developing and delivering public awareness campaigns.	Low	Public & Stakeholder Awareness and Education	Tsunami specific	40
Very High	That emergency plans at national, provincial and local levels be developed and these plans should contain detailed arrangements for each of the threats related to Vanuatu including tsunami. The plans should detail and formalise warning systems in place and the preparation of this plan should include the production of evacuation maps and community consultation. When completed plans should be made available to the public and evacuation maps displayed in prominent locations within communities.	Medium	Governance & Coordination	Multi-hazard	8
Very High	Incorporate tsunami considerations into working groups established under the Vanuatu National Disaster Risk Reduction and Disaster Management Arrangements on which key agencies and at-risk communities are represented. This will ensure tsunami risk assessment, planning, community education and capacity development considerations and activities are undertaken within a multi-hazard context.	Medium	Governance & Coordination	Tsunami specific	3



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, historical tsunami records and studies, earthquake hazard studies, existing tsunami modelling, deep ocean tsunami models and topography data to identify low-lying communities which may be prone to tsunami impacts from all likely tsunami sources and produce a suit of hazard maps. Commence tsunami mitigation (structural and non-structural management options), response and evacuation planning using local knowledge.	Medium	Tsunami Hazard, Vulnerability & Risk	Tsunami specific	34
Very high	Complete, approve and implement a tsunami “disaster support plan” under the Vanuatu Disaster Risk Reduction and Disaster Management Arrangements once approved. Include consideration of critical infrastructure and lifeline support facilities.	Medium	Emergency Response & Evacuation	Tsunami specific	28
Very High	VMS continues to develop strong capability to respond to the tsunami threat through the establishment of 24/7 operations based on strong procedures developed with stakeholders. In the short term the response of 24/7 staff at Airport should be formalised.	High	Tsunami Warnings	Tsunami specific	16
Very High	The Geo-Hazards Unit continue to pursue development of a robust and sustainable national seismic network (including training of the maintenance and operational use of data) and promote seismic data sharing internationally and with neighbouring countries in the region.	High	Tsunami Warnings	Multi-hazard	15

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	<p>That improved warning dissemination methods be investigated including evaluation of different methodologies which would best suit the Vanuatu context, including community based and traditional methods. Examples include:</p> <ul style="list-style-type: none"> <li>a. The suitability of SMS be investigated as a means to complement other dissemination methods;</li> <li>b. Communicating with remote communities including the use of sirens, drums, gongs</li> <li>c. If full coverage is available from Radio Vanuatu, transmission options for automatic warning tones in remote communities exist;</li> <li>d. As availability/affordability grows, the internet be investigated as a means to deliver up to date warnings and educational information to the community;</li> <li>e. Formats used to disseminate warning information be flexible enough to meet the needs of a wide range of users and delivery mechanisms;</li> <li>f. Establishing links with NGO's, the Red Cross/Peace Corps to assist the dissemination of warnings; and</li> <li>g. Use of the mobile phone network web access.</li> </ul>	High	Tsunami Warnings	Multi-hazard	20

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	That all agencies involved in tsunami warning and response develop Standard Operating Procedures (SOPs) consistent with the Vanuatu National Disaster Risk Reduction and Disaster Management Arrangements. These procedures should contain details about each agency's operational response to tsunami. The SOPs should formalise points of contact between each relevant agency in the warning system in all hours of operation and include mechanisms to communicate with other government departments, NGOs, Red Cross/Peace Corps and the community.	High	Governance & Coordination	Tsunami specific	9
Very High	That NDMO facilities located within the new VMS building, include enough resources and space for the coordination of operations and the display of critical information during emergencies.	High	Emergency Response & Evacuation	Multi-hazard	32
Very High	That the responsible national working group, in coordination with NDMO and other key government agencies, NGOs, Red Cross/Peace Corps and donor organisations establish a comprehensive tsunami public awareness program based on risk where possible. The programme should aim to improve the awareness and preparedness of the Vanuatu population by considering the production of education material and delivery based on proven methods to the Vanuatu community in multiple languages.	High	Public & Stakeholder Awareness and Education	Tsunami specific	39
Very High	That a tsunami capacity development program be developed, including training and exercising for emergency managers, NGOs, Red Cross/Peace Corps and VMS staff and that this be done in a competency-based framework	Very High	Public & Stakeholder Awareness and Education	Tsunami specific	43

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Very High	That all aspects of the warning system are exercised regularly and in a structured way; both within Vanuatu and by taking part in international exercises to ensure that the response to tsunami warnings is effective at all times.	Very High	Tsunami Warnings & Emergency Response	Tsunami specific	21
Very High	Pursue the strategies identified in the Geo-Hazard's Unit Business Plan to facilitate the development of a 24/7 operational capability for the Geo-Hazard Unit in the new VMS building.	Very High	Governance & Coordination	Multi-hazard	6
High	In the short term community education programs could make use of existing generic tsunami education material available through SOPAC and delivery strategies such as National Disaster Awareness Week and schools programs. This material could also be made available to NGOs, Red Cross/Peace Corps and donor organisations for distribution amongst at-risk communities.	Low	Public & Stakeholder Awareness and Education	Tsunami specific	41
High	That a Vanuatu Association of NGOs (VANGO) be formally established as the primary national focal point for NGOs in terms of disaster management and risk reduction activities.	Low	Governance & Coordination	Multi-hazard	7
High	To complement a public awareness program, the establishment of tsunami signage within urban areas should be investigated to assist in the awareness of transient populations such as tourists, including signage in hotels and resorts.	Low	Public & Stakeholder Awareness and Education	Tsunami specific	42

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
High	That media outlets be used to assist in community awareness and preparedness campaigns and an multi-hazard media education campaign be developed and delivered to ensure the media are educated on natural hazards, warning and response systems.	Low	Public & Stakeholder Awareness and Education	Multi-hazard	44
High	Vanuatu Meteorological Service and the NDMO to develop formal Memorandums of Understanding (MOU) with radio stations regarding the broadcast of emergency information including agreements regarding broadcasting of warning information outside normal hours of operation.	Low	Communications	Multi-hazard	26
High	That any planning for a future warning service take into account the expanding capabilities delivered by anticipated radio and mobile telephone coverage.	Low	Communications	Multi-hazard	24
High	Develop strategies to enhance the dissemination of warnings to all communities through the use of satellite phones.	Low	Communications	Multi-hazard	25
High	Investigate the feasibility of current satellite technology to alert remote communities of tsunami warnings including pursuing the pilot trial of the RANET (Radio and Internet for the Communication of Hydro-Meteorological Information for Rural Development) Chatty Beetle.	Low	Communications	Multi-hazard	27
High	Continue the moves towards Intergovernmental Coordination Group (IOC) Membership and development of linkages with Institut de Recherche pour le Développement (IRD).	Low	Regional & International Coordination	Multi-hazard	10

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
High	Incorporate into tsunami SOPs the issuing of 'No Threat' messages to the community for tsunami that will not impact on Vanuatu or earthquakes that do not have the potential to generate tsunami. This will avoid misinterpretation of media and international family information. This will also test the system and enhance community awareness when there is a long time between events.	Low	Tsunami Warnings	Tsunami specific	19
High	That the response to any exercises, real events or near-event is reviewed with a Lessons Learned Workshop and the results be made available to all stakeholders and accountability for improvements is delegated and followed up on.	Medium	Emergency Response & Evacuation	Tsunami specific	29
High	That plans be developed that recognise public broadcasts as a vital part of the preparedness, response and recovery stage following a disaster and that this is captured in MOUs with radio stations regarding the broadcast of emergency information.	Medium	Emergency Response & Evacuation	Multi-hazard	30
High	That information systems are established to enable emergency response personnel to access data that could potentially assist in response and recovery in a real event (e.g. Geographic Information Systems (GIS) layers of critical infrastructure). These information systems should also have the capability to adequately record critical event-based information and that this is shared across agencies.	High	Emergency Response & Evacuation	Multi-hazard	31
High	That government planning includes an assessment of the impacts of works near the coastal interface (for example, sand excavation) and the natural hazard risk potential for new developments.	High	Tsunami Hazard, Vulnerability & Risk	Multi-hazard	38

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
High	That work related to capacity building is complemented with resources that assess its ongoing effectiveness.	High	Public & Stakeholder Awareness and Education	Tsunami specific	45
High	Building on lessons learned from the Tropical Cyclone Warning System, that Vanuatu investigate the development of contingency plans that allow the issue of public warnings from another country and/or a back-up agency in country (to receive warnings from PTWC and disseminate nationally).	High	Tsunami Warnings	Multi-hazard	22
High	VMS obtain access to a tsunami deep ocean model scenario database to assist in determining threat levels to Vanuatu and inform appropriate warning decisions. Adequate ongoing training to use this database would be required.	High	Tsunami Warnings	Tsunami specific	18
High	VMS investigate use of available scientific data and tools (deep ocean tsunami models, sea level data and travel time software) to assist in localising the threat to Vanuatu and incorporate use of these tools into tsunami SOPs.	High	Tsunami Warnings	Tsunami specific	17
High	Investigate the current status of volcano monitoring within Vanuatu and evaluate the tsunamigenic potential of major volcanoes and feed this into tsunami plans.	Very High	Tsunami Hazard, Vulnerability & Risk	Tsunami specific	37
Medium	Continue active participation in the Southwest Pacific Tsunami Working Group (WG5) of the Intergovernmental Coordination Group (ICG) of the Pacific Tsunami Warning and Mitigation System (PTWS), Regional Meteorological Service Directors meeting and the Pacific Platform for Disaster Risk Management meetings, engaging VMS, the Geo-Hazards Unit and NDMO in these forums.	Medium	Regional & International Coordination	Multi-hazard	11



Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 4
Medium	Conduct an inventory of geospatial data available for tsunami and multi-hazard risk assessments, modelling and mapping of populated areas.	Medium	Tsunami Hazard, Vulnerability & Risk	Multi-hazard	34
Medium	Actively pursue the acquisition of data from previous and future research projects conducted in country and develop a protocol to do this.	High	Research Expertise	Multi-hazard	14
Medium	Investigate possible future options for further inundation modelling for prioritised communities.	High	Tsunami Hazard, Vulnerability & Risk	Tsunami specific	36
Medium	Acquire the necessary baseline data for populated areas to fill identified gaps as part of a multi-hazard mapping activity.	Very high	Tsunami Hazard, Vulnerability & Risk	Multi-hazard	35
Low	That those Tsunami Capacity Assessment recommendations that are common across a number of Pacific Island Countries (PICs) be made available to SOPAC and other regional and international organisations for consideration.	Low	Regional & International Coordination	Multi-hazard	12
Low	Actively cooperate and seek to develop partnerships with universities and regional and international agencies that can assist with conducting scientific research and technical capacity building in Vanuatu with regards to all facets of tsunami management.	Low	Research Expertise	Tsunami specific	13