

**Baseline survey of Hazard Warning and
Disaster Response Systems for Pacific
Island States.**

SOPAC, June 2005

1. INTRODUCTION

The Secretary-Generals of Inter-governmental Organisations (IGOs) at their January 13th 2005 side meeting during the Mauritius International Meeting agreed to support a Commonwealth Secretariat (CS) proposal for follow-up discussion during the next IGO meeting in July on a possible collaborative project on Disaster Warning and Response systems for Small Island States. To undertake this, the Commonwealth Secretariat (CS) set about seeking advice from experts on the ways in which enhanced coordination would benefit Small Island States in mitigating the impacts of disasters through disaster warning and response systems. The CS indicated that it planned to have a consultant review the report and propose a framework for action - from identifying gaps and niche areas - for consideration by the IGOs in its meeting in June. For the Pacific, a CS communiqué with the Pacific Island Forum Secretariat (PIFS) resulted in an approach to the South Pacific Applied Geoscience Commission (SOPAC) to be the lead agency, working jointly with PIFS.

At the same time it was apparent from Paragraph 66 of the Report of the Secretary-General of the United Nations to the Fifty-ninth Session of the United Nations General Assembly (UNGA Document A/59/2005) that the United Nations that the International Strategy for Disaster Reduction (ISDR) Secretariat would be asked to conduct a survey of existing capabilities and gaps in world-wide early warning systems.

Since the World Conference on Disaster Reduction in Kobe, Japan in January 2005, the Pacific Region has been developing a Framework for Action in the period 2005 to 2015 under the title “An Investment for Sustainable Development in Pacific Island Countries. Disaster Risk Reduction and Disaster Management: Building the Resilience of Nations and Communities to Disasters”. It is intended to present this paper for endorsement by the Pacific Islands Forum at its annual meeting in 2005. The draft was reviewed by national and regional delegates and representatives of scientific and technical agencies and non-government organisations (NGOs) at the 12th Pacific Regional Disaster Management Meeting in Madang, Papua New Guinea in June 2005.

In response to the CS request and in anticipation of a UN ISDR request, SOPAC, as regional coordinating agency, has sought information on existing disaster warning and response systems from the Pacific region. This information will form an initial database of information

showing what exists in the region both at national and regional level. It will be used as the basis for responses to requests for information from IGOs.

In the information collection process, SOPAC sought information from relevant national, regional and international agencies to: -

1. *Identify disaster warning and response systems and compile an inventory by country and on a regional basis.*
2. *Identify aspects of these systems that need strengthening, including the human and institutional capacity and information systems, and potential measures required to address the gaps avoiding added reporting burdens on governments and regional organizations.*
3. *Examine the work being done by the UN and other international organizations in the area of disaster warning and response systems by country and on a regional basis.*

Early Warning and Disaster Risk Management in the Pacific Context

The geographic and geological setting of the Pacific island countries (PICs) makes the vulnerable to a number of natural hazards. The variety of disasters that have occurred in the past decade clearly highlights the range of hazards and risks to which the region is exposed. They include; tropical cyclones with associated storm surge, flooding and landslides (Niue, Solomon Islands, Cook Islands, Fiji, Vanuatu); volcanic eruptions (Manam, Witori and Rabaul in Papua New Guinea, Ambae, Ambrym and Epi in Vanuatu); tsunamis (Papua New Guinea and Vanuatu); landslides (Federated States of Micronesia, Papua New Guinea and Fiji); drought (Papua New Guinea, Solomon Islands, Fiji, Kiribati and Tuvalu). In addition to these natural hazards, an increasing number of social, biological and environmental hazards (political unrest, ethnic tension, HIV/AIDS and insect-borne crop infestations) are being added to those posed by increasing technological sophistication. Rapidly increasing populations with urban drift into communities that, to a large extent, live on the coastal fringes are rapidly increasing the size of the vulnerable population

Various reports and workshops in the region document the use of science for early warning and identify lessons learnt from a wide range of experiences of those who have worked with or helped to develop early warning systems for a wide range of societal concerns. Many early warning systems are in operation today to warn the public and governments about impending

climate- or weather-related hazards and other threats. There is, at the same time, a growing regional drive to document traditional early warning signs for preservation of information and more rigorously test them to their current reliability in changing resource and ecosystems. The recent survival of the Tikopia community in the Solomon Islands during Tropical Cyclone Zoë (Dec 2002), which coped solely through the efficacy of traditional early warning and response measures, is a standing testimony to the ability and resilience of remote communities.

As a region, the Pacific, through SOPAC, is promoting at the national level an integrated comprehensive approach to the management of risks in the context of national development planning. The process is aligned with the joint Australia – New Zealand Risk Management Standard and documented as a Regional Guideline on Comprehensive Hazard and Risk Management (CHARM).

Interest in Early Warning and Guiding Principles

All governments, corporations, groups and individuals are interested in early warning about impending or likely threats and problems they may have to face. The more advanced warning they can get the better, because they would, at least in theory, have ample time to prepare for and hopefully cope with the threat or to prepare for its potential impacts.

Early Warning Systems (EWS) are now interpreted as being much broader than just the use of technological instruments for detecting and forecasting impending hazard events and for issuing alerts. The needs now are to strive for more effective, integrated and people-focussed early warning systems that provide greater clarity of warning and related information so as to more effectively reduce risks at both national and local levels. Warnings of impending hazard events need to be complemented by information on the risks posed by the hazard and by information on likely strategies for mitigating the loss and damage that could arise. This “value added” warning information then needs to be communicated to vulnerable groups and sectors in a way that facilitates good decisions and timely actions.

The region has long recognised the need to develop and strengthen early warning systems that respond to the special needs and circumstances of Pacific island nations and communities. These systems must be able to communicate over vast ocean distances both within and

between countries, and reach generally small isolated populations on small islands within a vast ocean.

As a follow-up to the Kobe 2nd World Conference on Disaster Reduction, the Pacific region has now drafted its own response framework¹ which states a number of guiding principles to address the specific gaps and challenges identified by Pacific island communities.

The early warning systems need to encompass or consider:

- (a) Prior knowledge of the hazards and risks faced by communities, in particular, knowledge of the potential impact of an impending hazard event on specific vulnerable groups and sectors.
- (b) Technical monitoring and warning services for these risks, in which hazards are monitored and forecast at regional, national and local levels, and in which relevant technical information on impending hazard events is produced and communicated to the national disaster management authorities.
- (c) Systems for dissemination of understandable warnings to those at risk, requiring good communication systems that reach the remotest communities and allow vulnerable groups and sectors to receive timely information on impending hazard events, potential risk scenarios and preparedness strategies in order to enable appropriate preparedness and mitigating action to be taken to reduce vulnerability.
- (d) Knowledge, public awareness preparedness and capacity to implement preparedness strategies developed to reduce the loss and damage expected from an impending hazard event

While these systems must remain ‘community-based’ they also need to be integrated into the developing global network of observing systems, so that countries can have access to all possible sources of information and technical resources. The targeted outcomes over the next years are that: -

¹ **“An Investment for Sustainable Development in Pacific Island Countries; *Disaster Risk Reduction and Disaster Management: Building the Resilience of Nations and Communities to Disasters; A Framework for Action 2005 – 2015*”.**

- (a) Robust, effective national and regional monitoring and early warning systems are established and strengthened for all hazards that respond to traditional and technological knowledge and tools.
- (b) Effective communication and awareness-raising are in place as part of these community-focused early warning systems.
- (c) National and regional early warning systems are integrated into new global networks to improve safety and security in time of disasters.

In this report, information collated by the various approaches below will be assessed under the four elements listed above as needed for effective early warning and response systems.

Terminology

In undertaking this assignment, SOPAC takes the view that information being sought is with reference to early warning and disaster response systems, the terminology widely used in the Pacific.

2. Data Collection Methodologies

Actual work on collecting data and information started during the week of 9th May. Given the difficulties of communicating with nations in the region (the Pacific covers close to one-third of the earth's surface) a number of overlapping approaches were undertaken so as to gather as much information as possible within the time available. The following means were employed

Survey Questionnaire

A survey questionnaire was jointly developed between SOPAC and PIFS was posted to the 15 National Disaster Management Offices of the Pacific Island States. In the week given for response, four countries returned completed survey forms. This was above expectation and reflects the genuine concern of the region to developing effective early warning systems.

Evaluation by Organisations with Regional Programmes

A number of regional and international organizations are active in the region. Invitation letters were sent to seven contact points in organizations with regional responsibility or having programmes relating to various aspects of early warning systems. It is encouraging that five

responded that allowed a merging of national and regional information where appropriate to enable development of a better regional perspective.

Personal Interview

As SOPAC was convening two regional training activities in this period, opportunity was taken to discuss the research with selected participants. Though this did not provide much new concrete information at this junction, the contacts made will be useful during the in-country activities that will follow the July meeting of IGOs. Further interviews were conducted with national and regional delegates and representatives of technical agencies, NGOs and other agencies attending the 12th Pacific Regional Meeting Disaster Management in Madang, Papua New Guinea in June 2005.

Other Sources

Additional information was gathered from internal sources including SOPAC staff and the staff of partner agencies such as the Australian Bureau of Meteorology (BOM Australia), Geoscience Australia (GA), New Zealand's National Institute of Water and Atmospheric Research (NIWA), and Institute of Geological and Nuclear Sciences (GNS), and the National Oceanographic and Atmospheric Agency (NOAA) and Pacific ENSO Applications Center (PEAC) of the United States (both valuable sources of information on the islands in the north Pacific).

3.0 FINDINGS

The following is a summary of the major hazards that threaten Pacific island countries and the capabilities of relevant warning systems. Detailed analysis on a country-by-country basis will be found in Annex A

Early Warning Systems

(a) Tropical Cyclone Hazards and Warning Systems

Tropical Cyclones (known as typhoons in the north Pacific) pose a serious threat to many of the countries in the region and are among the most frequent causes of disasters in Pacific island countries. As a result the warning systems for this hazard are the most advanced in the region. The World Meteorological Organisation (WMO) plays a pivotal role in the coordinating and strengthening tropical cyclone warning systems. It has a South Pacific Subregional Office located with the South Pacific Regional Environment Programme

(SPREP) headquarters in Samoa and works closely with the major partner agencies in the region, BOM Australia and the New Zealand Meteorological Service of New Zealand (MetNZ) as well as all of the Pacific island National Meteorological Services, in particular the Fiji Meteorological Service. The WMO, with support from Japan has established a “**Regional Specialized Meteorological Centre (RSMC)**” in the Fiji Meteorological Service office in Nadi, which provides regional and national warning services to many of the countries in the South West Pacific. Similar services are provided by BOM Australia Tropical Cyclone Warning Centres (TCWCs) for Papua New Guinea and Solomon Islands; by Meteo-France for the French-speaking countries; and by NOAA for the American affiliated states in the North Pacific as well as for American Samoa.

All the countries in the region have meteorological offices that contribute information to the global weather system and the majority have trained forecasters who translate the tropical cyclone warnings disseminated by the Nadi RSMC and Brisbane TCWC into local languages and enhance them with local information.

(b) Flood and Drought Hazards and Warning Systems

Flood is a hazard in many regional countries. In countries with high mountainous islands, flash flooding can occur after heavy rain and is a frequent source of damage after tropical cyclones. The major rivers of Papua New Guinea flood seasonally. Storm surge flooding occurs in low-lying coastal areas of countries subject to tropical cyclones.

Fiji and PNG each have telemetered flood-warning systems on one major river but the majority of rivers are not monitored. Flood warnings are confined to these rivers with heavy rain forecasts being the only widely available indications of the possibility of floods in other areas. Technical assessments of flood disasters have been undertaken in Fiji and Samoa. Fiji has started but has yet to complete a pilot community-based flood warning and response system for the Ba River. .

Drought associated with El Niño events is a serious threat in the region. Among the larger countries, Papua New Guinea, Solomon Islands and Fiji all suffered serious drought in association with the 1997/98 El Niño event. Smaller countries, particularly those made up of atoll islands, are at particular risk from drought because of their sandy porous soils, shallow fresh-water lenses and limited water storage capacities. Drought conditions on these islands

can develop very quickly and the remoteness of many of the islands makes timely supply of water to their drought-affected populations difficult.

As drought is a slower-onset hazard, drought warnings are circulated in the form of regular newsletters from NIWA (for the southern hemisphere) and PEAC (for the northern hemisphere) that interpret El Niño/Southern Oscillation (ENSO) and other data to make climate forecasts for the forthcoming months. Climate monitoring and climatological forecasting are in their infancy in most of the island countries due to shortages of trained staff and resource constraints. Affected countries in the northern Pacific were able to reduce the impact of the most recent El Niño event by taking notice of forecasts and of measures recommended by a country intervention of a project team from PEAC.

(c) Volcano Hazards and Warning Systems

Volcanic activity is a major threat in Papua New Guinea Vanuatu, Solomon Islands, Tonga, Samoa and Fiji. Papua New Guinea, with the highest risk, has the most resourced and advanced volcanic hazard early warning system in the region. The remaining countries rely on local seismic observatories for alerts. Vanuatu had a sophisticated satellite monitoring and communication system monitored by the French agency ORSTOM until some years after independence but for the last six years the ageing system has been operated by the Vanuatu Department of Geology.

The International Airways Volcano Watch aims to separate aircraft in flight from hazardous volcanic eruption clouds. Administered by the International Civil Aviation Organisation (ICAO) and WMO it provides information to all regional countries from Ash Advisory centres located in Darwin (Australia), Wellington (New Zealand), Tokyo (Japan) and Washington (USA).

(d) Earthquake and Tsunami Hazards, Monitoring and Warning Systems

Earthquakes occur frequently in those regional countries close to tectonic plate boundaries, particularly those on the so-called Pacific 'Ring of Fire'. Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia, Fiji, Samoa and Tonga are at the greatest risk.

Many Pacific island countries, particularly those within the Melanesian arc, have developed seismic monitoring systems in recent decades. Well-equipped seismic stations are established

in Tonga, Samoa, Fiji, Vanuatu, Papua New Guinea and Solomon Islands with Papua New Guinea, Vanuatu and Fiji the three that have progressed to developing national networks of monitoring stations. Tonga is currently developing an extensive monitoring network funded by Japanese Technical Assistance.

Many of the seismic monitoring networks have been established for scientific research purposes, primarily designed to study island-arc tectonics and managed by universities and related research bodies. Use of data collated by these networks has only been applied to studies related to built structures, seismic zoning and hazard mitigation has been limited to the period since the 1970s.

Tsunami is a significant hazard in the region with many of the islands close to tectonic plate boundaries experiencing local tsunamis relatively frequently. Few of these are high enough to cause significant casualties or damage although both Papua New Guinea and Vanuatu have suffered fatalities and severe damage in areas close to earthquake epicentres in the last ten years. Atoll islands throughout the region are potentially vulnerable to oceanic tsunamis but fortunately most are protected from significant impact by fringing reefs.

The Pacific Tsunami Warning Center in Hawaii provides tsunami watch and warning information to most regional countries but few have established systems for disseminating these warnings and some lack 24-hour contact points to give real-time response. Australia, in partnership with a number of other countries, has recently begun developing a tsunami warning system for both the Indian and Pacific Oceans that is expected to provide warnings to island countries when completed.

(e) Other hazards

Landslides caused by earthquakes or heavy rain are significant hazards in many steep slopes of the higher islands in the region. Fiji is undertaking an assessment of landslide hazards adding to some past efforts to develop early warning for rainfall-induced landslides.

Technological and environmental hazards are increasing in the region as a result of development projects with limited infrastructural and staff training support. Waste disposal in

countries experiencing urban drift is a growing problem with the fresh-water lenses of atoll countries being particularly vulnerable.

A number of **biological hazards** exist in the region. Chloroquine-resistant malaria is endemic in Papua New Guinea, Solomon Islands and Vanuatu infecting a high proportion of their populations. A number of other debilitating diseases occur but with decreasing frequency, however the incidence of HIV/AIDS infections does appear to be growing with particular concern being expressed at the potential level of infection in Papua New Guinea. Health departments and ministries in the region are frequently short-staffed with consequent limitations on training and personal development of professional staff. Although health monitoring systems are in place in most countries, their effectiveness can be variable and the capability to warn of the onset of epidemics limited.

Another significant biological hazard is the risk of crop diseases and pest infestations. Poor quarantine control, sometimes after other disasters, have led to the introduction of insect pests and diseases that have devastated staple and export taro crops in Samoa and elsewhere while the introduction of fungus disease some years ago substantially reduced the export potential of Papua New Guinea's previously pristine coffee crop.

Ethnic and political tensions are **social hazards** that have affected a number of regional countries in recent years. In addition the incidence of cross-border crime is an increasing cause for concern throughout the region. No formal monitoring or warning systems are established in the region although there is significant cooperation between law-enforcement agencies

Needs

It is clear from the responses recorded in Annex A that there is a substantial need for new hazard-related technical equipment accompanied by appropriate operator and maintainer training. However even if these needs were met there would remain a substantial gap in the capabilities of warning systems in this region. The greatest gaps in the warning chain exist in the last stage of transferring the warning information to the rural users. There is widespread need for low-cost, low maintenance, robust long distance communications equipment two-way communications for remote communities and broadcasting capability to reach such

communities at all hours. Trials are being made of the use of HF Email (PF Net), RANET *(Radio and Internet) System.

A further need is for capacity building of technical staff in the region. There is a shortage of qualified and experienced meteorologists, seismologists and other technically trained personnel able to understand, maintain, sustain, operate and produce meaningful results from the increasingly complex equipment being supplied as part of development assistance programmes. A symptom of the shortfall is the limited ability of the Regional Specialised meteorological Centre in Nadi, Fiji to provide meaningful storm surge warnings for countries within its area of forecasting responsibility.

Disaster Response in the Pacific Islands Region

(a) National

The relative isolation and sometimes enormous geographical extent of Pacific island countries have inspired significant interest in development of disaster response structures and mechanisms. To overcome the limitations imposed by these factors, the relatively small populations of most countries on an international scale and the limited resources available have encouraged an interest in regional cooperation in many sectors.

Disaster management and disaster risk reduction have benefited from the regional approach. Growing experience among countries, the support of a small number of donors, the availability of regionally-based training and the closer ties that have been enhanced by regular meetings of responsible officials have led to the development of a regional approach to organisation.

The basic disaster management structures in Pacific island countries are very similar. Most countries have nominated a responsible Minister to oversee arrangements and direct policy on behalf of Cabinet. Policy development and direction of disaster management activities is generally the responsibility of a National Disaster Committee made up of senior officials from operational ministries and departments, often joined by representatives of the national Red Cross Society, one or more NGOs the national telecommunications agency and first responders. A small National Disaster Management Office within the responsible Minister's portfolio organises day-to-day disaster management matters and acts as the secretariat to the

National Disaster Committee. Specialised functions are the responsibility of relevant line Ministries and Departments.

Annex B gives country-by-country details of disaster management responsibilities and activities.

(b) Regional

National leaders in the region meet annually in the Pacific Islands Forum to agree policy directions and common approaches to regional problems. The Forum is supported by a permanent secretariat, the Pacific Islands Forum Secretariat (PIFS) located in Fiji. Regional coordination in disaster management really began with the establishment of a South Pacific Programme Office by the United Nations in 1990. Regionalisation of this function was completed after a 1996 decision of the Forum allocated regional responsibility for disaster management matters to a regional organisation, the South Pacific Applied Geoscience Commission (SOPAC), also located in Fiji, which retains the responsibility. SOPAC has links with international and regional organisations, government agencies, NGOs and scientific and technical agencies.

(c) International

A number of international and donor agencies are continuously active in promoting disaster management in the region. These include United Nations Agencies such as UNDP, OCHA, WHO and WMO; the Red Cross movement; AusAID, NZAID and USAID (generally working through other agencies).

Disaster Response Needs

As in the section on warning systems, the main needs identified in Annex B relate to capacity building for members of the disaster response community and to solving the limitations currently being experienced with backup communications to and from more remote locations.

ANNEX A: EARLY WARNING SYSTEMS AND CAPABILITIES

Country	Hazards	External Agency Providing Early Warning	National Agency Responsible For Early Warning	Status of Early Warning System	Limitations	Needs
Cook Islands	Tropical Cyclones	Nadi Regional Specialized Meteorological Centre (RSMC)	Cook. Is (CI) Met Service	National coverage	Poor post- event communications may limit follow-up warnings	More robust communications systems
	Flooding		C.I. Met Service and Works Dept Hydrology Unit.	Limited to inclusion in weather forecasts	No flood monitoring capability	
	Storm Surge	Nadi RSMC	C.I. Met Services	Limited to inclusion in weather forecasts	No detailed warning	See Fiji
	Heavy Rain		C. I. Met Services	Limited to inclusion in weather forecasts		
	Tsunami	Pacific Tsunami Warning Centre (PTWC)	C.I. Met Services and National Disaster Management Office (NDMO)	National coverage	No local tsunami warning capability	
	Landslides		Unclear	None	No warning capability	
	Waterspouts and tornados		C.I. Met Services.	Limited to inclusion in weather forecasts		
Fiji	Cyclone	Nadi RSMC	Fiji Met Service	National coverage. Staff shortage, storm surge warning needed	Warnings give detailed cover of wind speed but little information on storm surge	Development of RSMC storm surge forecasting capability.
	Flood		Fiji Hydrology Unit.	Partial system exists - Fiji Hydrology Unit has piloted a telemetry system in one sub-catchment only of the Rewa River	Other major rivers are not covered	Resources and training for further development of community-based systems

Country	Hazards	External Agency Providing Early Warning	National Agency Responsible For Early Warning	Status of Early Warning System	Limitations	Needs
	Tsunami	PTWC	Fiji Met Services and Seismology Unit	(a) PTWC warning messages received by Fiji Met Services and passed to Seismology Unit of the Mineral Resources Dept. (b) Cabinet has recently approved establishment of a local Tsunami Early Warning System.	Public are still not fully aware of the warning system	Improved public awareness and education
	Drought	NIWA	Fiji Met Services	Drought Warnings issued based on below average rainfall and external information.	Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
	Landslide		Dept of Geology and Mineral Resources	Work started on a pilot landslide early warning project a few years ago but project ended after the consultant left.	Projects never tested and proved	Further support with development of a system
French Polynesia	Cyclones	Meteo France/Tahiti	Meteo France Tahiti			
	Tsunami	PTWC	Meteo France and Protection Civile			
Federated States of Micronesia (FSM)	Cyclones (Typhoons)	Joint Typhoon Warning Center (JTWC) - Guam	National Weather Service	Incomplete broadcast coverage	Communications to some distant States are limited	Improved communications and broadcast capabilities
	Tsunami	PTWC to local met service	NDMO	Incomplete broadcast coverage	Communications to some distant States are limited	
	Drought	PEAC PDC	National Weather Service	Incomplete broadcast coverage	Drought Warnings issued based on below average rainfall. Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
	Floods		National Weather Service	Flash flood warnings based on rainfall		

Country	Hazards	External Agency Providing Early Warning	National Agency Responsible For Early Warning	Status of Early Warning System	Limitations	Needs
Kiribati	Cyclones	Nadi RSMC	Kiribati Weather Service	Extremely low risk		
	Tsunami	PTWC	NDMO			
	Drought	PEAC, NIWA	Fiji Met Services	Drought Warnings issued based on below average rainfall and external information.	Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
Marshall Islands	Cyclones (Typhoons)	JTWC - Guam	Marshall Islands Met Service	Incomplete broadcast coverage		
	Tsunami	PTWC to local met service	NDMO			
	Drought	PEAC	Marshall Islands Met Services	Drought Warnings issued based on below average rainfall.	Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
Nauru	Cyclones	Nadi RSMC	Nauru Met Service	Extremely low risk		
	Tsunami	PTWC	Not Known			
	Drought	NIWA	Nauru Met Service	Drought Warnings issued based on below average rainfall and external information.	Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
New Caledonia	Cyclones	Meteo France/Noumea	Meteo France, Noumea			
	Tsunami	PTWC	Meteo France and Protection Civile			
Niue	Cyclones	Nadi RSMC	Niue Met Service	National coverage although some delays to communications shielded areas.	Met Service only has Observers – no local forecasters	Upgrading of regional warning to include storm surge and wave/swell information
	Tsunami		Police	National coverage although some delays to communications shielded areas.	No direct tsunami warnings	Access to tsunami messages

Country	Hazards	External Agency Providing Early Warning	National Agency Responsible For Early Warning	Status of Early Warning System	Limitations	Needs
Palau	Cyclones (Typhoons)	JTWC - Guam	Palau Weather Service	Incomplete broadcast coverage		
	Tsunami	PTWC	Palau Weather Service & NDMO	Incomplete broadcast coverage		
Papua New Guinea	Cyclones	Brisbane TCWC	PNG National Weather Service (NWS)	Coverage in affected provinces is adequate	Limited forecasting capability	Met. Training, Public awareness, communication systems
	Tsunami	PTWC	Geophysical Observatory and NDMO	Coverage in affected provinces is adequate		
	Volcano		National Volcano Observatory and Provincial Governments	Only covers volcanoes that pose major threats	Only occasional monitoring of minor but active volcanoes	Support for wider monitoring networks and staff
	Floods		PNG NWS	General warnings provided in weather forecasts	No flood monitoring capability even on major rivers	Development of a flood monitoring capability
	Drought	NIWA, BOM Australia, WMO	PNG NWS and Dept of Agriculture	Warnings transferred through media releases and by agricultural extension officers	Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
	Frost		PNG NWS	Coverage in high provinces through radio broadcasts	Frost mainly occurs on clear nights destroying staple crops. Cloud cover observations	Improved observation network
Samoa	Cyclones	Nadi RSMC American Samoa Weather Service	Samoa Met Service	National coverage		
	Earthquakes		Ministry of Agriculture (Observatory)	Monitoring through a few seismometers	Restricted coverage	Better instrumentation
	Tsunamis	PTWC	NDMO	National coverage		
	Volcano		Ministry of Agriculture	Limited by equipment	Detection of movement through seismometers and occasional visits	Telemetered observation network

Country	Hazards	External Agency Providing Early Warning	National Agency Responsible For Early Warning	Status of Early Warning System	Limitations	Needs
	Flood		Samoa Meteorological Service	National coverage	No flood monitoring systems exist so warnings based on forecast rainfall	
Solomon Islands	Cyclones	Brisbane TCWC	.Solomon Islands met service	Incomplete broadcast coverage HF SSB radio also used to villages	Broadcasts cannot be received in remote areas at all hours.	
	Tsunami	PTWC	Local met service and NDMO	Both contact points through EMWIN are not 24 hour so alerts can be delayed	No 24 hour contact point for watch and warning messages	New 24 hour contact.
	Volcano		Ministry of Mines and Energy and NDMO	Monitoring via seismometers and satellite	No 24 hour coverage. Limited staff resources	More trained staff and upgrading of equipment
	Drought	NIWA	Min of Agriculture and Livestock	Undeveloped	Link between ENSO events and drought in Pacific countries is poorly understood	Further international research. Need to translate ENSO reports into understandable language
Tokelau	Cyclones	Nadi RSMC Samoa Met service	Tokelau Weather Service	Very limited. Broadcasts from Samoa	No Met service. No broadcasting station. Three atolls in country – several hours apart by sea. Vulnerable comms	Development of national warning system
	Tsunami	PTWC				
	Drought	NIWA	Tokelau Weather Service and Agriculture Department		Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
Tonga	Tropical Cyclone	Nadi RSMC	Tonga Met Office	National coverage	Warnings from Fiji cease when the national satellite dishes are locked in high winds.	
	Earthquake		Ministry of Lands and Survey	Newly installed seismic network monitors and locates earthquakes	Network is still very new.	

Country	Hazards	External Agency Providing Early Warning	National Agency Responsible For Early Warning	Status of Early Warning System	Limitations	Needs
	Tsunami	PTWC	Tonga Met Office	National coverage	Local earthquake monitoring cannot forecast local tsunamis	
	Drought	NIWA	Tonga Met Office	National coverage	Link between ENSO events and drought in Pacific countries is poorly understood	Earlier warning. Further international research
	Storm Surges	Nadi RSMC	Tonga Met Service	National coverage	Warnings are too generalised to be practically useful	Better storm surge forecasting
	Coastal Flooding		Tonga Met Office	Covered in local weather forecasts		
	Volcano		Ministry of Lands and Survey	Seismic monitoring of the volcano area	Accurate Eruption warning is not possible at present	Improved monitoring and training for technical staff.
Tuvalu	Cyclones	Nadi RSMC	Tuvalu Meteorological Service	Incomplete broadcast coverage due to technical problems	Storm surge forecasting is inadequate for an atoll country	Better storm surge forecasting from Nadi Improved communications
	Tsunami		Met Service			
	Drought	NIWA	Tuvalu Meteorological Office		Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
Vanuatu	Cyclone	Nadi RSMC	Met Service Vanuatu	Incomplete broadcast coverage due to distance	Distance	Storm surge
	Tsunami	PTWC	NDMO			
	Drought	NIWA	Met Service Vanuatu		Link between ENSO events and drought in Pacific countries is poorly understood	Further international research
	Volcano		Department of Geology	Monitoring provides some advanced warning but coverage incomplete	Limited and ageing French equipment. Communications	Upgrading of equipment
	Earthquake		Department of Geology	Monitoring rather than warning	Limited and ageing French equipment. Communications	

ANNEX B; NATIONAL DISASTER RESPONSE CAPABILITIES AND NEEDS

Country	Plans, policies, legislation, structure	Key response partners	Emergency operations centre(s)	Human resources training ²	Community preparedness	Emergency comms	Emergency stockpiles	Needs
Cook Islands	Yes but need review	Red Cross	National Emergency Operations Centre (NEOC)	50+ 250 but still not meeting the needs	Satisfactory	Full national coverage	2 DPC ³	Human Resource training and backup communications.
Fiji	Yes	Red Cross	National EOC	186+400			27 DPC	
FSM	All states have plans but no legislation (replaced by Executive Orders)	Red Cross US Federal Emergency Management Agency (FEMA) Small NGOs	State level	3+42 Needs not being met	Community Awareness and education programmes are under way	Single HF SSB systems with no backup	5 DPC	Human resource training, backup communications, transport support
Kiribati	Yes	Red Cross	No	18+70	Good	Gaps in coverage	1 DPC	Strengthened communications systems

² Number of people trained at regional level, between 1995-2003, source TAF/OFDA

³ DPC – Disaster Preparedness Containers pre-positioned by Red Cross

Country	Plans, policies, legislation, structure	Key response partners	Emergency operations centre(s)	Human resources training ²	Community preparedness	Emergency comms	Emergency stockpiles	Needs
Marshall Islands	Plan recently developed. Policies etc still linked to US FEMA	FEMA	No EOC	4+40. Not meeting the needs	Very little	National coverage	1 DPC	Community awareness and education. Maintenance and service backup for communications
Nauru	No		No					
Niue	Yes but legislation dated	Village councils.	Temporary NEOC	12+24	Satisfactory	Gaps in communications and broadcasting coverage	None	Strengthened communications system. Development of national & village EOCs
Palau	Yes. Legislation replaced by Executive Order	Red Cross Church Groups	NEOC	12+80	Satisfactory	Gaps in coverage	1 DPC	Equipment for first responders (fire police, emergency medical service). EOC equipment
Papua New Guinea	Yes. Plan being updated	Red Cross, World Vision, CARE	NEOC	14+125			16 DPC	
Samoa	Yes. Plan being reviewed	Red Cross	NEOC	52+75. More continuity training	Currently developing new programs	None	5 DPC	Not available until the outcomes of current World Bank Project become apparent

Country	Plans, policies, legislation, structure	Key response partners	Emergency operations centre(s)	Human resources training ²	Community preparedness	Emergency comms	Emergency stockpiles	Needs
Solomon Islands	Yes. Plan being reviewed	Red Cross, World Vision, OXFAM Womens' Organisations	NEOC	33+125	Requires further work	Gaps in coverage	7 DPC Govt store of shelter materials	Better communications coverage Support for community preparedness
Tokelau	National Plan only Some village plans		No	2+11 Needs not being met	Mainly traditional Polynesian practices	Satellite phones	No	Medical response capability Emergency power Evacuation shelters
Tonga	Plan	Red Cross	New EOC under construction	49 + 150. More community-based training needed	Awareness is high but education needs further attention	Telephone system is used for main communications. There is currently no radio backup except the Defence network to a few islands	3 DPC	Development of a community awareness and education programmes
Tuvalu	Plan (needs revision) No legislation	Red Cross. Church Groups	National Coordination Centre	27 + 75 Not meeting the needs	Moderate	Gaps in coverage	2 DPC	Capacity building for disaster managers

Country	Plans, policies, legislation, structure	Key response partners	Emergency operations centre(s)	Human resources training ²	Community preparedness	Emergency comms	Emergency stockpiles	Needs
Vanuatu	Yes. Some policy limitations	Red Cross, World Vision, Peace Corps Caritas	NEOC	37+100 Not meeting the need	Satisfactory	Gaps in coverage	5 DPC	Agency plans and sectoral capacity building for support plans
Regional		FRANZ countries UNOCHA IFRC						