Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System

# TSUNAMI NEWSLETTER

International Tsunami Information Centre

## TABLE OF CONTENTS



## Women, Disaster Reduction and Sustainable Development[1]

*Prepared by the Inter-agency Secretariat for the International Strategy for Disaster Reduction (UN/ISDR), Geneva. Reprinted from http://www.unisdr.org/eng/risk-reduction/gender/Women_disaster_reduction_and_SD.pdf*

Disaster reduction policies and measures need to be implemented with a two-fold aim: to enable societies to be resilient to natural hazards, while ensuring that development efforts decrease the vulnerability to these hazards. Sustainable development is not possible without taking multi-hazard risk assessments into account in planning and daily life. Disaster reduction is an issue that affects the lives of both women and men. Given that the magnitude of a disaster is partically influenced by the political, economic and socio-cultural contexts, mainstreaming gender into disaster-reduction policies and measures translates into identifying the ways in which women and men are positioned in society. This enables the effective mapping, not only of the different and similar ways in which the lives of women and men may be negatively affected, but also of the ways in which they can contribute to disaster-reduction efforts.

In other words, cultural patterns structuring the lives of women and men must also be clearly understood. Women's and men's differing needs, roles and social power in different social contexts need to be taken into

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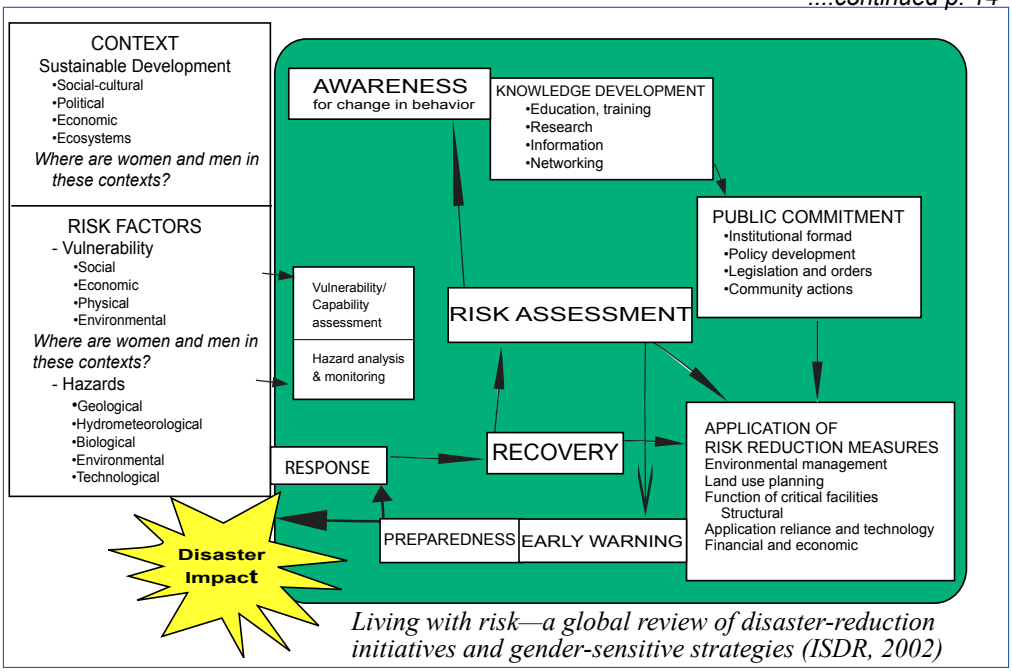



*Living with risk—a global review of disaster-reduction initiatives and gender-sensitive strategies (ISDR, 2002)*

# SUMMARY OF EARTHQUAKES

## Occuring October-December 2007

*With surface wave or moment magnitude (Mw) greater than or equal to 6.5 and a depth no greater than 100 km, or an event for which an international warning centre issues a message. Pacific Tsunami Warning Center (P) issues; Tsunami Information Bulletins (TIB), Expanding Regional Warnings (ERW), Regional Watch/Warnings (RWW) or Indian Ocean Watch Bulletins (IO), or Local Tsunami Watch Bulletins (LTWB) or Tsunami Information Statements (TIS). Japan Meteorological Agency (J), issues the Northwest Pacific Tsunami Bulletins (NWPTA), or Indian Ocean Tsunami Watch Information Bulletins (TWI). When the West Coast/Alaska Tsunami Warning Center (A) issues a message it is also included. Epicenter depth from GCMT solutions, and $M_W$ from USGS (G), and $M_W$ from PTWC (P) at action time. Height measurements from tide gauges peak to trough or half peak to trough as indicated, otherwise measurement is the greatest value for either inundation or runup depending on the event.*

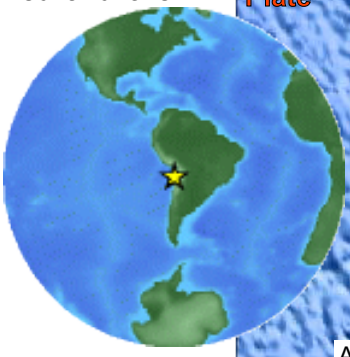
| DATE | TIME (UTC) | LOCATION | EPICENTER | DEPTH (km) | $M_w$ | PTWC (P) JMA (J), or WC/ATWC (A) ACTION | ACTION TIME (UTC) | TSUNAMI? DAMAGING? | MAXIMUM MEASUREMENT and LOCATION |
|---|---|---|---|---|---|---|---|---|---|
| 2 Oct | 18:00 | Alaska Peninsula | 54.511° N 161.708° W | 42 | 6.6 (P) 6.3 (GCMT) 6.2 (G) | TIB | 18:06 | NO | |
| 15 Oct | 12:30 | South Island of New Zealand | 44.785° S 167.538° E | 17 | 6.9 (P) 6.8 (GCMT) 6.7 (G) | TIB | 12:46 | NO | |
| 16 Oct | 21:06 | South of Fiji Islands | 25.775° S 179.530° E | 515 | 6.6 (GCMT, P) 6.5 (G) | TIB | 21:17 | NO | |
| 24 Oct | 21:03 | Southern Sumatra Island | 3.896° S 101.017° E | 20 | 7.0 (P) 6.9 (G) 6.8 (GCMT) | (IO) TIB 001 TB001 (IO) TIB 002-Cancellation | 21:14 21:32 22:46 | NO | |
| 31 Oct | 03:30 | Mariana Islands | 18.896° N 145.363° E | 214 | 7.2 (G, GCMT) 7.0 (P) | TIB NWPTA | 03:43 03:55 | NO | |
| 14 Nov | 15:41 | Northern Chile (Antofagasta) | 22.247° S 69.890° W | 38 | 7.7 (GCMT, P) 7.4 (G) | TIB 001-Warning TIB 002-Cancellation | 15:56 16:56 | YES | 25.5 cm (Peak-to trough) Antofagasta, Chile tide station |
| 15 Nov | 15:06 | Near Coast of Chile (Antofagasta) | 22.925° S 70.237° W | 19 | 6.8 (GCMT, P) 6.6 (G) | TIB | 15:36 | NO | |
| 16 Nov | 03:13 | Peru-Ecuador Border Region | 2.312° S 77.838° W | 114 | 6.8 (GCMT, P) 6.7 (G) | TIB | 03:25 | NO | |
| 22 Nov | 08:48 | Eastern New Guinea Region Papua New Guinea | 5.757° S 147.098° E | 56 | 6.7 (G, GCMT, P) | TIB NWPTA | 09:03 09:08 | NO | |
| 25 Nov | 16:02 | Sumbawa Region, Indonesia | 8.277° S 118.339° E | 25 | 6.7 (P) 6.5 (GCMT) 6.4 (G) | TIB TWI | 16:15 16:30 | NO | |
| 25 Nov | 19:53 | Sumbawa Region, Indonesia | 8.225° S 118.453° E | 20 | 6.5 (GCMT, P) 6.4 (G) | TIB NWPTA | 20:04 20:11 | NO | |
| 27 Nov | 11:50 | Solomon Islands | 10.950° S 162.149° E | 25 | 6.6 (GCMT, P) 6.4 (G) | TIB NWPTA | 12:02 12:05 | NO | |
| 29 Nov | 19:00 | Martinique Region, Windward Islands | 14.973° N 61.263° W | 151 | 7.4 (G, GCMT) 7.3 (P) | TIS | 19:09 | NO | |

## Earthquakes, *continued*

| DATE | TIME (UTC) | LOCATION | EPICENTER | DEPTH (km) | $M_w$ | PTWC (P) JMA (J), or WC/ATWC (A) ACTION | ACTION TIME (UTC) | TSUNAMI? DAMAGING? | MAXIMUM MEASUREMENT and LOCATION |
|---|---|---|---|---|---|---|---|---|---|
| 09 Dec | 07:28 | South of Fiji | 25.996° S 177.514° W | 144 | 7.9 (P) 7.8 (GCMT) 7.7 (G) | TIB | 07:50 | NO | |
| 16 Dec | 08:09 | Near Coast of Northern Chile | 22.954°S 70.182°W | 33 | 6.7 (G, GCMT) 6.6 (P) | TIB | 08:28 | NO | |
| 19 Dec | 09:30 | Andreanof Islands, Aleutian Islands | 51.363° N 179.522° W | 29 | 7.3 (P) 7.1 (GCMT) 7.0 (G) | TIB | 09:41 | NO | |
| 20 Dec | 07:55 | Off East Coast of North Island of New Zealand | 39.011° S 178.291° E | 30 | 6.6 (GCMT) 6.5 (G) 6.3 (P) | -- | -- | NO | |
| 26 Dec | 22:05 | Fox Islands, Aleutian Islands | 52.578° N 168.203° W | 14 | 6.5 (P) 6.4 (GCMT) 6.2 (G) | TIB | 22:41 | NO | |

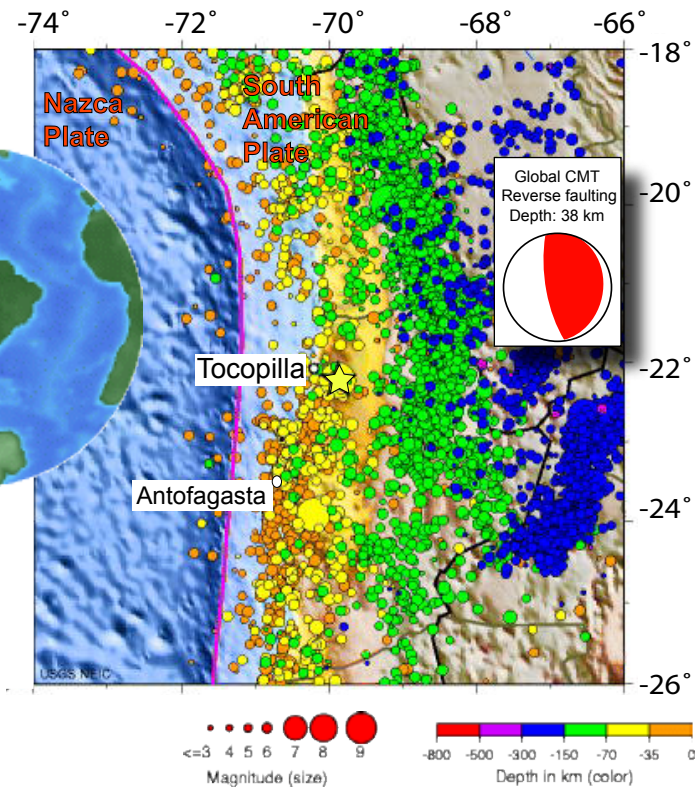
## Chile, 14 November 2007, 15:41 UTC, $M_W$=7.7

A large earthquake with a magnitude of 7.7 ($M_W$) occurred at 15:41 UTC 14 November 2007. (12:41, local time at the epicentre, Julian day 318). The earthquake was located 25 miles (40 km) East Southeast of Tocopilla, Chile. Two people were killed and over 45 injured and buildings damaged at Tocopilla. Further, twenty people were injured and buildings damaged at Maria Elena. Several thousand homes were destroyed or damaged, displacing about 15,000 people in the Maria Elena-Tocopilla area. Damage also occurred to buildings at Antofagasta and Calama. Power and telephone outages occurred at Antofagasta and Iquique. Felt reports came from across the region including reports from Bolivia, Argentina and Brazil.



According to the USGS summary of the event, tsunami wave heights in centimeters (peak-to-trough) were recorded at the following tide stations: 25.5 at Antofagasta, 19.5 at Arica, 9.5 at Caldera and 19.3 at Iquique. See the next page for a chart displaying tide records for the tsunami as compiled by the West Coast/Alaska Tsunami Warning Center.

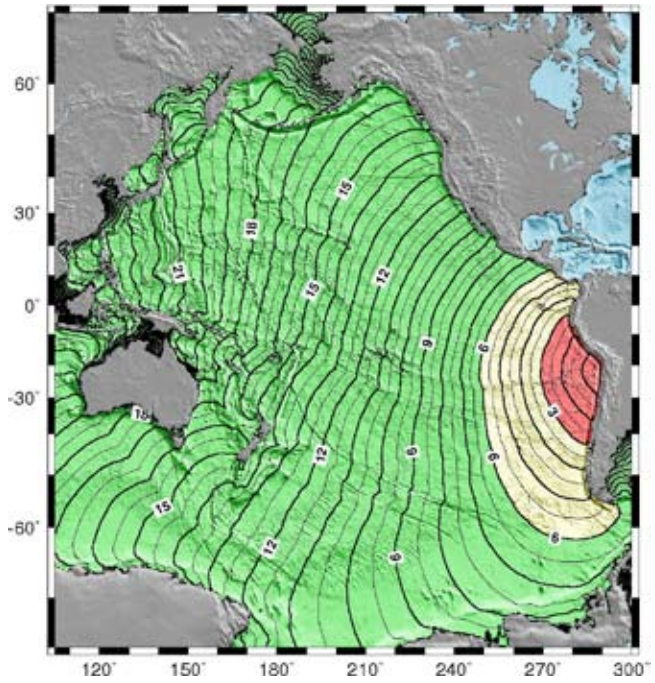
For additional information see the NOAA/Pacific Marine Environmental Lab web site, [http://nctr.pmel.noaa.gov/chile20071114.html](http://nctr.pmel.noaa.gov/chile20071114.html) where animations of calculated travel time and directivity are posted.



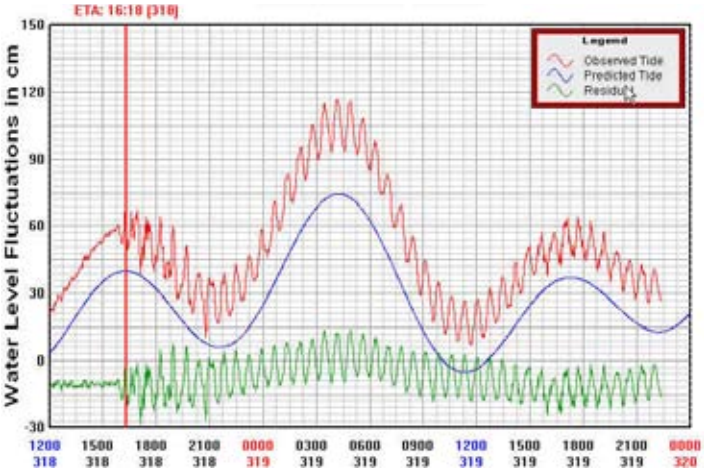

*Historical Seismicity for the area from 1990 to the present. The recent earthquake location and depth marked by a yellow star. Map courtesy of USGS National Earthquake Information Center (NEIC).*

**Chile,** *continued*

| Tide gage | Peak amplitude (above sea level in cm) | Observed initial arrival time (UTC) | Computed initial arrival time (UTC) | Initial motion | Sample interval (min.) |
|---|---|---|---|---|---|
| Antofagasta, Chile | 14 | 1552 | 1611 | fall | 2 |
| Iquique, Chile | 13 | 1617 | 1617 | rise | 2 |
| DART 32401, Chile | 2 | 1615 | 1626 | rise | 1 |
| Caldera, Chile | 7 | 1619 | 1629 | rise | 2 |
| Arica, Chile | 28 | 1638 | 1638 | rise | 2 |
| Coquimbo, Chile | 8 | 1659 | 1653 | rise | 2 |
| San Antonio, Chile | 6 | 1749 | | (?) | 2 |
| DART 32412, Chile | 1 | 1751 | | rise | 1 |
| Talcahuano, Chile | 14 | 1856(?) | 1819 | (?) | 2 |
| Puerto Williams, Chile | 2 | 2255 | 2249 | rise | 2 |
| Hilo, Hawaii | 8 | 0550 | 0539 | fall | 1 |
| Kahului, Hawaii | 8 | 0600 | 0559 | (?) | 1 |
| Pago Pago, American Samoa | 6 | 0640 | 0611 | (?) | 1 |

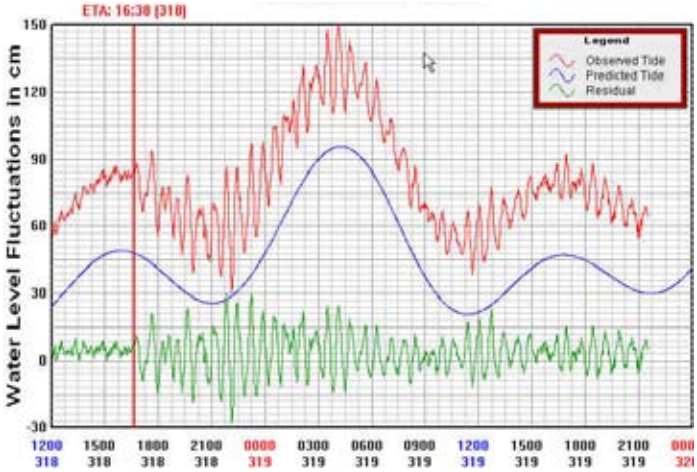



**Antofagasta, Chile**

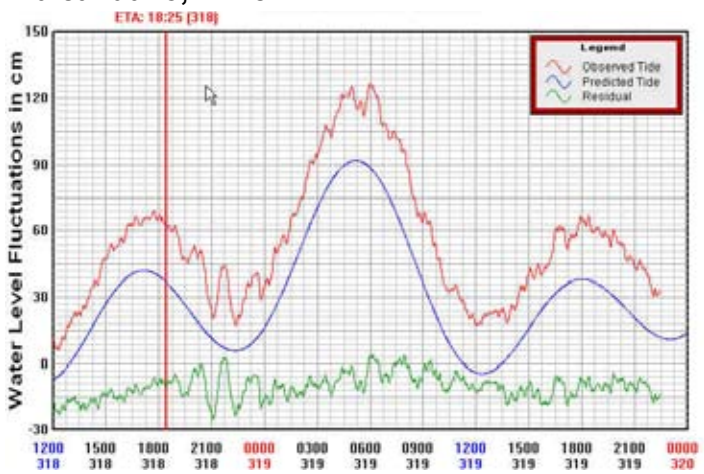



*Above, Chart showing the locations of tsunami measurement, with peak amplitudes, arrival times and initial motion. The data for each gage can be obtained from the West Coast/Alaska Tsunami Warning Center website. Left, Map showing the estimated travel time for the tsunami. Above and below, tide gauge records from tide stations in Chile. All this page, courtesy of WC/ATWC.*

**Arica, Chile**

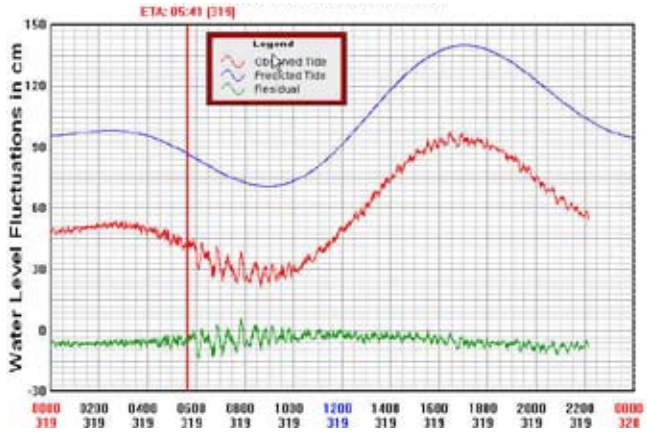



**Talcahuano, Chile**

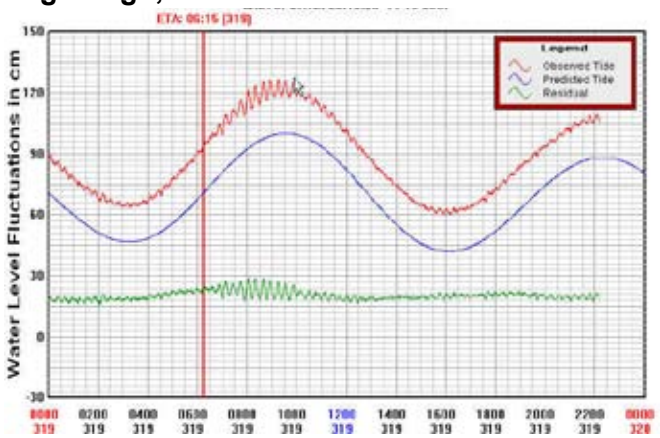


**Chile,** *continued*

**Hilo, Hawaii**




**Pago Pago, American Samoa**




*Above, tide gauge records from tide stations in Hilo, and Pago Pago. As on the previous page, 'observed arrival time' is the actual tsunami arrival time in UTC on gages where it could be determined. The 'computed arrival time' is the estimated time of arrival computed at the West Coast/Alaska Tsunami Warning Center (WC/ATWC) based on the origin time and location. The 'sample interval' column shows the time between samples (see graph). These records along with raw data from each tide gauge, can be obtained from the West Coast/Alaska Tsunami Warning Center website at: http://wcatwc.arh.noaa.gov/previous.events/11-14-07-Chile/11.14.07.html. Records courtesy of WC/ATWC.*

## IOC NEWS

### Caribbean Working Group Meeting 5-7 December 2007, Cartegena, Colombia

*by Brian Yanagi, Disaster Management Specialist, ITIC, Honolulu, Hawaii, e-mail: Brian.Yanagi@noaa.gov.*

A working group meeting of the UNESCO Intergovernmental Oceanographic Commission (IOC) Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG-CARIBE-EWS), was held in Cartegena, Colombia, 5-7 December 2007, under the leadership of ICG Vice-Chairs Israel Matos (NOAA/NWS Puerto Rico), and Gustavo Malave Bucce (Venezuela Seismological Agency). The working group (WG) meeting was attended by 33 participants from eight of the 29 ICG-CARIBE-EWS Member States, and other organizations.

The overall expected key outcomes of the meeting were outlined in a 2 November 2007 IOC Circular Letter to establish a Caribbean 'end to end' tsunami early warning and mitigation system. Moreover, the ICG Vice Chairs provided general guidance to the four working groups. Each working groug had a specific work plan, and elected a WG Chair and Vice Chair for a period of two years.

The four working groups are; Working Group 1: Monitoring and Detection Systems, Warning Guidance, Working Group 2: Hazard Assessment, Working Group 3: Warning, Dissemination and Communication, and Working Group 4: Preparedness, Readiness and Resilience.

*Participants of the ICG-CARIBE-EWS Working Group meeting in Cartegena, Colombia.*

Expert presentations were made by working group participants. Each working group deliberated and produced various strategies and recommendations to move forward. I was assigned to Working Group 4, which worked closely with the Caribbean Disaster Emergency Response Agency (CDERA), representing 16 English-speaking Caribbean nations.

Working group recommendations will be forwarded for approval to the next ICG-CARIBE-EWS General Session (III), to be conducted 12–14 March 2008 in Panama.

## TSUNAMI SIREN ALERT SYSTEMS COMPARISON, French and U.S. Systems

*by Denis Musson Former Director of Civil Protection and Defence in French Polynesia, Deputy Director of Civil Defense in 77 Department and François Schindelé : National representative of France of ICG/PTWS - expert senior tsunami CEA-DASE.*

Sirens are one of the methods used to rapidly notify the public of the approach of a tsunami. The following table examines siren parameters between two sample companies, the French Assystem and U.S. Federal Signal Corporation systems. Countries considering future purchase of sirens should review siren capacities.

| **Assystem** | **Federal Signal Corporation Federal Warning System** |
|---|---|
| French company, primarily an engineering and innovation consultancy firm, has developed a warning system for French Polynesia and New Caledonia. | Federal Warning Systems is dedicated to emergency warning systems:<br>• Outdoors<br>• Indoor; facilities wide<br>• City, County, State or Nationwide<br>• Any and every medium |
| Alert system by radio/satellite/GSM/phone<br>• Siren<br>• Voice (pre-recorded), any language<br>• Live voice (radio)<br>• Any wave form | All Hazards Alert Broadcasting (AHAB) Radio:<br>• Siren<br>• Voice (pre-recorded), any language<br>• Live voice (radio)<br>• Any wave form (i.e. Reveille) |
| 2 Models:<br>Model 1<br>136 dB (A) 120° to 360° (1 to 4 loudspeakers)<br>106 dB (A) sound pressure at 30 meters (100 ft.) on axis.<br>Model 2<br>132 to 152 dB (A) (2 to 20 loudspeakers) for 152dB(A) (20 loudspeakers)<br>122 dB (A) sound pressure at 32 meters (100 ft.) on axis. | The industry standard is dB (C frequency).<br>Outdoor warning sirens are rated at measured sound pressure at 100 feet on axis (which means in a direct line with the siren horns.)<br>The AHABs are rated at 125 dB (C) at 100 feet on axis. |
| Activation:<br>• By satellite (from multiple sites)-1 Inmarsat C satellite remote control allowing activation of 1 siren or group of sirens on island/archipelago<br>• Locally<br>• Phone/GMS/RF regionally | Activation:<br>• By satellite from Emergency Operations Cente (EOC), or<br>• Regionally by Radio Frequency (RF) or satellite using a PC-based control station |
| Remote monitoring<br>• Poll sirens collectively or individually to determine operational status<br>• Activation or failure to activate is noted.<br>• Daily report<br>• Activation notification (showing who activated the siren)<br>• All event notifications (mail/printers) | Remote monitoring<br>• Constant contact with all sirens. Any change is immediately communicated to Control Station (intrusion, loss of power, amp failure, Comm failure, ...)<br>• Activation notification (shows who activated the siren and how/why)<br>• Show failure to activate |

**Sirens**, *continued*

| | |
|---|---|
| Power:<br>• Battery powered design to insure performance, AC or solar used to charge batteries. | Power:<br>• Battery powered (U.S. FEMA-preferred design to insure performance when disaster strikes). AC and/or solar used to charge batteries. |
| Siren designed to withstand the elements. 2 Models:<br>Model 1 136 dB (A)<br>• Sirens are high power electronic sirens without any mechanical part.<br>• They are made of a waterproof steel electrical equipment box and 1 to 4 loudspeakers for 120° to 360°, polyester<br>Model 2 133 at 154 dB(A)<br>• Made of waterproof steel 2 to 20 loudspeakers. Aluminum<br>• Control and battery cabinets : IP54 | Siren designed to withstand the elements:<br>• Sirens are high power electronic sirens without any mechanical parts.<br>• Models are polyester powder coated aluminum.<br>• Control and battery cabinets are 4x stainless steel. |

## ITIC NEWS

### MEETINGS ATTENDED BY THE ITIC DURING THE INTERSESSIONAL PERIOD, October 2007 to December 2007

The ITIC Director and/or the Disaster Management Specialist participated in or organized the following trainings or meetings during the intersessional period. The ITIC provided technical expertise to Member States of the ICG/PTWS, and worked closely in exchange of information with the Secretariats of the Indian Ocean and Caribbean regions in building a global tsunami warning and mitigation system.

Meetings:
ITIC-Technical Expert:

- Incorporated Research Institutions for Seismology (IRIS) Global Seismic Network Meeting, New Mexico, USA, 17-20 Oct 2007.
- High-Performance Computing Meeting, Shenzen, China (Hong Kong), 26-29 Oct 2007.
- US National Tsunami Hazard Mitigation Program Meeting in Hawaii, USA, 30 October – 1 November.
- South Pacific Applied Geoscience Commission (SOPAC) Meeting, Tonga, 23 November – 1 December 2007.
- International Workshop on Coastal Disaster Prevention, Yokohama, Japan, 1-2 December 2007.
- Working Group Meetings of the UNESCO IOC - Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG-CARIBE-EWS), Cartegena, Colombia, 5-7 December 2007.

ITIC Hosting of visits to Hawaii:

- ITIC Associate Director and the Deputy Director of the Chilean Oceanographic Institute (SHOA), 30 November – 5 December 2007.
- Two Malaysian Meteorological Department scientists, 26 December, 2007 - 4 January, 2008.

### UNESCO/IOC International Tsunami Information Center ITSU Training Program (ITP), Hawaii 5-16 November, 2007 26 December 2007— 5 January 2008

The ITSU Training Programme (ITP)-Hawaii has been conducted by the ITIC nearly annually since the 1970s. The programme brings participants to Hawaii to learn about the actual operations of the Pacific Tsunami Warning and Mitigation System, and in doing so, helps countries to build and implement their national programmes, and at the same time, establish familiarity and networking with the PTWC and fellow Member States. Typically, the training length is two weeks. A specific agenda was customized according to the needs of participants. The training is through actual discussions with working organizations involved in the end-to-end warning system, and includes discussions on preparedness and community awareness building. The training has traditionally targeted PTWS participants. Upon interest and with funding, the ITIC is happy to arrange a similar training with focus on PTWS or IOTWS needs.

The ITP-Hawaii 2007 was conducted from 5-16 November 2007. ITIC hosted seven persons from the

**ITP reports,** *continued*

Pacific representing Tsunami Warning Systems and Disaster Management from Ecuador, the Federated States of Micronesia, Nicaragua, Samoa, Vietnam, and Vanuatu. The area of focus was on Standard Operating Procedures (SOPs) of tsunami warning centres and emergency operations centres, and the testing of SOPs through drills and exercises. Special emphasis was also given to telecommunications and methods for receiving and disseminating timely alerts. Participants were asked to create, modify, and discuss their country draft SOPs using guidance and template examples provided during the training. Lectures and/or tours were given by PTWC, University of Hawaii Sea Level Center, Hawaiian Volcano Observatory, Pacific Tsunami Museum, Hawaii State and County Civil Defense agencies, and the Hawaii State Earthquake Advisory Committee.

*ITP participants standing (from left to right): Philip Raffilpiy, Yap State Government Disaster Coordinating Office; Emilio Martinez, Nicaragua Institute of Territorial Studies; Brian Yanagi, ITIC; Samuel Unutoa, Samoa Electric Power Corporation; Nguyen Dung, Vietnam Academy of Science and Technology; and Antholino Net, Federated States of Micronesia Environment and Emergency Office. Sitting (l to r): Laura Kong, ITIC, Giorgio Morales, Ecuador Institute of Oceanography; Esline Gavaebiti, Vanuatu Department of Geology Mines and Water Resources.*

## ITP Trip Report—Federated States of Micronesia (FSM)

*by Philip Raffilpiy, Office of Planning & Budget/Disaster Coordinating Office, Yap State Government*

### Overview

The Intergovernmental Oceanographic Commission (IOC) and in particular the International Tsunami Information Center (ITIC), as part of its on-going functions, has put together this year's training for its member states and countries to the Intergovernmental Coordination Group of the Pacific Tsunami Warning System, known as ICG/PTWS. The ICG main purpose is to coordinate international tsunami mitigation activities, including the dissemination of timely tsunami warnings, watches, and advisory bulletins throughout the Pacific to member states in accordance with procedures set forth by the member states and countries. These procedures are compiled and outlined in the Users Guide that is usually distributed at every ICG/PTWS bi-annual meetings. The XXIII (23rd) ICG/PTWS meeting is tentatively scheduled to be in Samoa next February.

Unfortunately, FSM is not a member of the ICG/PTWS and was not eligible for funding under the IOC and ICG/PTWS technical assistance programs. However, IOC has encouraged and reaffirmed its support to expedite the membership at the International level if FSM take the initiatives and proceed with the membership documents through its Foreign Affairs Office.

### Trip Summary

ITP- HAWAII, 2007 aimed to provide:

1. *Guidance and understanding on the end-to-end tsunami warning and mitigation system which demonstrate close stakeholder coordination and partnership for operational warnings and preparedness activities;*
2. *Standard Operating Procedures (SOPs) for tsunami warning and emergency response plans;*
3. *Coordination and sharing of data with other governmental, institutions and member warning agencies;*
4. *Comprehensive information on geophysical analysis on plate tectonics in vulnerable locations around the Pacific, Indian and Atlantic Oceans, particularly the active subduction zones in the Pacific Ring of Fire;*
5. *Interactions with civil defense agencies and relevant emergency coordination offices in Oahu and Big Island (Hilo) including speakers from the universities.*
6. *Practical understanding of how to design and implement warning systems through learning of*

*Troy Kindred (left) Administration, Hawaii Copunty Civil Defense Agency, describes how Standard Operating Procedures (SOPs) are enacted on a 24/7 basis to alert the public of an approaching tsunami.*

**ITP reports,** *continued*

*real-life operation of the warning and emergency services.*

7. *Roles of regional, national and state warning and emergency services in monitoring and evaluating the tsunamigenic potential of earthquakes.*
8. *Understanding of the timely issuance of tsunami warning messages to emergency response services.*

It is important to note that my participant in this training is co-sponsored by the Office of Environment and Emergency Management Agency (FSM) and Yap State Government specifically the Office of Planning & Budget/State Disaster Coordinating Office. It is the first time that this kind of funding arrangement is done and also the first time to participate in the International Tsunami Information Center Training Program that is open to non-member states or countries to attend. Also attending the same training is Mr. Tony Neth from the FSM E&EMA who strongly support the challenges and is willing to embark on the mission to initiate and secure FSM membership to the IOC and latter the ICG/PTWS.

The primary purpose of my attending this training and that of the National Government was to cover issues relating to the component of the National and State emergency coordination and all hazard emergency responses that deal mostly with vulnerability and mitigation. We have learned so much about disaster management and yet we are still unable to effectively and efficiently coordinate response without solid data as well as accurate information. Unfortunately, we have to acquire most of the data from these regional and international emergency services. Also, in order to fully understand the formalities in joining the IOC (ICG/PTWS), our participation significantly helps as we interact with appropriate officials and know who they are as they direct and guide us toward understanding the process.

In short, we spent a week and half of training at the ITIC on Oahu, learning and exchanging ideas on issues of particular importance in each country attending the ITP. On the second day of the training, we were able to present our country (FSM) report on the structural location and present our "needs analysis" in Yap and the whole Nation. Several visits were made, particularly, to "Diamond Head" where Oahu Civil Defense is located, University of Hawaii – Manoa, and the UH Marine Observatory Lab. Also PTWC, with a role in a warning network that oversees and is responsible for technical assistance and providing warning services to the Pacific islands as well as the IOC member countries.


*A brief visit was made to the Pacitic Tsunami Museum in Hilo while the ITP was on the Big Island, during the later part of the course. The museum is housed in a former bank, which during the 1960 Chilean earthquake tsunami escaped damage with the water reaching only the front steps.*

November 13-16, the last three days of the ITP, was held on the "Big Island", where more visits and exchange of expertise and knowledge was gained from officials from the Hawaii County Civil Defense and the Hawaii Volcano Observatory including a brief visit to the Hawaii Tsunami Museum. Due to flight arrangements and limited flights to Micronesia, especially Yap and the rest of the FSM states, we departed Honolulu on November 16 on separate flights.

**Suggestions and recommendations**

While I have outlined the general purpose of the trip, more information and planning or efforts will have to be taken from our side in order to upgrade or improve our emergency response capacity. Hence, I recommend the following:

1. *Since the FSM Office Environment & Emergency Management Agency (OEEMA) is in place and also our direct representatives to international functions, they should take the lead in formalizing coordination with appropriate officials at the National level and pursue our IOC (ICG/PTWS) membership.*
2. *While we are working on the membership, funding should be made available so attendance at the 2009 ICG/PTWS in Samoa is secured. This Conference is important in that it will give us the opportunity to understand more on the effective communication and sharing of information on a regional and international level. This can also provide some insights on addressing the discrepancies found in our early warning systems including timely disseminations of tsunami warnings from the National to the states' level.*
3. *It is also important that activities being undertaken by other projects (EU grants, OFDA, FEMA, etc) relating to improving emergency response capacity should be identified and coordinated with the tasks*

**ITP reports,** *continued*

*under the NDP to improve data/information sharing.*

4. *Revisit the existing Disaster Preparedness Plan and write up SOPs for tsunami events in anticipation for future disaster.*
5. *OEEMA, as our focal point for international relations, should ensure they are in close collaboration with the ITIC on issues pertaining to the "end to end" warning systems and keep the states inform on the updates.*

**Conclusion**

Although the World is getting smaller and smaller due to the improved technology, we still need to maintain our efforts in ensuring that our islands are not compromised by natural disasters. It should be our primary role as disaster managers, information centers, and other warning institutions to keep a close dialogue with one another, especially to improve our disaster preparedness. Our dialogue will be complimented with the sophisticated warning systems ever designed by the developed countries.


*International Training Programme participants learned about emergency management operations at the Hawaii Country Civil Defense Agency in Hilo.*

I'd like to take this opportunity to thank Mr. Brian Yanagi and Laura Kong for extending the invitation to us. They have done so much to ensure we enjoy our training sessions. This particular training, in my personal view, has enhanced my knowledge to understand the process involved in analyzing tsunamigenic data from the original impact to the end users.

Now, these new information learnt will be applied or used during a disaster. Likewise, they can be tailored to fit our local needs. But most importantly, this new knowledge or the applications of such knowledge is beneficial and in line with my current role as a Warning Coordinator for the Yap State Disaster Coordinating Office.

## The Pacific Tsunami Warning and Mitigation System: Standard Operating Procedures for Tsunami Warning and Emergency Response 26 December 2007—5 January 2008

*by Zaidi bin Zainal Abidin and Asmadi bid Abdul Wahab, Malaysia Meteorological Agency.*

We would like to thank Dr Laura Kong, director for the ITIC for graciously accepting us for this training and we also like to thank all the watchstanders at the PTWC especially the director, Dr Charles "Chip" McCreery, for accommodating us in the PTWC and also Mr. Brian Yanagi with Mr. Peter Hirai for giving us the insight on how civil defense and PTWC cooperate successfully in disaster mitigation.

**Day 1: 26 December 2007**

We were grateful when we were warmly greeted by Dr Laura Kong after our long flight. We were then driven by Dr Laura Kong first to hotel to register and then to the ITIC to brief us on what we will be doing for next 10 days in our training. After that, she graciously sent us back to our hotel for a much needed rest.

PTWC (27- 31 December 2007). We went to the ITIC for a brief presentation on the workings of ITIC and the PTWC by Dr Laura Kong. After that we went to the PTWC where we observed and learned how the watchstanders do their work in monitoring the earthquake in the Pacific and the Indian Ocean. We learned about their work schedule, their areas of responsibility, how they operate and their cooperation with the civil defense in disaster mitigation. We learned that while their area of responsibility is the Pacific, they were also providing tsunami watches for the Indian Ocean. In addition, we learned that while the center detects earthquakes, the sole purpose is to analyze the observed earthquakes for possible tsunami.

While we were there, we were not only engaged in observing how and what the watchstanders did, we were invited in their meeting and also there are lectures and discussion with them. It was indeed an eye opener as one of the lecturers, Dr Gerard Fryer states that historically it is possible that there might be another 7.0 Richter magnitude earthquake in the Andaman Sea in the future. We were not sure whether this will generate tsunami again in the future but it is above the benchmark value that our department has set up for the tsunami alert.

It was interesting that there is a benchmark value of the earthquake parameter in order for the watchstanders

**ITP reports,** *continued*

to act to, whether to sound the alarm of tsunami or that the earthquake, while hit the threshold value do not generate any tsunami. When we were there, while it was fortunate that there was no tsunami or that there was no large earthquake abovc the threshold value, it is unfortunate that we were unable to see the watchstanders in action. Even when there is no huge earthquake that causes tsunami, the watchstanders do not stand idle. We observed that each of them has things to do, related to their job whether programming or research. The way we look at it, is that everyone of them is a scientist first and a watchstander second and each of them is a valuable asset to PTWC.

**ITIC (2, 3, 4 January 2008)**

On 2 January, we were given a short presentation by Brian Yanagi on how the State of Hawaii deals with natural disasters within Hawaii. After that we were taken on a tour to the City and County of Honolulu, Department of Emergency Management (DEM). We were given a short but concise presentation by DEM Deputy Director, Peter Hirai on what the department has been doing and its significant cooperation with PTWC. We learned of the hierarchical nature of the DEM, where the ultimate decision lies with the mayor of the county in deciding whether or not to sound sirens for the evacuation alert for a distant tsunami. We noticed that while PTWC acts as a center for tsunami warning for the Pacific, it is also bears responsibility for the tsunami alert for the state of Hawaii. However, here the ultimate responsibility lies with the mayor as the PTWC capacity is to advise the mayor. It is significant to note that in a local earthquake and tsunami event, where there are only minutes to react, the State of Hawaii has given permission to the PTWC to directly notify designated county 24 x 7 police dispatch services to activate their sirens, without first contacting the Mayor. It is also interesting to note that the DEM has a routine to check the communication lines daily within the State of Hawaii and testing sirens on the first working day of every month in order to confirm that the utilities are running smoothly. The DEM itself has a communication array at the top of the building to communicate within the nearby area.

*Zaidi bin Zainal Abidin and Asmadi bid Abdul Wahab, during their abbreviated training in Honolulu.*

On 3 January, we were given a presentation by Ms Yohko Igarashi on Japan Meteorological Agency's (JMA) capability in handling earthquake and tsunami generated earthquake. We learned that for Japan, the JMA had been doing such extensive tsunami modeling that they have over 100,000 simulations covering the coast of Japan. It is amazing that they are very prepared if there is any tsunami generated by earthquake at any location along the coast of Japan. They even have their own form of Mercalli intensity scale.

On the last day, we were briefed by Dr Laura Kong and summarized what we had been doing. In the end, what she said is truly enlightening. Even if we were to emulate PTWC, what PTWC has been doing is the result of years of evolution from its inception. What our country needs is to adopt what is necessary and modify it to become useful to our country. In conclusion, we would like to say mahalo to everyone from the ITIC and the PTWC who have been helpful to us while we were there.

## MEETINGS AND WORKSHOP SUMMARIES

### A Workshop on a System Approach for Tsunami Warning and Hazard Mitigation in the South China Sea Region, SCSTW 2007, Taiwan, 5-7 December 2007

The 2004 Sumatra-Andaman earthquake and Indian Ocean tsunami have highlighted inherent vulnerabilities of the world's coastal zones to extreme natural hazardous events. During the Indian Ocean tsunami, which lasted for only a few hours, nearly 300,000 people were killed and more than one million people were left homeless in 10 countries surrounding the Indian Ocean. Based on various reports, the total property damage is estimated over US$10 billion. Most of damage occurred because neither a tsunami warning system nor a simple communication network among the countries in the region was in place. Public education and coastal zone planning for tsunami hazard were also practically non-existent in the region.

## South China Sea, *continued*

Tsunami is a high impact, but a rare natural event. Another large tsunami similar to the 2004 Indian Ocean tsunami will occur somewhere on the earth sooner or later. Such an event can not be stopped. However, we can avoid a similar disaster by taking immediate actions towards establishing tsunami hazard mitigation programs and early tsunami warning systems in different parts of the world.

The South China Sea Region is defined as the group of countries surrounding the South China Sea (SCS), including China, Vietnam, Cambodia, Thailand, Malaysia, Singapore, Indonesia, Philippines and Taiwan. This region is known to be rich in natural and human resources and is expected to experience significant economical development and growth in this century.

**Workshop objectives**

In the South China Sea region coastal geography, geology, ecology, population and economic development vary significantly. While the best tsunami hazard mitigation programs need to be developed and implemented locally so that local environment and culture are considered, potential tsunamis are generated by same sources and propagate through the same South China Sea and therefore, an early warning system would be best developed regionally and collaboratively.

To understand the fundamental processes for tsunami, one needs to address the generation mechanisms, the propagation characteristics and, finally their coastal effects. Therefore, strong interactions and collaborations among coastal physical oceanographers, geophysicists, and engineers are necessary. The objective of the workshop is to create such a forum.

The specific objectives of the workshop included:

1. *To review the on-going tsunami early warning program for Indian Ocean region.*
2. *To review the on-going tsunami research in the South China Sea region.*
3. *To discuss the future research and implementation plans for tsunami early warning system and coastal hazard mitigation programs in the South China Sea region.*

After the 2004 Indian Ocean tsunami, many countries, including the United States, Japan, Germany and other European countries, have been working independently and collectively to develop tsunami warning systems for Indian Ocean region countries. To ensure the safety and protection of American lives and property from tsunami, the US government has also made plans to expand the U.S. tsunami detection and warning capabilities. The plan has committed more than $50 millions over the next several years to deploy 29 new deep ocean sensor systems in the Pacific Rim and Caribbean Sea.

Recently the USGS issued a report assessing the potential risk as a tsunami source along the entire Pacific seduction zones (A preliminary report USGS1 Tsunami Subduction Source Working Group). It identified the Manila (Luzon) Trench as a high risk zone, where the Eurasian Plate is actively subducting eastward underneath the Luzon volcanic arc on the Philippine Sea plate. Two other medium risk subduction zones in the neighboring area are also identified. Along the Ryukyu Trench the Philippine Sea Plate subducts northward beneath the Ryukyu Arc on the Eurasian Plate, while along the North Sulawesi Trench the Pacific-Philippine, Indo-Australian Plates and the Sunda Block meet. These subduction zones can also rupture and generate large tsunamis in the future that will have significant impacts on the countries in the South China Sea region.

It is clear that recent attention on tsunami hazard mitigation planning and early warning system development has been primarily focused on Indian Ocean, Pacific Ocean and the Caribbean Sea. Potential devastating tsunami disasters in the South China Sea region have been overlooked. During the recent 2007 NUS-TMSI workshop on “Earthquake and Tsunami: from Source to Hazard,” this concern was raised and discussed. The participants of the workshop supported the idea of forming a working group to initiate a study on a regional tsunami hazard mitigation plan and an early warning system in the South China Sea region.

## Kickoff of Mauritius and Mozambique Tsunami Capacity Building Project—October 2007

A Mauritius and Mozambique tsunami capacity building project was awarded to the ITIC on behalf of the IOC, and funded by the US Department of State.

The objective of the project is to increase the capacity of Mauritius and Mozambique to mitigate losses from tsunamis. This will be done by increasing the countries’ understanding of the end-to-end tsunami early warning process and informing them on mitigation efforts that they can initiate, implement and sustain to reduce the impacts from tsunamis. The project statement of work was divided into phases for assessing, implementing, and evaluating.

In detail, the primary outcomes of the project are expected to be:

- *Tsunami warning training materials that can be used around the world;*

**Project kickoff,** *continued*

- *Nationally-focused assessments identifying key next steps for building national tsunami warning and mitigation systems;*
- *Initiation of implementation of key next steps, including the development of standard operating procedures for tsunami warnings.*
- *National cadre of hazard professionals trained in the requirements of effective tsunami warning and mitigation systems;*
- *Enhanced stature for the IOC as a catalyst for national capacity building, regional coordination catalyst.*

Secondary outcomes of the project are expected to be:

- *Greater interest in countries in finding effective means to enhance real time data sharing and interoperability of warning systems to ensure that national systems can rely on effective regional tsunami warning centers for timely warnings; and*
- *Greater country commitment to implementing observing systems in coastal arenas where there are clear social benefits, hence a boost for the President's agenda on implementing the Global Earth Observing System of Systems.*

The outputs for this project, or the services that the ITIC will provide in order to achieve the Outcome, are trainings, workshops, or other consultation visits to Mauritius and Mozambique. The visits are to be carried out by experts who will work to achieve the project outcomes. Phase I was carried out to identify the most useful assistances. Phase II is intended to provide the assistances within the constraints of project funding. Phase III is intended to evaluate the effectiveness of the assistances and recommend next action steps to the country.

The project kicked off with Phase I scoping missions for Mauritius (October 2007) and Mozambique (January 2008), and Phase II training missions for the two countries throughout 2008. Contact points for the Project and the organization and logistics for missions are the National Tsunami Warning Focal points for each country. The project is scheduled to be completed by the end of 2008. Phase I missions met with key stakeholders to identify needs and priorities which the Project could assist with. During each Phase I mission, a 1-day workshop was convened with stakeholders to provide an overview of the tsunami warning and mitigation systems. These stakeholders comprise the National Tsunami Warning Center (Meteorological Service), sea level and seismic monitoring agencies, disaster management and emergency response agencies, port or harbor authorities, education and planning agencies,


*ITIC's Brian Yanagi, addressing a group of national stakeholder agencies in Mauritius.*

research science agencies or universities, and non-government agencies such as the Red Cross, and the media. For each country, the Project liaised with and briefed the US Embassy on this mission, and was provided with local logistics support. All missions generated local media coverage. A Phase II mission for Mauritius (January 2008) provided training in Seismology and Tsunami Warnings for 25 stakeholders, principally the Meteorological Services, was carried out in cooperation with the U.S Geological Survey (USGS); Phase II 2008 missions will focus on strengthening their seismic monitoring system, building on the seismic station installation contributed by the IOC, and on tsunami emergency response and evacuation in April and May, 2008 using experienced, practicing experts. Phase II assistance to Mozambique will focus on strengthening their tsunami warning centre, seismic and sea level monitoring, and in contributing to the development of Portuguese-language tsunami awareness materials; coordination and cooperation with Germany and the USGS is planned. Based on the outcomes of the Phase I scoping, the IOC will be able to provide significant equipment contributions to Mozambique stakeholders to improve their capabilities to receive and analyze tsunami, sea level, and seismic data.

The ITIC and IOC will conduct the final Phase III missions to evaluate the effectiveness and impact of the Phase II efforts and work with the country to identify next steps.

## Gender, *continued*

account. Men are usually seen as primary income generators while women's economic activities, often the mainstay of the household economy, are less visible. Women carry the primary responsibility for the care of children, the elderly, the disabled and the ill, whose mobility and survival in disasters may be limited. Sex-specific dependencies and vulnerabilities based on reproductive differences are relevant in disasters, as is the respective ability of women and men to participate fully in household, community and national decision-making about hazard and risk.

### Disasters: increased impact

During the past decade, natural hazards, such as earthquakes, landslides, droughts, floods, storms and tropical cyclomes, wildfires and volcanic eruptions, resulted in significant losses in human life and livelihoods, the destruction of economic and social infrastructure, as well as environmental damage. According to the reinsurance industry, economic losses have increased more than 10 times each decade during the last four decades. Losses from water-related disasters far exceed others: some statistics indicate 80-90 per cent of losses are due to floods.[2]

Anecdotal evidence suggests that women are typically the most affected by disasters[3]. Men lose their lives more often than women due, in part, to their use of hazardous machinery in emergency relief efforts and during the rebuilding phase. In contrast, women were highly over-represented among the 120,000 people killed in the 1991 cyclone in Bangladesh, because cultural norms constrained their access to emergency warnings and cyclone shelters.

*"In the smallest islands of Micronesia, virtually inaccessible except by cargo ship, society functions with very clear gender roles. Men are generally responsible for things related to the ocean and women are responsible for land-based (and near-shore reef-based) activites. These everyday responsibilities translate easily into preparatiory activities of an oncoming hazard, such as a typhoon, where the men secure the structures, canoes and objects needed for fishing, etc. and the women gather plant cuttings, prop banana trees, and gather food and water and families in a designated shelter where everyone awaits the storm. Afterwards, men rebuild structures and women and children father the salvageable palms and food, women weave thatch, and replant the gardens." (Cheryl Anderson, Science Research Institute, University of Hawaii)*

Gender relations structure is part of the social and cultural context that shapes a community's ability to anticipate, prepare for, survive, cope with, and recover from, disasters. In re-settling, extended families have been divided in many instances, leaving the old more vulnerable without the family support. Although the loss of women's home-based work space, supplies and equipment can have serious repercussions for the household economy, these losses are rarely documented.

*Mangrove planting by volunteers saves lives and money in Viet Nam. Since 1994, the Viet Nam Red Cross has been planting and protecting mangrove forests in the north of the country to protect the coastal population from typhoons and storms. (Photo: Viet Nam Red Cross)*

In both rural and urban households hit by Hurricane Mitch in Central America in 1998, significant increases were reported in rates of female headship, which doubled by some accounts. A year after the devastating storm, Honduran relief workers reported that half the households still sheltered were maintained solely by women; in Nicaragua, 40 per cent were female-maintained[4].

*"The capacity of human societies to withstand disasters is primarily determined by the internal strengths and weaknesses of the society inquestion: namely, its level of social,economic and cultural development or vulnerability. Capacities to cope are different, depending on the class, gender, age and background (indigenous or not), etc., of the affected communities." (Briceño, Director, UN/ISDR)*

### Women–agents of change

Nevertheless, women are not only victims, they are also agents of change. Further, women and men, working together, can identify those hazards that are threats to their homes and livelihoods and work together to build safer communities. Some examples illustrate how this can be done.

### Gender-sensitive risk-assessment model in the Caribbean[5]

Women's community-based organizations in the Dominican Republic and St. Lucia participated in an exploratory project to map risk in the communities, including the daily disasters that shape low-income women's lives and the hurricanes, landslides, and fires to which they are exposed. With training in basic research methods, the women conducted interviews, recorded

**Gender,** *continued*

life histories, developed photo essays and drew risk maps to assess their own strengths and the dangers they face. This information was then compiled into community vulnerability profiles to be used by community leaders and shared with local emergency managers. A set of practical guidelines was developed to help guide women's and other community groups in community-based action research to assess risk. This model is being tested in El Salvador and Cominica and will be revised accordingly.

**Reducing women's risk, capitalizing on window of opportunity after Hurricane** Mitch

Several studies show that increased violence against women is often a secondary effect of post disaster stress all over the world. The NGO, *Puntos de Encuentro* was particularly active after Hurricane Mitch in Nicaragua, conducting a major household survey, participating in a social audit, launching public education campaigns and developing workshops on women and reconstruction. To mitigate possible violence against women in the aftermath, *Punto de Encuentro* integrated antiviolence education directly into post-disaster recovery work. Working through various media outlets, they developed a community education campaign to transmit this message: "Violence against women is one disaster that men can prevent". One observer recalled:

> *It is clear from the looks on participants' faces that this workshop is not only enabling them to work through the emotional difficulty of post-traumatic stress but also to consider the need for transforming gender roles in their community.*

*"The women who lost all their....belongings and their life savings in India, after the recurrent floods of the monsoons.....have not been able to compensate their losses even after decades. This situation has threatened their security within the family relationship. Children (both girls and boys) dropped out of school. And young girls, whose families lost their savings and jewellery.....which were to provide their dowry in marriage, either lost the opportunity or had to delay getting married, which has serious implications for their social status, psychology and survival." (Madhavi Ariyabandu, Programme Manager for Disaster Mitigation of Intermediate Technology Development Group-South Asia, an NGO based in Sri Lanka).*

Like other NGOs and women's groups, *Puntos de Encuentro* was highly involved in hurricane relief and recovery but went much further. Their proactive work around violence against women seems likely to help mitigate violence against women in future disasters and is a model for capitalizing on the window of opportunity to challenge structural inequalities that undermine community solidarity in the face of disaster.[6]

Womens' efforts pay off. When the rural town La Masica, Honduras, reported no deaths after hurricane *Mitch*, some applauded women's extensive involvement in community education programmes undertaken by a programme channeled through the Central American Disaster Prevention Centre with German support, months earlier. A study conducted by the Inter-American Development Bank[7] in the aftermath of the hurricane stated:

> *Gender lectures were given and, consequently, the community decided that men and women should particpate equally in all hazard management activities. When Mitch struck, the municipality was prepared and vacated the area promptly, thus avoiding deaths....Women also took over from men who had abandoned the task of continuous monitoring of the early warning system.*

Some 20 years earlier, a similar pattern developed in Honduras after Hurricane Fifi, when women stepped in to carry on the soil-conservation measures abandoned by men.

**Reducing social vulnerabilities: skills training for women following disasters**

Increased opportunities for non-traditional skills building and employments are often reported in the wake of natural disasters, although the gendered division of labour defines the broad contours of both women's and men's emergency response work. In India, women received skills training in safe housing-constructions techniques after the Latur and Gujarat earthquakes in India, working through community based women's groups, mitigation agencies and government recovery programmes. They also helped redesign new homes better suited to their needs as workers whose homes are workplaces as well as residences. Some accounts from the USA suggest that, after a flood or a hurricane, women may manage home construction, organize work crews, learn and practice new home-repair skills and negotiate with insurance agents to rebuild their homes. Some work in warehouses, landscaping, and construction during the recovery period.

This is also evident in Montserrat when half the population was displaced due to widespread volcanic eruption. Women there started a new group called *Women on the Move* which assisted women displaced from their homes and workplaces by offering skills training in both traditional and nontraditional fields such as information technologies. Through their efforts, more work became available for more women on male-dominated construction sites and women gained in self-confidence and economic independence. The group's consensual decision-making process reportedly helped unite women traumatized by this unfolding disaster, robbing them of their way of life. Not only did *Women on the Move* advance women's long-term recovery, it also fostered faith

**Gender,** *continued*

in women's "own ability to shape and direct their lives" and encouraged women to "enter into new relationships with their men and the society in which they live."[8]

**Early warnings and getting the message across—overcoming the barriers**

Cheryl Anderson, University of Hawaii, gives some examples from recent studies which illustrate how women are excluded from timely and understandable early warning information. She recounts that a colleague's research in a Peruvian fishing village focused on forecasting methods and impacts from climate variability, specifically an El Niño-Southern Oscillation (ENSO) event. After a strong El Niño event, it was discovered that the fisherman had been warned about the upcoming conditions, because th climate forecasters issued warnings to those who would be directly impacted. The result of the ENSO warm event was increased poverty, unemployment and harsh economic conditions. The women in the village manage the household budgets. Had they known about the onset of ENSO, they would have saved more household funds and budgeted expenses differently to prepare for the event. For some sociocultural reason, the men did not discuss the warnings with their wives and continued to spend their money without regard to their future situation. One of the problems with male-dominated networks of information is that women are primarily responsible for gardening/agriculture, securing land-based food resources, and budgeting water resources for household consumption and gardening in these places. Without access to information, they cannot minimize risks associated with their regular activities.

On a more positive note, Cheryl continues with an example of a study in Hawaii. During the 1997/1998 El Niño event, women participated as community educators and there were three locations out of seven in the study where a few women participated on the ENSO task forces to mitigate drought. These women were responsible for developing public education and awareness programmes. Information was carried from village to village and public service announcements were broadcast on radio and television. The drought impacts were severe but would have been much worse without the penetration of information that resulted in conservation and public health programmes. The campaign to treat water before drinking (where rivers had dried considerably and groundwater was limited and/or suspect) actually reduced the recorded incidence of reported diarrhoeal disease significantly. This is an example where targeting women with forecasts and warnings may have some direct bearing on reducing the impacts of hazards.

*Gender: While the sex of an individual is biologically determined, gender refers to the socially constructed and adopted roles and relationships that society imposes on men and women. Gender is culturally specific and changes over time. Most societies are characterized by a male bias: the male norm is taken as a norm for society as a whole. Gender perspectives are "those which bring to conscious awareness how the roles, attitudes and relationships of women and men function to the detriment of women: according to the United Nations Development Fund for Women (UNIFEM). A focus on gender stresses the identification of different needs of the community and the formulation of policies that address those needs, prioritizing equality of opportunity.*

*Gender analysis: Gender analysis inovlved the collection and use of sex-disaggregated data that reveal the roles and responsibilities of men and women that should be fed into the policy process. The analysis assesses how existing and future policies and programmes potentially affect men and women differently.*

*Gender mainstreaming: This is the process of bringing a gender perspective into the mainstream activities of governments at all levels, as a means of promoting the role of women in the field of development, integrating women's values into development work. Gender mainstreaming in disaster reduction refers to fostering awareness about gender equity and equality, to help reduce the impact of disasters, and to incorporate gender analysis in disaster management, risk reduction and sustainable development to decrease vulnerability.*

*Link to sustainable development: State leaders at the World Summit on Sustainable Development (Johannesburg, South Africa, 26 August-4 September 2002) recognized that disasters are a major threat to development and adopted a set of specific actions to address disaster risk in the Plan of Implementation.*

*Disaster reduction is about taking measures in advance to address vulnerabilities, reduce risk and anticipate hazards. They involve environmental protection, social equity and economic growth, the three cornerstones of sustainable development. "Development that is not engendered is endangered."*

**When radios aren't enough**

Another study, reported by Emma Archer (International Research Institute for Climate Prediction/ Columbia University/ National Oceanic Atmospheric Administration, USA/South Africa) found that women farmers in South Africa (particularly those who are not the head of the household) prefer seasonal climate forecast information to be made available through the extension officer of school, rather than the radio (preferred by male interviewees):

*The farmers state that, in attempting to balance farming, child care and other domestic responsibilities, they are less able to schedule a fixed time to listen to the radio. They also prefer information to be provided on site, in an environment where queries can be handled immediately, and discussion can take place. This confirms a growing sense in the climate impacts and applications commu-*

**Gender,** *continued*

*nity that women are a crucially underserved clientele.*

Radios and TVs are not always found in homes. Rainula Rodriquez, International Institute for Disaster Risk Management, Philippines, says:

*In some countries (Bangladesh, among others), women who are confined to the house or family plot have no access through radio, TV or otherwise to warning information. This may seem self-evident, but there are many examples of how this is not considered—most warning programmes being designed as one–model–fits–all. Therefore, not only is there a need to develop gender/culture/economic ... sensitive warning systems, but also to ensure that the other key elements are in place, in particular focused information, education and public awareness programmes and the necessary support for women and children to act on the warning. Preparing to leave an area about to be hit by a cyclone can mean taking with you some very cumbersome assets which are basic to survival in 'normal' times*.

In many regions, women have been engaged in risk-reduction activities outside fomalized programmes. For example, on the fragile charlands inhabited by poor people in Bangladesh, women engage in extensive homestead gardening and raise crops with medicinal properties for home-health care. Preserving seeds, conserving water, composting to improve poor char soil, constructing housing resistant to strong winds and planting seedlings to stabilitize the shifting charlands are common activities developed over time by women to make life safer during floods.

These examples contributing to the shaping of the future programme of action for disaster reductions should continue to be nurtured and supported by policies, data and analyses that take into consideration the roles and needs of both women and men.

**Understanding the scope of disaster and risk reduction**

The United Nations adopted the International Strategy for Disaster Reduction in 2002, as a partnership with governments, UN agencies, regional bodies, civil society and communities, to further pursue awareness and public commitment to vulnerability and risk reduction, expanded partnership and networking, as well as research and implementation on hazards, risk and specific disaster reduction measures. Disaster reduction, as envisioned within the ISDR framework, aims to build disasater-resilient societies and communities to withstand natural hazards and related technological and environemtnal disasters, and reduce environmental, human, economic and social losses.

ISDR, in addition, supports international cooperation to reduce the impacts of the El Niño phenomenon and

*Women's impoverishment and economic insecurity undermine resilience to disasters as do their high levels of malnutrition and chronic illness, low levels of schooling and literacy, lack of information and training, inadequate transportation, and cultural limitations on mobility. Caring for others takes many women's lives when sudden choices must be made about self-preservation or rescue of children and others. (Photo: PAHO/WHO)*

other climate variability and to strengthen early warning capactities for disaster reduction. One of the main partners within the Strategy for this purpose is WMO. WMO chairs the Working Group on Climate and Disasters of the Inter-Agency Task Force on Disaster Reduction within the ISDR.

For a comprehensive understanding of the scope of disaster reduction, the graphic representation on the first page, describes the main context and activities, including elements necessary for gender-sensitive strategies. It is important to stress that gender equality in disaster reduction policies and measures require promoting women to have an increasing role in leadership, management and decision-making, as well as recognizing womens' positions in their community and the larger society. Since disaster-reduction activities are part of development, they are linked to promoting the general welfare of societies, without increasing the risk to hazards.

Disaster-reduction strategies include vulnerability and risk assessments, as well as a number of institutional capacities and operational abilities. The assessment of the vulnerability of critical facilities, social and economic infrastructure, the use of effective early warning systems, land-use planning, environmental management and the application of many different types of scientific, technical and other skilled abilities are essential features of a disaster reduction strategy.

The sharing of information and experience, both for the purposes of public information and all forms of education and professional training, is as important for creating a

**Gender,** *continued*

safety culture as the crucial involvement of local community action and new forms of partnership motivated by cooperation and shared responsibilities. Above all, functions associated with disaster reduction need to be viewed not as an expense, but as an investment in a society's future.

Consideration of the needs and roles of women is crucial in this context. There are fundamental elements in every disaster reduction strategy, but the priorities, relative emphasis, available resources, and specific ways of implementation must take into account practices that are most suited to local conditions, understanding and effectiveness.

*For more information, contact the UN/ISDR: isdr@un.org or molinvales@un.org (one of the authors of this article) or visit the ISDR websites: www.unisdr.org or www.eird.org (Elaine Enarson collaborated with the ISDR Secretariate in compiling examples). The results from the on-line debate quoted in the article can be found at: www.un.org/womenwatch/daw/csw/env_mange/.*

**Notes:**

*1 Prepared by the Inter-agency Secretariat for the International Strategy for Disaster Reduction (UN/ISDR), Geneva. The UN/ISDR collaborated with the United Nations Division for the Advancement of Women in the organization of the Expert Meeting on Environmental Management and the Mitigation of Natural Disasters: a Gender Perspective (Ankara, Turkey, 6-9 November 2001). Prior to that meeting, a fruitful online debate took place in October 2001, moderated by Elaine Enarson, expert in gender and disasters. Many of the arguments and examples reflected in this article are based on the ideas and experiences shared during the online debate and the expert meeting, and a paper prepared by the UN/ISDR for the Commission on the Status of Women, 6 March 2002.*

*2 Figures are higher if the consequences of the many smaller and unrecorded disasters at the community level are taken into account.*

*3 No systematic sex disaggregated data are available.*

*4 Patricia Delaney and Elizabeth Shrader, 2000: Gender and Post-disaster Reconstruction: the case of Hurricane Mitch in Honduras and Nicaragua.*

*5 E. Enarson with Lourdes Meyreles, Betty Hearn Morrow, Audrey Mullings and Judith Soares: Working With Women at Risk: Practical Guidelines for Assessing Local Disaster Risk (www.fiu.edu/~lsbr).*

*6 Patricia Delaney and Elizabeth Shrader, 2000: Gender and Post-disaster Reconstruction: the case of Hurricane Mitch in Honduras and Nicaragua.*

*7 Mayra Buvini, 1999, "Hurricane Mitch: Women's Needs and Contributions. Inter-American Development Bank", Sustainable Development Department Technical Papers Series.*

*8 Adapted from Judith Soares and A. Mullings, 2002: "'A we run tings': women rebuilding Montserrat", in: G.D. Howe and Howard Fergus (Eds.), A Will to Survive: Volcanic Impact and Crisis Mitigation in Montserrat. Jamaica: University of the West Indies Press.*