SOPAC Member Countries National Capacity Assessments:

Tsunami Warning and Mitigation Systems

Federated States of Micronesia

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AUSTRALIA

SOPAC

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 Federated States of Micronesia (hereafter referred to as "FSM") to receive, communicate and effectively respond to tsunami warnings took place in a workshop held from 14-17 September 2009 in Pohnpei, FSM.

The workshop was facilitated by a team of visiting experts and attended by some forty FSM Government agency representatives including participants from each State (Yap, Chuuk, Kosrae and Pohnpei), Non-Government Organisations (NGOs), regional and international organisations to discuss key areas of tsunami warning and mitigation in FSM by completing a comprehensive in session questionnaire, presentations and site visits.

As well as outlining the strengths and opportunities for improvements to the FSM tsunami warning and mitigation system from a National and State perspective, 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 ongoing improvements to the FSM tsunami warning and mitigation system.

FSM is a sovereign island nation which is made up of four States; Yap, Chuuk, Pohnpei and Kosrae. The vastly dispersed nature of FSM's 607 Islands and varied sea-bed characteristics within the archipelago means that exposure to tsunami and possible tsunami impacts are likely to vary from island to island. Tsunami risk modelling and few historical records of tsunami events would suggest that FSM has a moderate tsunami risk relative to other Pacific Islands Countries (PICs) that are in closer proximity to subduction trenches on which earthquakes with the potential to generate tsunami can occur (Thomas and Burbidge 2009). Even so, while the population and Government of FSM have had little direct experience with tsunami impacts, there is an awareness of the susceptibility of low-lying atolls and coastal communities to rising sea levels associated with climate change, the potential for tsunami impact and impact from other hazards such as storm surge resulting from typhoons. This is evident with the inclusion of tsunami as a potential natural hazard for FSM within the country's Multi-State Multi-Hazard Mitigation Plan 2005 (MSMH-MP (D6)).

Studies predict that the main sources of tsunami threat to FSM as a nation are the Philippines and Mariana Trenches, with the New Guinea Trench and the Kuril Trench expected to potentially affect specific FSM states or island groups. In recorded history there have been no significant tsunami impacts on FSM as wave heights and run-up elevations from detected events have fallen below the normal range of damaging high tides and storm surge levels. Information collected from the National Geophysical Data Center for the period between 1950 to 2009 indicates that tsunami generated from the above mentioned sources did not reach amplitudes higher than 10 cm. The highest amplitude recorded for the region at 30 cm was a result of the distant source1960 Chile earthquake and tsunami (Warne 2009).

FSM has National and State level Disaster Preparedness Plans establishing command and control for managing a range of hazards. However, at the time of the Tsunami Capacity Assessment not all plans formally included agency roles and responsibilities or outlined communication and warning dissemination for the potential tsunami threat. Many of the plans were under review with the intention to incorporate tsunami hazard management

components as required. Documents under review included the MSHM-MP, which while it does include tsunami in the contents, has not been updated since it was endorsed in 2005.

Tsunami warnings form part of the agreement under the Compact of Free Association (CFA) (D11) between the United States of America (USA) and FSM through the provision of services from the United States Weather Service. The Pacific Tsunami Warning Center (PTWC) issue tsunami warnings to in-country FSM Weather Service Offices (WSO) who operate on a 24/7 basis. The Weather Forecast Office in Guam (WFO Guam) place follow-up calls to the Pohnpei, Yap and Chuuk WSOs and the Kosrae Disaster Coordination Office (DCO) to ensure warnings have been received. The WSOs will notify their relevant DCO, with Pohnpei WSO also having responsibility for notifying the Governor. Warning dissemination and evacuations are permitted on authority from the Governor. The National Office of Environment and Emergency Management (OEEM) assist the DCOs in emergency response activities.

Also under the CFA, emergency management support and disaster relief assistance is provided to FSM by the United States Agency for International Development (USAID) and the International Organization for Migration (IOM) in transition from the Federal Emergency Management Agency (FEMA) in accordance with statutory authorities, regulation and policies.

Participants in the workshop identified a number of areas where advancements could be made to the current FSM tsunami warning and mitigation system. Recurring themes included improved emergency response planning, enhancing communications systems and interagency cooperation, introducing community awareness programs about tsunami and strengthening regional and international partnerships. Very high priority recommendations to come out of the Tsunami Capacity Assessment of FSM include:

- The need for National and State agencies to collaborate on joint disaster management including preparedness initiatives from planning stages to implementation. In addition, develop SOPs for the receipt and dissemination of tsunami warning messages from the WSOs to the DCOs and OEEM. Following on from this, review and exercise the FSM National Disaster Preparedness Plan and developed SOPs linking the National and State roles and responsibilities.
- Department of Foreign Affairs submit FSM's membership application to the International Oceanographic Commission (IOC) to ensure continued support and assistance. In addition to this, strengthen cooperation with regional and international support to improve State mitigation, preparedness, response and recovery capabilities.
- Research and document tsunami history including anecdotal evidence and traditional coping strategies that may be incorporated into tsunami awareness, education, preparedness and response activities. Furthermore, train local media about tsunami risk and their role in assisting communities prepare and respond effectively to this hazard.
- Investigate the 'Chatty Beetle' or Rural Internet Communications System (RICS) solution as a backup to the Emergency Management Weather Information Network (EMWIN) and the Federated States of Micronesia Telecommunications Corporation (FSMTC) circuits to receive emergency warnings at the three critical WSO portals and at the Kosrae DCO. Consideration should also be given to establishment of a 24/7 early warning communication link to the remote Outer Islands from the DCOs using fixed solar powered 'Chatty Beetle' (or RICS) earth stations in community centres and controlling units from the DCOs.
- Maintain and upgrade the main island's Very High Frequency (VHF) two-way radio network and consider upgrading to a linked repeater system with full interagency interoperability. A fund to maintain all emergency communication systems should also be considered by the National government. Also identified as a very high priority, was for OEEM and DCOs to purchase backup power systems for communications to support mitigation and response activities.

Workshop participants are encouraged to use the FSM National Tsunami Capacity Assessment report to guide both National and State level projects and aid funded projects to achieve targeted

improvements in the tsunami warning and mitigation system for FSM. In turn, this will assist in improving systems for other high priority natural hazards.

Contingent on the availability of human and financial resources, 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 the recommendations made to improve FSM'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 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 to the FSM 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
Very High	**Low –** Recommendation currently being progressed or could possibly be progressed within the capacity of existing in-country resources (funds and staff).
High	**Medium –** 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.
Medium	**High –** Recommendation would require a high level of additional staff and/or expertise and funds. External funding support is likely to be required.
Low	**Very High –** 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 FSM's tsunami warning and mitigation system.

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 5
Very High	National and State level agencies need to collaborate on joint disaster management including preparedness initiatives from planning to implementation.	Low	Tsunami Emergency Response (including evacuation)	Multi-hazard	21
Very High	Department of Foreign Affairs submit FSM's membership application to the IOC to ensure continued support and assistance.	Low	Regional and International Coordination	Tsunami specific	5
Very High	Develop Standard Operating Procedures (SOPs) for receipt and dissemination of warning messages for WSO to DCO and OEEM.	Medium	Tsunami Warning	Multi-hazard	8
Very High	Review and test the FSM National Disaster Preparedness Plan and SOPs linking responsibilities from National to State and vice versa	Medium	Governance & Coordination	Multi-hazard	2
Very High	Research and document tsunami history including anecdotal evidence and traditional coping strategies that can be incorporated into tsunami awareness, education, preparedness and response activities.	Medium	Public and Stakeholder Awareness and Education	Tsunami specific	28
Very High	Train local media about tsunami risk and their role in helping communities prepare and respond effectively. This training should focus on educating the media about tsunami alerts/warnings and in turn informing the community on response concepts.	Medium	Public and Stakeholder Awareness and Education	Tsunami specific	30

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 5
Very High	Look to at 'Chatty Beetle' or RICS solution as a backup to EMWIN and the FSMTC circuits to receive emergency warnings at the three critical WSO portals and at the Kosrae DCO.	High	Communications	Multi-hazard	11
Very High	Establish a 24/7 early warning communication link to the remote Outer Islands from the DCOs. It is recommended solar powered 'Chatty Beetles' (or RICS) are fixed to earth stations at each Outer Island community centre and that they are controlled from each DCO.	High	Communications	Multi-hazard	13
Very High	Maintain and upgrade the main island's VHF two-way radio network. Consider upgrading to a linked repeater system with full interagency interoperability.	High	Communications	Multi-hazard	16
Very High	Strengthen cooperation with regional and international support to improve State mitigation, preparedness, response and recovery capabilities.	High	Regional and International Coordination	Multi-hazard	3
Very High	FSM National government establish a fund to maintain all emergency communication systems.	High	Communications	Multi-hazard	18
Very High	OEEM and DCOs to purchase backup power systems for communications and to support mitigation and response activities.	High/Very High	Tsunami Hazard, Vulnerability, Risk and Mitigation	Multi-hazard	25

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 5
High	FSM explore opportunities by international and regional organisations to build capacity and/or provide expertise for addressing tsunami risk and vulnerability issues.	Low	Research Expertise	Tsunami specific	6
High	Update the National Disaster Preparedness Plan to include tsunami within an all-hazards context.	Low	Tsunami Emergency Response (including evacuation)	Tsunami specific	20
High	USAID and IOM clarify roles, responsibilities, processes and resources to support mitigation, response and recovery initiatives.	Low	Regional and International Coordination	Multi-hazard	4
High	Strengthen community preparedness and response capability using resources available through regional partners such as Weather Forecast Office Guam and National agencies such as OEEM and WSOs.	Low	Public and Stakeholder Awareness and Education	Multi-hazard	32
High	Utilise community-based/non profit organisations such as Red Cross, women's, youth, traditional and religious groups, Chamber of Commerce, Lions and Rotary Clubs to promote local tsunami preparedness and awareness programs.	Low	Public and Stakeholder Awareness and Education	Tsunami specific	33
High	OEEM and DCOs maintain and distribute directory of contacts including satellite phone numbers and designated frequencies for radios, to members of emergency task forces.	Low	Communications	Multi-hazard	10

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 5
High	Assess and improve existing National and State disaster preparedness and emergency response capabilities based on reviews such as the Pacific Wave 2008 exercise.	Low/Medium	Tsunami Emergency Response (including evacuation)	Multi-hazard	22
High	OEEM to explore possibilities of sending emergency cellular text (Simple Messaging System, SMS) and Emergency Alerting System (EAS) TV text through the FSMTC network to disseminate warnings and emergency information.	Medium	Communications	Multi-hazard	12
High	Encourage international research facilities to install monitoring stations in FSM.	Medium	Tsunami Monitoring Infrastructure	Tsunami specific	7
High	Place an all-hazards display including information on tsunami in a publicly accessible building e.g. the Micronesian Seminar or government offices such as tourism and public libraries.	Medium	Public and Stakeholder Awareness and Education	Multi-hazard	31
High	Develop all-hazards community awareness materials to provide consistent information that can also be adapted and translated for local communities to understand.	Medium	Public and Stakeholder Awareness and Education	Multi-hazard	29
High	a) Assess existing public awareness and community emergency preparedness to tsunami. b) Develop program based on assessment to inform vulnerable communities about tsunami and preparedness options.	High/Medium	Public and Stakeholder Awareness and Education	Tsunami specific	27

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 5
High	Add Sirens with cellular triggers (with manual back-up) around all State centres.	High	Communications	Multi-hazard	17
High	All States should repair/upgrade and maintain the Amplitude Modulated (AM) broadcast station. AM radio signals can deliver disaster related warnings and updates to the Outer Islands and locations on the main islands that are out of Frequency Modulated (FM) broadcast station range.	High	Communications	Multi-hazard	15
High	Set up permanently mounted 'always on' Iridium handheld in each State Emergency Room (ER) and Emergency Operations Center (EOC).	High	Communications	Multi-hazard	14
High	Develop/upgrade and then exercise State emergency response plans to include details on evacuation routes and locations of shelters.	High	Tsunami Emergency Response (including evacuation)	Multi-hazard	19
High	Review hazard and risk assessments based on new data collected to enhance tsunami preparedness and development planning.	High	Tsunami Hazard, Vulnerability, Risk and Mitigation	Tsunami specific	24
High	Conduct tsunami hazard and risk assessments using numerical inundation models based on existing and to be acquired high resolution, near-shore and lagoon bathymetric and topographic data.	High	Tsunami Hazard, Vulnerability, Risk and Mitigation	Tsunami specific	23
High	Complete review of FSM's Multi-State Multi-Hazard Mitigation Plan (2005).	High	Governance and Coordination	Multi-Hazard	1

Priority	Recommendation	Resource Intensity	Topic	Multi-hazard or tsunami specific	Recommendation Number In Table 5
High	Develop and enforce National/State building codes/standards incorporating major hazard risks.	High/Very High	Tsunami Hazard, Vulnerability, Risk and Mitigation	Tsunami specific	26
Low	Develop SOPs for DCO's to immediately notify PTWC of a tsunami event.	Low	Tsunami warnings	Tsunami specific	9