



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

**Republic of the Fiji Islands**



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***SOPAC***

## 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 Fiji Islands tsunami warning and mitigation system are outlined (as at the date the Tsunami Capacity Assessment Workshop was held in March 2008, updates between then and the publication of this report are as marked).

**Table 3: Summary of current status of key components of the Fiji Islands tsunami warning and mitigation system as at March 2008**

### 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>Legislative responsibility for issuing tsunami warnings is currently not formally defined. The Natural Disaster Management Act 1998 (D2) and Amendment 11/2005 makes provision for formulation and implementation of disaster management policies and structures at a national and divisional level (<b>Update March 2009</b> – Revisions of this Act have been drafted and are due to go to the Solicitor-General's Office for vetting). The legislation refers to the National Disaster Management Plan (NDMP, currently version 1995 being revised, D16) which outlines responsibilities across government for warnings, response and recovery for natural and man made hazards. Certain agency responsibilities during disasters are covered by their own acts, such as the Police Act.</p> <p>Under the NDMP 1995 (D16) current responsibility rests with MRD Seismology Section to "provide information and advice to National Disaster Management Council (NDMC) on matters pertaining to earthquake, tsunami and landslide". FMS are listed as being responsible for issuing cyclone warnings under the plan but no responsibility is nominated for tsunami warnings.</p> <p>The draft 2006 Fiji National Disaster Risk Management Arrangements (NDRMA, D17), the revised version of the Fiji NDMP 1995 (D16), lists tsunami as a hazard "with the potential to create emergencies or disasters in Fiji" (D17, p11). It names the agency responsible for development and regular testing of the early warning system for tsunami as MRD with support agencies FMS, Fiji Islands Disaster Management Authority (FIDMA, currently known as NDMO), Fiji Navy, Fiji Police Force, and the Fiji Islands Maritime Safety Administration (FIMSA) (D17).</p>

Key Component	Rating	Discussion
<b>Authority, Coordination and NGO Role (Continued)</b>		
(Continued) Legislation in place for tsunami warnings and response	<b>Partially</b>	<p><b>Update May 2009 –</b></p> <ul style="list-style-type: none"> <li>○ Fiji is considering engaging another consultant to complete the review of the NDMP 1995 and the plans draft replacement (the 2006 Fiji National Disaster Risk Management Arrangements).</li> <li>○ A workshop was held late in 2008 to review the draft arrangements. At this meeting a possible plan restructure was discussed and the need for accountability in the complimentary Act and plan was discussed.</li> <li>○ Under the plan review, further use of FMS as a backup will be considered given their 24/7 operation.</li> </ul>
Tsunami coordination committee or effort at a National and local level	<b>Partially</b>	<p>The NDMC (who report to cabinet) encompasses three committees. (1) Emergency Committee (2) Preparedness Committee (3) Mitigation and Prevention Committee. The TWG was established under the NDMC in 2002 as a recommendation of the SERMP Project. Regularity and attendance at the TWG meetings requires improvement.</p> <p>All hazard Divisional Emergency Operations Centres (DivEOC) and District Emergency Operations Centres (DEOC) exist.</p> <p><b>Update May 2009 –</b> The TWG currently meet to discuss tsunami mitigation and preparedness for Suva based on the results of the SERMP Project. Plans progressing for Suva include evacuation locations, routes and signage, billboards (showing danger areas and evacuation routes) and sirens. Dissemination of warnings is also being discussed with the three telecom providers Telecom Fiji Limited (TFL), Digicel and Vodaphone.</p>
Agency responsibilities clearly defined	<b>Partially</b>	The draft Fiji Tsunami Warning System and Response Arrangements (D4a) outline the roles and resources of key agencies. These arrangements are yet to be finalised and adopted.
NGOs have a defined role in tsunami warning dissemination, preparedness and awareness and emergency response	<b>Yes</b>	The roles of NGOs are outlined in the NDMP 1995 (D16). The main focus of NGOs is disaster relief and community awareness.
<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>	<p>Fiji became a member of the IOC in 1974 and has been regularly involved ICG/PTWS and the Southwest Pacific Working Group.</p> <p><b>Update May 2009 –</b> Fiji will have one person involved in one-year training on "Tsunami Disaster Mitigation" course run by The International Institute of Seismology and Earthquake Engineering (IISSE) and Japan International Cooperation Agency (JICA).</p>

Key Component	Rating	Discussion
<b>Priorities</b>		
<p>Priorities established for implementation of tsunami warning and mitigation system at a National level</p>	<p><b>Partially</b></p>	<p>Key players in Fiji have a developed understanding of where priorities should lie to improve Fiji's National tsunami warning and mitigation system (refer to questionnaire Question 12 and D7). Documents such as D7 outline strengths and weaknesses of the current arrangements.</p> <p>Participants in the workshop were asked to outline what they thought Fiji's urgent priorities should be to enhance the country's tsunami warning and mitigation system. Agency coordination was a consistent theme throughout these discussions. Urgent priorities identified by participants included:</p> <ul style="list-style-type: none"> <li>• Legislation and relevant plans to specify agencies roles;</li> <li>• Proper SOPs for all key agencies involved;</li> <li>• Key agencies on 24/7 watch;</li> <li>• Earliest possible issuing of warning (all of Fiji) including issuing of "No Threat" messages;</li> <li>• Basic risk assessment training for key agencies;</li> <li>• Training on how to interpret and best utilise PTWC bulletins;</li> <li>• Define roles and responsibilities of agencies and communicate amongst key-agencies;</li> <li>• Each agency to know and review roles on regular basis (staff turn-over);</li> <li>• Exercises to improve coordination; and,</li> <li>• Awareness programmes to communicate roles to other agencies/public.</li> </ul>
<b>Multi-hazard Approach</b>		
<p>Tsunami warning capabilities are being established within a multi-hazard framework</p>	<p><b>Yes</b></p>	<p>The NDMP 1995 (D16) outlines disaster risk management in an all-hazards context. The NDMC and committees, NDMO, National Emergency Operations Centre (NEOC) and related agencies are all charged to deal with disasters in a multi-hazard framework, which includes tsunami.</p>
<b>Research Expertise</b>		
<p>Active research is being undertaken within the country for seismology and tsunami to strengthen the tsunami warning and mitigation system</p>	<p><b>Partially</b></p>	<p>A number of seismological studies have been undertaken by MRD Seismology Section (refer D14). A number of regional and international agencies have also undertaken scientific research including New Zealand Geological Survey, PDC, GA, SOPAC, and Canterbury University etc.</p>

Key Component	Rating	Discussion
<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>	Fiji has a VSAT Telemetry Seismograph Network with data available in real time to MRD Seismology Section who manually calculates earthquake parameters. This is fed into national warnings where possible but is not always timely. The current network is comprised of three stations. JICA project is underway to add another three (making a total of 6) stations to broadband to allow faster automated solutions in determining threat from local earthquakes. Seismic data is not available to international community in real-time but will eventually be made available via the JICA project. The JICA project also includes training of technicians to maintain the system.
Existence of sea level stations and integration of real time data from these stations into the tsunami warning process	<b>Partially</b>	Two sea level gauges exist in Fiji that are operated by Australia. (1) Lautoka – Seaframe (2) Suva – former National Oceanic and Atmospheric Administration (NOAA) gauge now run by the Bureau. Real-time data for both stations is accessible via a Registered User Website at the Bureau as well as via the WMO GTS. This data is not currently accessed by Fiji for use in their national tsunami warnings. Sea level data is utilised by PTWC in regional warnings.
Sharing of seismic and sea level data internationally to facilitate improvement of PTWC tsunami messages for the region	<b>Partially</b>	National seismic data is not currently shared internationally. Timely and free sea level data (third party sites) is shared internationally and fed into PTWC tsunami messages. There are intentions to eventually make the seismic data available internationally after the JICA upgrade is complete.
<b>Warnings</b>		
Nation receives PTWC messages	<b>Yes</b>	<p>As per the draft Fiji Tsunami Warning System and Response Arrangements (refer to D4a), FMS is presently the agency that receives PTWC messages. The information is then passed onto the MRD Seismology Section for assessment. The MRD Seismology Section assesses the information and relays the assessed information to FMS and the NDMO. FMS are operational 24/7 and receive PTWC messages via the GTS, e-mail and to the FMS Director via Radio and Internet for the Communication of Hydro-Meteorological Information for Rural Development (RANET) SMS. MRD Seismology Section, who are not operational 24/7, receive PTWC messages from FMS (by phone call) and directly from PTWC (email and RANET SMS to the Senior Seismologist). During the night / weekends FMS is first to receive the information and then passes this onto MRD Seismology Section.</p> <p><b>Update May 2009 -</b></p> <ul style="list-style-type: none"> <li>○ The Senior Seismologist has changed phones and is currently not receiving the SMS.</li> <li>○ FMS does not contact NDMO or Fiji Police Force at the moment, only MRD.</li> </ul>

Key Component	Rating	Discussion
<b>Warnings (Continued)</b>		
24/7 operational staff at warning receipt and dissemination location	<b>Partially</b>	<p>FMS receives PTWC messages and is staffed 24/7. Neither MRD Seismology Section nor NDMO, who receive the messages internally, are 24/7. They do have informal on-call arrangements. MRD Seismology Section prepares and disseminates national tsunami warnings and NDMO prepare to coordinate emergency response.</p> <p><b>Update May 2009</b> - NDMO have no current on call arrangements. They plan to move towards a Duty Officer arrangement.</p>
Disseminate national tsunami warnings as guided by a Standard Operating Procedure	<b>Partially</b>	<p>Although the Fiji Tsunami Warning System and Response Arrangements (refer to D4a) draft plan exists arrangements and detailed SOPs for the issue of national tsunami warnings in Fiji are not yet agreed and formalised. The draft arrangements state that the authority to issue warnings and implement actions resulting from natural hazards is with the National Disaster Controller (NDC). However, the draft arrangements recognise the short onset lead time of a tsunami and propose FMS should have delegated authority to issue tsunami warnings for Fiji. The draft arrangements propose that FMS will instruct the media to broadcast specific messages directly to the public as well as instructing TFL to activate tsunami warning sirens.</p> <p>Under present arrangements FMS receives messages from PTWC and contacts MRD Seismology Section (by phone and fax). MRD Seismology Section will then issue a national bulletin in English (D9, D10). If FMS is unable to contact MRD Seismology Section, FMS will contact the Fiji Police Force and other response agencies and may issue a tsunami advisory to the general public to be broadcast on national radio.</p> <p><b>Update May 2009</b> - Dissemination of warnings is also being discussed with the three telecom providers TFL, Digicel &amp; Vodaphone using Suva as a pilot.</p>
System redundancies in place for receipt of PTWC messages and dissemination of National warnings	<b>Partially</b>	<p>FMS receives PTWC messages via the GTS and e-mail in real time. Staff at MRD Seismology Section receive the PTWC messages via email and RANET SMS (as does the FMS Director) but are not 24/7. MRD Seismology Section on duty staff are not provided with a work mobile phone. Mobile phones registered for the RANET SMS alert services are private and usually pre-paid and apparently vulnerable to be disconnected from service (lack of credits, switched off, number change).</p> <p><b>Update May 2009</b> – NDMO have an EMWIN system that is not working. SOPAC operated this system during the last flood. NDMO do not have technicians to maintain operational EMWIN. FMS (who have an EMWIN) can help set up and provide technical EMWIN training.</p>

Key Component	Rating	Discussion
<b>Warnings (Continued)</b>		
Redundant 24/7 method available for dissemination of warnings to community (e.g. public radio, sirens etc.)	<b>Partially</b>	<p>National broadcasts through Amplitude Modulated (AM) and Frequency Modulated (FM) radio stations are the main means of dissemination of national tsunami warnings to the Fiji community during waking hours. Television is also used. All major population centres are covered by AM and FM radio. Remote communities are covered by AM. Most households have a radio. Radio stations are 24/7 in most cases but some stations may go into pre recorded modes overnight. VSAT exists in the Lau Group. Police stations in the community are 24/7 contact points for communication.</p> <p>HF and VHF) predominately voice only radio systems exist, linking key agencies including FMS, NDMO (including District Offices), Ministry of Health, Royal Fiji Military Forces (RFMF), Fiji Police Force, TFL, Power Authorities and MRD Seismology Section. Although there is no dedicated disaster frequency NDMO have two HF channels to Divisions and Districts and FMS has three meteorological channels used formally for disaster communication.</p> <p>After hours Fiji plans to use tsunami warning sirens (a project for remotely operated siren system for Suva is underway), Fiji Police Force sirens and broadcasts from mobile units, SMS National broadcasts, RFMF sirens and communication means, Navy ships alerting systems and the National Fire Authority (NFA) (if necessary) to warn the population. Harbour Master, Navy and TFL will be responsible for marine warnings. Traditional Lali drums may be used in remote communities and face to face contact by Fiji Police Force and other response agencies may be undertaken. FMS has an internet site but tsunami warnings or advisories are not currently posted.</p> <p><b>Update May 2009</b> - Tsunami siren progress – Vodaphone funding has lapsed. New funding and a revised project proposal are required.</p>
Effective warning dissemination to remote communities	<b>Partially</b>	<p>Communication of tsunami warning messages to remote villages in Fiji presents a particular challenge. Remote villages and islands have AM radio coverage and a radio in most households. VSAT in locations such as the Lau Group and 24/7 Police stations are also possibilities. This may facilitate dissemination of tsunami warnings to these communities in waking hours. However, further work is required to ensure communities can receive tsunami warning messages after hours through systems in remote centres such as HF and VHF radio operated by the Ministry of Health, RFMF and Police. Community education on the natural warning signs of tsunami is also vital to ensure appropriate action is taken for locally generated tsunami for which warnings are not provided or timeframes too short. Local communities know their village and are best placed to plan their response ahead of an event occurring.</p>

Key Component	Rating	Discussion
<b>Warnings (Continued)</b>		
Communications coverage of whole country that is effectively utilised for the dissemination of tsunami warning messages	<b>Partially</b>	<p>Adequate communications coverage via FM and AM radio as well as HF radio (primarily voice) systems.</p> <p>Iridium satellite phones are relatively common (Red Cross etc.) but are not normally switched on 24/7. They are used more as a communication back up. There is concern about the costs of satellite phones (for example, FSM has an old sat phone. \$3USD per minute. Pre-paid with a post pay option). A central database of numbers is not held.</p> <p>Scope for improvement by development and use of dedicated HF frequencies, HF e-mail and SMS. Communication with field officers post a disaster or emergency requires improvement.</p>
Issue of marine tsunami warnings and guidance for vessels, harbours and ports	<b>Partially</b>	<p>There is no specific marine tsunami warning product as such. However, whatever product is put out by FMS or MRD Seismology Section is broadcast hourly over marine HF coastal radio (3DP) run by TFL. Improvement in two-way communications with small boat operators required, possibly as part of the licence system.</p> <p><b>Update May 2009 –</b></p> <ul style="list-style-type: none"> <li>○ Suva Radio is now coming under FIMSA so hopefully this can provide a better service.</li> <li>○ FMS considering whether tsunami warnings should be fed into other marine warnings.</li> </ul>
<b>Emergency Response and Evacuation</b>		
Disaster preparedness and emergency response system has been reviewed and opportunities for improvement and training identified	<b>Partially</b>	<p>Tropical Cyclone Gene and exercises such as Pacific Wave 06 and the Tsunami Emergency Response Tabletop Exercise 2007 have been effective tools to identify strengths and improvements required in Fiji's disaster preparedness and emergency response system.</p> <p>However, a plan for implementing the identified improvements required is not evident. An informal approach is taken to implement the identified improvements. There is a need to further engage with local government such as Suva City Council (resources and knowledge of localities).</p>
Tsunami emergency response, evacuation and recovery plan exists (including responsible agencies)	<b>Partially</b>	<p>The NDMP 1995 (D16) details the functions of groups at national, divisional and local level. The plan includes a "Rehabilitation" section. This plan has been reviewed and will eventually be replaced by the Fiji NDRMA (current version October 2006, D17).</p> <p>Under current arrangements (D16) the NDMO and NEOC (when activated) are responsible for emergency response, with support of other agencies. All hazard DivEOC and DEOC exist. However, in some instances, these are not fully implemented. Plans are required for Districts and Divisions.</p>



Key Component	Rating	Discussion
<b>Emergency Response and Evacuation (Continued)</b>		
<p><i>(Continued)</i></p> <p>Tsunami emergency response, evacuation and recovery plan exists (including responsible agencies)</p>	<b>Partially</b>	<p>Under the revised draft (NDRMA), FIDMA (currently known as NDMO) is listed as the lead agency for tsunami disaster/emergency response with support from all agencies as directed by the NDC (D17, p41). The draft NEOC SOPs (draft 4, 2006, D3) provides for FIDMA to become operational forming the NEOC in all types of emergency or disaster operations.</p> <p><b>Update May 2009 –</b></p> <ul style="list-style-type: none"> <li>○ The NEOC SOPs have been finalised but the National Disaster Management Plan and Act need to be finalised before the SOPs are able to be effective.</li> <li>○ NDMO currently has 12 staff.</li> </ul>
<p>The designated agency for evacuation is identified and have authority by law</p>	<b>Yes</b>	<p>Authority designated to the NDMO by the NDMC. Evacuation is organised through the NEOC.</p> <p>If a Disaster is declared the NDMC officials like Fiji Police Force and RFMF can have special powers relating to the protection of life and property (including forced evacuation). NDMC arrangements at the district and local government level are in place, but not fully implemented.</p> <p>Communication with evacuation agencies to mobilise during an event requires improvement.</p>
<p>Plans have been made for safe evacuation of population centres including aspects such as maps, routes and signage</p>	<b>Partially</b>	<p>Tsunami evacuation exercises have been conducted in Suva leading to the development of some preliminary evacuation plans and routes for Suva. During the village education progressed by MRD Seismology Section, villages are encouraged to put their own tsunami evacuation plans in place. It is expected that Suva will be a pilot area for signage. Outer islands with tourist resorts are also vulnerable and no concrete plans exist for the safe evacuation or otherwise of residents.</p> <p><b>Update May 2009 -</b> Suva City Council has agreed on evacuation routes and billboards and signage to communicate these evacuation routes to the community in low lying areas of Suva. International signage will be used. NDMO is currently looking for funding.</p>
<p>Procedures are tested and exercised to improve the response through better planning and preparedness</p>	<b>Yes</b>	<p>To assist with continuous improvement of the Fiji tsunami warning and response system, three significant tsunami exercises have been conducted in Fiji between 2003 and 2008. Exercises include:</p> <ul style="list-style-type: none"> <li>• In October 2007 Tsunami Tabletop exercise;</li> <li>• Earthquake building evacuation drill in Suva September 2003 (as part of the SERMP Project); and</li> <li>• Involvement in Pacific Wave 2006.</li> </ul> <p><b>Update May 2009 –</b> Suva evacuation test will occur once signage and community awareness plans are complete.</p>
<p>Land use policies and building codes are in place to mitigate against the tsunami hazard</p>	<b>Partially</b>	<p>Critical infrastructure has been identified in the Suva area only as part of the SERMP project (D18). Legislation, building codes (under review) and zoning of land is all aimed at reducing development in tsunami danger zones and making buildings safer. Issues addressed for Suva area (with Suva City Council), but need to be addressed for all areas within the country.</p>

Key Component	Rating	Discussion
<b>Tsunami hazard, vulnerability and risk</b>		
Completion of studies to assess the tsunami hazard in the country or Region	<b>Partially</b>	Studies have been completed by MRD Seismology Section, SOPAC and the SERMP Project (D18). The SERMP project concluded that a significant risk of local tsunami does exist for the City of Suva and its harbour environs. A Suva hazard map exists. The project considered mitigation measures for both the earthquake and tsunami impacting upon the City of Suva, with the scenario event based on the real experience of the 1953 Suva earthquake and tsunami. GA has completed a preliminary tsunami hazard assessment of the Southwest Pacific as well as a probabilistic study. Both of these studies include Fiji.
Local risk assessments have been completed for at risk communities	<b>Partially</b>	Not on a country scale, but specific for Suva area Pacific cities Suva, the SERMP project.
Adequate data exists and local inundation modelling has been completed for population centres	<b>Partially</b>	Some high resolution bathymetry and topography data exists, however, some gaps exist and need to be addressed. Refer to D11, <i>Fiji Islands Inventory of Geospatial Data and Options for Tsunami Inundation &amp; Risk Modelling</i> .
<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>	Public education (such as on the MRD Seismology Section web site and brochures) has focused on educating people to respond to the natural tsunami warning signs and warnings issued by the relevant authorities.
Community level education and preparedness programs exist for tsunami	<b>Yes</b>	<p>MRD Seismology Section tsunami awareness program has been undertaken in approximately over 90 (as at <b>May 2009</b>) coastal communities so far. This program is ongoing using the limited MRD Seismology Section budget. MRD Seismology Section also have web and print education resources (D1, D4b and D8). NDMO have a disaster awareness program (Disaster Awareness Week). The Fiji Tsunami Awareness Kit has also been distributed to schools. The Navy, FIMSA (work with maritime communities) and Fiji Red Cross also contribute to awareness programs.</p> <p><b>Update May 2009 –</b></p> <ul style="list-style-type: none"> <li>○ MRD Seismology Section's tsunami awareness program has been integrated with NDMO into an all hazards program for rural coastal communities.</li> <li>○ A more integrated approach between key agencies is now being taken to training, awareness, exercises and development of disaster plans for schools and community. Key agencies include FMS, MRD, NDMO, NFA, St John's Ambulance, Police and the Red Cross.</li> </ul>

Key Component	Rating	Discussion
<b>Public and stakeholder awareness and education (Continued)</b>		
Training programs for the National media exist for natural hazard and tsunami	<b>Partially</b>	Key agencies closely work with the media and are now developing an understanding of the importance of getting media involved to ensure correct information is passed onto the general public. Visits with the media are undertaken before cyclone season. The main problem is that the media get information from other sources. Further explanation of workings and limitations of tsunami system required.