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**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)**

**Twentieth Session of the International Co-ordination Group
for the Tsunami Warning System in the Pacific (ICG/ITSU)**

3 – 7 October 2005

**REPORT OF THE DIRECTOR OF
THE INTERNATIONAL TSUNAMI INFORMATION CENTRE
ON INTERSESSIONAL ACTIVITIES**

1. INTRODUCTION

The December 26, 2004 Indian Ocean tsunami has tragically demonstrated the urgent need for early warning systems that provide timely understandable warnings which motivate ordinary citizens to quickly move out of harm's way.

On 26 December 2004, there was no tsunami warning system in the Indian Ocean. Specifically, there was no warning center, inadequate regional seismic networks, no network of remotely reporting sea level gauges, no designated national authorities for tsunami warnings, no communications methods to reach potential authorities, no tsunami-educated emergency managers or local tsunami experts, no communications to disseminate warnings to coastal regions at risk, and painfully little tsunami awareness. Those were the plain facts. On that quiet afternoon of Christmas Day in Ewa Beach, Hawaii, the PTWC, with its staff of three that immediately came of duty, was confronted with an extraordinary event off northwestern Sumatra, Indonesia which evolved over hours and the next days to result in the world's worst tsunami catastrophe. The casualties and destruction occurred across the Indian Ocean basin, striking Thailand, Sri Lanka, India, and the Maldives and then Somalia, northeastern Africa eight hours afterward. Altogether, it is estimated that more than 200,000 people lost their lives in the great earthquake and ensuing tsunami, and it was these circumstances that immediately bolted the world's leaders on January 6, 2005 to immediately call for the establishment a tsunami warning system to protect against this fatal, but infrequent hazard.

As envisioned, the system should consist of a coordinated network of national systems whose assets are owned and operated by each of them. The systems should be developed within a multi-hazard framework using up-to-date global information systems and international data sharing standards to support national monitoring, warning and response, and with national coordination that builds local community-based empowerment for tsunami preparedness, education, and response. Once a real-time monitoring system, which could be deployed relatively quickly, is put in place though, a system must exist for disseminating those national warning and wave forecasts to specific regions and for local emergency officials to decide when a warning means that an evacuation is needed for their coastal communities. So, preparedness needs to occur to educate every citizen on the dangers of tsunamis and what to do, and emergency response plans need to be put in place for every at-risk area - and this is what could take years.

Over the past 40 years, the ITIC has built up tremendous expertise and experience in all aspects of tsunami warning and mitigation, and stands ready to assist all Member States to achieve effective and durable systems which will protect future generations from this infrequent hazard.

In order to better assist in these efforts, the USA has increased its contributions to the ITSU through increased staffing of the IOC ITIC.

In July and August 2005, the NOAA NWS added three full-time staff to the ITIC. The ITIC Staff now consists of the Director (to be seconded to IOC by NOAA, Dr. Laura Kong), Associate Director (provided by Chile, Emilio Lorca), Deputy Director / Office Manager (NOAA NWS, Brian Yanagi), Technical Information Specialist (NOAA NWS, Linda Sjogren), Information Technology Specialist (NOAA NWS, Tammy Kaitoku), and Secretary (1-year temporary, Pauline Benjamin).

Finally, the IOC plans to formally designate the ITIC as a Programme Office of the IOC in order to provide clear capacity building support as part of the IOC Tsunami Programme.

2. MAIN IOC MEETINGS DURING THE INTERSESSIONAL PERIOD ATTENDED BY THE ITIC DIRECTOR

- 2.1 The ICG/ITSU Officers met 6-10 December 2004 in Honolulu, Hawaii. The meeting was hosted by the ITIC, and attended by the ITSU Chairman, Vice-Chairman / PTWC Director, ITIC Director and Associate Director, IOC ITSU Technical Secretary, and the Chilean ITSU National Contact, whose country will host the XXth session of the ICG/ITSU. During the meeting, the Officers reviewed the progress achieved by the ICG/ITSU since ITSU-XIX (29 September – 2 October 2003), identified problems encountered in the programme implementation and identified actions needed for the successful preparation of ITSU-XX, paying special attention to the limited resources available for the Tsunami Programme.

Among the topics identified for action were: 1) the need to update the ITSU Master Plan taking into account the important components identified by the Working Group on a Comprehensive Tsunami Hazard Reduction Program; 2) the need to improve the real-time availability of sea level data in the Pacific through upgrades to existing systems, installation of new stations, and enabling of more frequent transmissions; 3) the desire to enable capability for real-time access to all sea level data by other centers through, for example, an Auto-Data Request Manager system; 4) the plan for the re-design and re-structuring of the ITSU web site as the ITIC web site hosted in Paris; 5) the need for increased support and service to Central America and the Southwest Pacific who have indicated an interest in establishing sub-regional warning systems; and 6) the need conduct the ITSU Programme Review.

For the Programme Review, the ITSU Officers met with the ITSU Review Committee Chair Dr. Costas Synolakis of the University of Southern California to identify a plan of action. The ITSU Officers also met with the Chairman for the IOC GLOSS Group of Experts, Dr. Mark Merrifield, Director of the University of Hawaii Sea Level Center (UHSLC), to discuss closer coordination and collaboration with GLOSS and the UHSLC for upgrades and maintenance. On 9 December 2005, the Officers attended the semi-annual meeting of the Hawaii Tsunami Technical Review Committee (TTRC), where the ITSU Chairman made a presentation. The TTRC is sponsored by the Hawaii State Civil Defense as the statewide all-stakeholder tsunami coordination committee.

The Summary Report can be found

http://ioc3.unesco.org/itic/files.php?action=viewfile&fid=290&fcid_id=193

- 2.2 While implementation of the Indian Ocean tsunami warning and mitigation system is being pursued with highest urgency, the tsunami hazard exists in all oceans and seas and it is likely that the next tsunami catastrophe will occur outside the Indian Ocean. In response and drawing upon the experience of the 40-year system in the Pacific, the IOC of UNESCO is leading the effort to build tsunami warning systems globally. At the 23rd Session of the IOC, Intergovernmental Coordination Groups for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARTWS), and the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS)) were established, demonstrating the high-level commitment by governments to initiate comprehensive tsunami risk reduction programmes. An ad hoc Working Group was also established to prepare a Framework for the Global Tsunami and other Ocean-related Hazards Early Warning System, and will report back at the 39th Session of the IOC Executive Council in June 2006.

During the Session, the ITIC Director gave the 2005 N.K. Panikkar Memorial Lecture on “People-Centred Tsunami Early Warning Systems: The Challenge of Building Preparedness at the National and Local Levels.” The ITIC Director, as part of the IOC Secretariat, also

staffed the Sessional Working Group for establishing a framework for the global tsunami and ocean-related hazards early warning system.

3. **MAIN MEETINGS ATTENDED BY THE ITIC DIRECTOR ON TSUNAMI WARNING SYSTEM IMPLEMENTATION GLOBALLY, INCLUDING THE INDIAN OCEAN, WHERE THE EXPERIENCE OF THE ICG/ITSU WAS SHARED**

3.1 In the Interseasonal period from October 2003 through 2004, prior to the 26 December tsunami, the ITIC Director participated in a number of activities in support of enhancing tsunami warning and mitigation systems in the Pacific. These included the following:

- a. **Second International Conference on Early Warning – Integrating Early Warning into Public Policy, 16-18 October 2003, Bonn, Germany.** The ITIC Director gave a talk on Tsunami Early Warning Systems using examples from Japan and the USA as mature operational tsunami warning systems. The ITIC Director also met with the El Salvador ITSU National Contact regarding the implementation of the Central America Regional Tsunami Warning System, training needs, and the re-initialization of sea level data transfer from currently installed, but non-working RONMAC project stations. In January, 2004, the PTWC installed two new sea level stations in Nicaragua and El Salvador. The ITIC Director met representatives from the Asian Disaster Reduction Center to discuss ITSU collaboration in tsunami mitigation with ADRC member countries.
- b. **NSF Caribbean Tsunami Workshop, 30-31 March 2004, Puerto Rico Tsunami Technical Review Committee (TTRC), 1 April 2004, San Juan, Puerto Rico, USA.** The ITIC Director and the PTWC Director participated in this US National Science Foundation sponsored workshop focused on increasing awareness in the international tsunami community of the Caribbean Sea tsunami hazard and on the diversity of tsunami-generating sources in the region. The workshop also served as a motivation for the tsunami modeling community to apply their skill and knowledge in addressing the regional tsunami threat which, when combined with the huge increase in coastal development, creates a potentially worrisome scenario. As the last destructive tsunami occurred more than 50 years ago (1946), this is of serious concern for the regional emergency response authorities because of the complacency caused by the infrequency of the event.

The final Workshop goal was to continue discussions for the establishment of a Regional Tsunami Warning Center in the Caribbean. Towards that goal, the ITIC and PTWC Directors participated in the kick-off meeting for the Puerto Rico TTRC. Modelled after the successful Hawaii TTRC, this tsunami coordinating committee, consisting of federal, state, and local tsunami warning stakeholders in the territory of Puerto Rico, meets regularly to discuss and coordinate the most effective tsunami warning system for Puerto Rico and the US Virgin Islands.

- c. **U.S. National Tsunami Hazard Mitigation Program (NTHMP) Steering Committee meeting, May and November 2004, USA.** The ITIC Director, as a member of the Steering Committee as the liaison to international activities, attended both meetings. During the meeting, the ITIC, in collaboration with NOAA Public Affairs Pacific Region, proposed and obtained funding from the NTHMP to compile “B-roll” tsunami informational video footage, graphics, and animations to support Emergency Managers and government officials in education and training; additionally, the materials are made available to the media for use during tsunami warning events. The project has produced 3 DVDs: Hawaii Tsunami Warnings 1986, 1994 (Oahu and Neighbor Island editions); and Selected Interviews of

NTHMP activities, including information on the PTWC, WC/ATWC, DART systems, Inundation Mapping, and the TsunamiReady program.

- d. **Integrated Tsunami Scenario Simulation Meeting, 25 June 2004, Lincoln City, Oregon, USA.** The ITIC Director attended the meeting to provide input to the project, which seeks to develop a scenario simulation to be used as an instructive case study by researchers to model the expected tsunami wave impact on a coastal community. The study of realistic, but hypothetical case studies can be a very useful exercise because real tsunamis are infrequent. The tsunami phenomena and effects are simulated for given geographical, seismological, geological, and societal conditions. The simulations are to be comprehensive and integrate not only tsunami generation, propagation, runup motion (flow velocities and inundation) and flow-structure interactions, but also other types of simulations such as warning transmission to the public, evacuation, environmental impacts, rescue tactics and short-term and long-term recovery strategies. Simulation exercises can then include physical models, numerical models, informatics, human behavior, communication simulations, and other exercises that will integrate the tsunami source with its eventual effects on communities and the environment.
- e. **South Pacific Tsunami Awareness Workshop (SPTAW), 1-3 July 2004, Forum Secretariat, Suva, Fiji Islands.** The ITIC Director organized and convened an awareness workshop in collaboration with the South Pacific Applied Geoscience Commission (SOPAC) Community Risk Programme. The SPTAW brought together National Disaster Managers and Technical Experts from agencies responsible for earthquake and tsunami monitoring and emergency response from American Samoa, Cook Islands, Fiji Islands, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu. The first two days were used to conduct the ITP-International training programme in tsunami risk reduction. Topics included warning guidance, hazard and risk assessment, and education, preparedness and land-use mitigation. To facilitate a better assessment on the level of awareness and understanding of the tsunami hazard, a User Questionnaire was distributed prior to the workshop. Country responses identified as foremost of the many issues at stake, the inadequacies of their national response systems, communication systems and education and awareness programmes to the tsunami hazard. Two key priorities were the conduct of a feasibility study for *Regional Tsunami Warning Services*, and the development of national tsunami response plans. Improvement of the regional tsunami event database was also identified as a key to better understanding the tsunami hazard.
- f. **STAR and SOPAC 33rd Annual Session, 17-24 September 2004, Coral Coast, Fiji.** The ITIC Director and PTWC Director gave talks on the SPTAW and the tsunami warning operations at the STAR meeting and made interventions in support of a SOPAC Member States Vanuatu and Papua New Guinea's interests in requesting tsunami mitigation to be SOPAC high priority activity. The Session included papers presented at the Science, Technology, and Resources Network meeting (STAR, 17-20 September), a joint plenary of the Governing Council and its Technical Advisory Group (TAG, 21-22 September), and the formal deliberations of the Governing Council (23-24 September). The sessions were attended by a total of 150 participants representing the 22 SOPAC countries, policy makers and other government officials, and scientists and researchers.

A Tsunami Working Group was convened at STAR to make recommendations to the STAR Chair for presentation at the TAG Session with the Governing Council. The recommendations asked the Council to adopt the SPTAW work programme in its entirety, establish a SOPAC Tsunami Working Group, seek funds for the Feasibility Study, and to consider the SPTAW process and outcomes as an integral part of the ISDR Regional Strategy to be presented at the 2nd World Conference on Disaster Reduction.

- g. **Technical Coordination Meeting for the Northwest Pacific Tsunami Information Center, 19-21 October 2004, Tokyo, Japan.** In preparation for the start of the Northwest Pacific Tsunami Advisory Center, the Japan Meteorological Agency (JMA) hosted a technical planning meeting with the PTWC and ITIC to discuss and coordinate the warning operation activities between PTWC and JMA. During the technical meeting, the procedures of both Centers were reviewed, and a number of action items identified to effect a smooth coordination of operations including the dissemination of products.
 - h. **East-West Center Leadership Seminar for Pacific Island Disaster Managers on Disaster Risk Reduction for Sustainable Island Development, 27 October 2004, Honolulu, Hawaii, USA.** The PTWC and ITIC Directors participated in a Tsunami Response Planning session organized by the Pacific Disaster Center. The session featured a Table Top Facilitated Discussion in which the participants identified the highest priority actions that they needed to take when a tsunami warning is issued by the PTWC.
- 3.2 In 2005 in the aftermath of the 26 December tsunami, the ITIC Director traveled extensively globally on behalf of the IOC to provide information on the comprehensive tsunami mitigation efforts that are a part of the ICG/ITSU and the Tsunami Warning System in the Pacific, and on the status of the IOC's effort in coordinating the implementation of the Indian Ocean Tsunami Warning and Mitigation System. At the same time, activities continued in support of the Pacific. The seminar, meetings, workshops and consultations included the following:
- 3.2.1 DEVELOPMENT OF A TSUNAMI WARNING AND MITIGATION SYSTEM IN REGIONS OUTSIDE THE INDIAN OCEAN
- a. **Sixth Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VI), 23-27 May 2005 Nha Trang, Vietnam.** The UNESCO Assistant Director General and IOC Executive Secretary, IOC ITSU Tsunami Secretariat Peter Pissierssens, ITSU Chairman and ITIC Director convened a special informational session on tsunamis on 24 May 2005 at the IOC WESTPAC-VI. Member States were informed on the IOC's tsunami initiatives in the Indian Ocean, including the provision on interim advisory information by the PTWC and JMA, and in southwest Pacific where a Tsunami Awareness Workshop was convened in cooperation with SOPAC in July 2004 to identify needs and priorities.
- The Southeast Asian Member States and organizations made presentations on their tsunami warning, preparedness and hazard assessment activities; these included Malaysia, Philippines, SOPAC, Asian Disaster Preparedness Center, and WAPMERR. The JMA Tsunami Warning System Director informed Member States on the activities of Japan in the Indian Ocean since 26 December 2004, and its present role and future plans as a regional center providing tsunami information for the northwest Pacific. The ITSU Chairman introduced discussion on tsunami preparedness in Southeast Asia and in particular noted the possible need to organize a tsunami warning and mitigation system for the South China Sea. He encouraged Member States to actively participate in ITSU, welcomed Malaysia and Vietnam as new members of ITSU, informed the group on the provisional agenda for ITSU-XX 3-7 October 2005, and invited all Member States to attend the meeting where southeast Asia tsunami warning and mitigation needs can be fully discussed.
- b. **Tsunami Deposits and their Role in Hazard Mitigation, 12-15 June 2005, Seattle, Washington.** The ITIC Director gave a presentation on the activities of the IOC in coordinating the implementation of the IOTWS, and in particular focused on the importance of scientists freely sharing their data with national governmental agencies. The ITIC Director further encouraged scientists to submit their data set to the ITIC who would forward the information and

recommendations to the proper national authorities.

The workshop, sponsored by the U.S. National Science Foundation (NSF), brought together scientific researchers and educators, as well as government and community representatives, in order to advance our understanding of tsunami behavior as reflected in coastal erosion and deposition—an understanding needed to define earthquake and tsunami hazards. The workshop also aimed to develop a means for improving the communication of tsunami research results to potentially affected communities. One of the major means for tsunami hazard assessment is to quantify recurrence intervals and size estimates of past events, and tsunami-deposit studies are an important means for doing so. Moreover, tsunami-deposit studies can help in generating public education and awareness—an important aspect of mitigation efforts. The recent Sumatra-Andaman earthquake and its global tsunami underscore the importance of these topics. Outcomes of the workshop include recommendations to NSF on tsunami research priorities and a brochure summary of conclusions to be distributed to policymakers.

- c. **Inter-regional Expert Consultation on Disaster Warning and Response Systems in Small Island Developing States Regions, 8–9 August 2005, Christ Church, Barbados.** Sponsored by the Commonwealth Secretariat, the Expert Consultation included representatives from the Inter-Governmental Organisations (IGOs) from the Pacific, Indian Ocean and Caribbean Regions, representatives from regional specialist organisations, and various experts in tsunami and hydro-meteorological early warning, geohazard assessment, medical disaster response and community empowerment. The IOC was represented by the ITIC Director who provided information on the current progress of the IOC and its United Nations partners (primarily the ISDR and WMO) for the Indian Ocean Tsunami Warning and Mitigation System, and its general expertise in assisting in building programmes in the Pacific and Caribbean. The meeting reviewed the present effectiveness of the disaster warning and response systems, identified gaps in the systems, and identified potential measures required to address the gaps.

Among the key findings was that the regions face similar hydro-meteorological hazards and are generally well organised with respect to early warning for tropical storms and cyclones, but lack co-ordinated early warning mechanisms for tsunamis of local and/or regional origin. All regions also identified the need for capacity building at the community level and various leadership levels as being a priority gap that needs to be addressed. Each region identified specific issues that need to be addressed. In the Pacific, one concern is the need to upgrade existing communications systems to meet present-day needs, especially at the community level.

- d. **IOC TsunamiTeacher Project meeting, 5-7 September 2005, Paris, France.** The IOC is developing *TsunamiTeacher* to act as a consolidated global resource toolkit containing reliable and authoritative resources, along with tsunami training modules, to assist national governments and community and local stakeholders to raise awareness and understanding of tsunamis, and plan to respond to and mitigate their impacts. *TsunamiTeacher*, to be modeled after UNESCO-IOC's *Ocean Teacher*, will be a web-based, distance learning product that is easily accessible by any user. The project will also be supported by DVD training packages. The five stakeholder target audiences are: Media, Education systems, Governments, Community groups, and the Private sector

The launch of the *Tsunami Toolkit* is planned for the ICG-IOTWS II meeting in Hyderabad, India, from 14-16 December 2005, with two modules completed, and the full website to be completed by September 2006. The *TsunamiTeacher* project will be based at the IOC-ITIC, and the website would maintained by the IOC IODE project in Ostend, Belgium. The language of the project would be English, and partnerships are being sought to translate the materials into French and

Spanish.

- e. **Enhancing Early Warning for Pacific Island Countries, SOPAC Regional Planning Workshop, 5-6 September 2005, Suva, Fiji.*** The workshop sought to strengthen “all hazards” early warning systems for geological, tsunami, and hydro-meteorological hazards. The workshop was attended by technical and emergency management representatives from Pacific Island Countries (PIC), including Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, Marshall Islands, New Zealand, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu, and other stakeholder groups. Support organizations included the Australia Marine Science & Technology, European Union, Federal Republic of Germany, International Federal of Red Cross and Red Crescent, Japan International Cooperation Agency, Pacific Disaster Centre, Pacific Tsunami Warning Centre (PTWC), UNESCO / IOC International Tsunami Information Centre, International Strategy for Disaster Reduction (UN/ISDR), Pacific Emergency Management Associates, and The Asia Foundation. The ITIC Deputy Director read two statements from the ITIC Director on behalf of the IOC on Tsunami Risk Reduction in Small Island Developing States and the roles of the National Disaster Management Organization in tsunami warning and mitigation. *See Annex 1. and Annex 2.*

The workshop prepared a Draft Strategy for early warning systems in which nations were encouraged to establish sustainable and effective all hazards warning systems. With respect to tsunamis, the Strategy identifies the urgent need for national tsunami response plans, the need to emphasize preparedness and awareness in the local context, and the need to build technical capacity within the region to support the analysis and evaluation of the tsunamigenic potential of regional southwest Pacific earthquakes

3.2.2 DEVELOPMENT OF A TSUNAMI WARNING AND MITIGATION SYSTEM FOR THE INDIAN OCEAN

- a. **IOC First International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean within a global framework, 3-8 March 2005, Paris, France.*** This was the first meeting in a series leading to establishing the technical and ‘legal’ framework for the establishment of the Indian Ocean System. The last day focused on the implementation and progress for a global system. The ITIC Director made a presentation on its role in the Pacific in support of the ICG/ITSU, and gave a short overview on the activities of the southwest Pacific. See <http://ioc.unesco.org/indotsunami> for more information.
- b. **IOC Second International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean within a global framework, 14-16 April 2005, Grand Baie, Mauritius.*** The meeting informed Indian Ocean countries on the interim advisory information system and progress in sea level upgrades and other mitigation initiatives, and sought to coordinate donor support. The ITIC Director gave a presentation the important roles and functions of a Regional Tsunami Information Centre.

The Mauritius Declaration adopted at the meeting also included the request to assess the technical and non-technical requirements of Member States for the implementation of an effective warning and mitigation system. The results of the assessments will be used to finalize the technical plans for both the national and regional systems.

From May through September 2005, the IOC led international missions involving IOC, World Meteorological Organization, and ISDR designated experts on tsunamis, communications, and disaster management to countries to obtain national information on a broad spectrum of topics

ranging from technical requirements and instrumentation to communication channels and public education programmes. In total, 16 countries were visited, with 4 countries still to be done, or rescheduled for visit. The reports are being compiled to obtain a regional summary for discussion on capacity building requirements at the Second ICG/IOTWS to be held 12-16 December in Hyderabad, India. The ITIC Director participated as the tsunami expert in the missions to Sri Lanka, Mozambique, Seychelles, Malaysia, and Indonesia.

- c. **First Meeting of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), ICG/IOTWS-I, 3-5 August 2005, Perth, Australia.** The meeting focused on the technical aspects of the warning system. Six technical intersessional working groups were established that will report at the Second ICG/IOTWS. The groups are: Seismic measurements, data collection, and exchange; Sea level data collection and exchange, including deep-ocean tsunami detection instruments; International DART Partnership; Tsunami hazard detection and characterisation, including modelling prediction and scenario development; Model Intercomparison Workshop; and System interoperable Advisory and Warning Centres. The ITIC Director assisted in the facilitation of the Seismic Working Group.
- d. **International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States (SIDS), 10-14 January 2005, Port Louis, Mauritius.** The ITIC Director met with Mauritian government officials at the US Embassy on January 11, 2005 to brief them on the actions taken by PTWC after the occurrence of the M9.0 earthquake off northwestern Sumatra, Indonesia on 26 December 2004. The ITIC Director further discussed the plans for the Indian Ocean Tsunami Warning System, and invited them to participate actively in its planning and implementation. The Mauritius Meteorological Service agreed to collect post-tsunami survey information and provide them to the ITIC for archiving, and expressed an interest in developing inundation models for their coastlines.

The ITIC Director and WMO Secretary General held a press conference on 11 January 2005 to announce further close collaboration that will begin between the IOC and WMO in implementing a global tsunami warning system. The WMO's operational satellites will be an essential telecommunications component for the transmittal of data and the dissemination of warning messages.

The ITIC Director participated in a Conference parallel session on Reducing Vulnerability and Building Resilience of SIDS on 11 January 2005, giving the presentation Lessons Learned from the Asian Tsunami and answering tsunami questions as part on the panel along with the UNESCO IOC, WMO, IPCC, and International Red Cross.

- e. **International Workshop on Tsunami Disaster Mitigation, 17-18 January 2005**
World Conference on Disaster Reduction, 18-22 January 2005, Kobe, Japan

The United Nations World Conference on Disaster Reduction (WCDR) was attended by more than 6,000 participants, including representatives of governments, UN specialized agencies, and other intergovernmental and non-governmental organizations. The WCDR aimed to increase the international profile of disaster risk reduction, promote its integration into development planning and practice, and strengthen local and national capacities to address the causes of disasters that hamper development in many countries. The Conference adopted three resolutions: 1. the Hyogo Declaration; 2. the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters; 3. Report of the Credentials Committee

The Conference convened a number of tsunami-related sessions, including the following:

In the morning of 19 January, a WCDR Thematic Session on Promotion of tsunami disaster mitigation in the Indian Ocean – towards establishment of tsunami early warning systems in the Indian Ocean by sharing experiences in the Pacific Ocean, sponsored by Japan, the Asian Disaster Reduction Center, and the UNESCO IOC, was convened. The Session was chaired by Mr. K. Nagasaka (Director-General, Japan Meteorological Agency). The Session was opened by Mr. Nagasaka, and Mr. K. Matsuura (Director General UNESCO). This was followed by a keynote speech by the ITIC Director, and reports on the operation of the Pacific Tsunami Warning Center in the Pacific by Dr. C. McCreery (USA) and Japan by Mr. N. Nishide (Japan). Country reports were presented and a Panel Discussion on the possible actions for establishment and operation of tsunami early warning system was held. The Session issued a Session Report outlining actions needed to be taken urgently and over the long-term to build the tsunami early warning system in the Indian Ocean. After the session, the ITIC Director participated in a Press Conference with the IOC Executive Secretary, the IOC Tsunami Programme Technical Secretary, and the ITSU Chair.

In the afternoon of 19 January, the ITIC Director and US NOAA Pacific Marine Environmental Laboratory Director combined to present a Keynote Speech on the “US National Tsunami Hazard Mitigation Program and International Tsunami Hazard Mitigation Program” in a WCDR Public Forum Symposium on Sea Coast to Reduce the Impact of Tsunamis sponsored by the Japan National Association of Sea Coast Associations, Japan Society of Civil Engineers, and the Japan Government. The official launch of the International Early Warning Programme – IEWP was held in the evening; the event was organized by UN-ISDR with partner organizations (WMO, UNESCO, World Food Programme) providing introductions regarding their activities.

On 20 January, the Conference held a special session entitled “Indian Ocean disaster: risk reduction for a safer future.” Remarks were made on early warning systems and preparedness, international emergency response, lessons learned and of the importance of transition within a risk reduction framework, and followed by a short review of country experiences and perspectives, and common outcome statements made by Member States, Organizations, and Observers. At the conclusion of the special session, the Conference issued a “Common statement of the special session on the Indian Ocean disaster: risk reduction for a safer future”.

On 21 January, a WMO/JMA Public Forum Workshop “Reducing Risks of Weather, Climate and Water extremes through Advanced Detecting, Monitoring, Early Warnings and Opportunities of Information Society” was convened. The ITSU Chair Dr. Francois Schindele gave a presentation on the state of tsunami science and early warnings, including the technical components of tsunami monitoring in which geophysical and space-borne data can be used for tsunami detection and evaluation. On 21 January, the PTWC Director gave a presentation on Tsunami People-Centered Early Warning Systems in the session on People-Centered Early Warning Centers.

On 22 January, the ISDR and IOC convened an ad-hoc Scoping Meeting of national representatives, UN organizations and experts to assist in the coordination of the many initiatives being started or being planned to develop tsunami early warning systems, with particular reference to the countries of the Indian Ocean region, but also with reference to the need for more effective tsunami early warning systems globally. The Session was chaired by the Salvano Briceno, ISDR Director, and Dr. Patricio Bernal, IOC Executive Secretary. The session featured presentations by the ITIC Director on national early warning systems, including operational and institutional components, and mechanisms for regional and

international support and coordination, and by the ITSU Technical Secretary Peter Pissierssens on the role of the IOC and its proposal for governance, capacity building and technical warning system implementations based on its Pacific experiences. During the WCDR, the ITIC Director, PTWC Director, and ITSU Chair held extensive discussions with their UNESCO IOC colleagues to further develop the plan of action for the Indian Ocean Tsunami Warning System.

Prior to World Conference, the ITIC Director and PTWC Director participated in the International Workshop on Tsunami Disaster Mitigation 17-18 January sponsored by the Japan Port and Airport Research Institute. During the Workshop, the ITIC Director chaired the Special Session on Indian Ocean Tsunami, gave a presentation entitled "Risk reduction initiatives in the Pacific: Regional tsunami warning systems and frameworks for effective emergency response", and participated as part of the Discussion Panel.

- f.* **China-ASEAN Workshop on Earthquake-Generated Tsunami Warning, 25-26 January 2005, Beijing, China.** The China-ASEAN Workshop on Earthquake-Generated Tsunami Warning was held in Beijing on 25-26 January 2005 as a follow-up action to the Special ASEAN Leaders' Meeting on Aftermath of Earthquake and Tsunami in Jakarta, Indonesia on 6 January 2005 to help ASEAN countries to establish a Strong Earthquake and Tsunami Warning Network. The Workshop aimed to exchange experiences and lessons learned from the Indian Ocean tsunami disaster, exchange information on technology of tsunami warning, and explore ways to carry out joint activities in the field of tsunami early warning through earthquake monitoring. The ITIC Director represented the IOC of UNESCO, providing briefings on the IOC's Tsunami Programme, the operations of the Pacific Tsunami Warning Center, and the IOC Action Plan for the Development of the Indian Ocean Tsunami Warning System, as well as closing remarks at the end of the workshop.

The meeting discussed the needs and priorities of ASEAN nations, and included participation from Indian Ocean countries and other experts, including representatives from Australia, China, India, Japan, Korea, Maldives, Seychelles, Sri Lanka and the USA (USGS, IRIS, Columbia University). Organizational representatives were present from the ASEAN Secretariat, UN/OCHA, UN/UNESCO, UN/ESCAP, UN/ISDR, UN/WMO, Asian Disaster Preparedness Center (ADPC) and Asia Seismology Commission (ASC).

The Meeting endorsed an Action Plan to Formulate the Technology Platform for Earthquake-Generated Tsunami Warning System. The Action Plan included the establishment of a warning system in the Indian Ocean and the Southeast Asian Region, establishment of an Asian Regional Seismographic Network (ARSN), and the support by China for capacity building and provision of earthquake information.

- g.* **Smithsonian Press Conference, 8 February 2005, Washington, D.C, USA.** The ITIC Director participated as one of a number of nationally-recognized tsunami experts in a press conference sponsored by Smithsonian Magazine entitled "Tsunamis: Can they happen here, and what are we doing about it?" held at the Willard Hotel in Washington, D.C. The ITIC Director provided an overview of the science of tsunamis and answered questions about tsunami mitigation activities taking place in the Indian Ocean. The ITIC Director also met with the US Permanent Representative to the IOC and the US State Department Foreign Affairs Officer for Ocean Science Policy, the NWS AA and his staff, the Secretariat Director for Group on Earth Observations (GEO) and Senior NESDIS Advisor, and the USGS Senior Science Advisor for Earthquake and Geological Hazards, and gave a lecture on the IOC Tsunami Program and the IOC-led actions for the implementation of a tsunami warning and mitigation system in the Indian Ocean, during her stay in Silver Spring, MD.

- h.* **Brainstorming workshop on Effective Disaster Warning Systems & Risk Communication, 17-18 February 2005, New Delhi, India.** The ITIC Director provided an end-to-end description of a tsunami warning system through examples of system components in operation by countries in the Pacific. Information on the ITSU Programme, the ITIC, and the PTWC was provided, as well information on the IOC Action Plan for the Indian Ocean Tsunami Warning System (IOTWS). The Workshop, sponsored by the Technology Information, Forecasting & Assessment Council (TIFAC), Department of Science and Technology, Ministry of Science and Technology, India, brought together different communication aspects related to the effective dissemination and responsible response of that warning message by government officials and the public. The agenda focused on the non-technical, social aspects.

As the IOC representative, the ITIC Director met with the Executive Director of TIFAC during the workshop to discuss possible collaboration activities, and after the workshop, with Secretary of the Department of Ocean Development, the Director of INCOIS, Department of Ocean Development and Vice President of the IOC, the Secretary of the Department of Science & Technology, and the Seismology Head in the Department of Science and Technology, to discuss India's proposed national tsunami warning system, and to continue the discussion for the upgrade of the Minacoy Island GLOSS sea level station in the Arabian Sea as a national contribution through the sharing of real-time data that will be needed from all nations in order to successfully implement the IOTWS.

- i.* **Mission on Policy Dialogue for High Level Administrative Policy Makers on Establishing a Tsunami Early Warning Mechanism in the Indian Ocean, 22-24 February 2005, Tokyo, Japan.** The ITIC Director and PTWC Staff Geophysicist participated in the meeting sponsored by the ISDR and the Japan Government that focused on the examination of the Japan National Tsunami Warning and Mitigation System. The ITIC Director, in representing the IOC, made a presentation on the lessons learned from the Pacific on the operations of national tsunami early warning systems and the effective communication of tsunami risk, and on the IOC planning for the future Indian Ocean Tsunami Early Warning Systems. The PTWC Geophysicist made a presentation on the status of the interim tsunami warning procedures that the PTWC, in conjunction with the JMA, are employing to provide interim tsunami warning services for the Indian Ocean.
- j.* **WMO Multidisciplinary Workshop and GTS Expert Meeting on the Exchange of Early Warning and Related Information Including Tsunami Warnings in the Indian Ocean, 14-18 March 2005, Jakarta, Indonesia.** The ITIC and PTWC Directors attended. The ITIC Director, as the IOC representative, made two presentations, one summarizing the outcomes of the 1st IOC International Coordination held the previous week, and the second on the planned IOC GLOSS sea level station upgrades in the Indian Ocean and the IOC's vision for the global implementation of a tsunami warning and mitigation system. The PTWC Director made a presentation providing guidance on the design and implementation of national tsunami warning centers. During the Expert GTS meeting, the PTWC Director chaired the Ad Hoc Working Group on the Technical GTS Requirements for Tsunami Warning Centers. The Expert meeting resulted in the identification of weaknesses in the IO GTS for strengthening in the next 6-12 months to ensure timely tsunami warnings (e.g., receipt within two minutes), and identified as a priority the implementation of satellite broadcast capability of tsunami warning messages as a means of ensuring timely receipt of the information.

During the meeting, as a representative of the IOC, the ITIC Director met with Head of the Gravity Field and Tidal Division of the National Coordinating Agency for Survey and Mapping (BAKOSURTANAL) to discuss the proposed installation of new GLOSS Sea Level stations in Indonesia that were previously planned by NOAA and the IOC, and to further discuss upgrades to other GLOSS sites for real-time data transmission for tsunami monitoring.

The meeting positively facilitated the planned April visit of the NOAA-funded University of Hawaii Sea Level Center that upgraded and installed the GLOSS station at Sibolga, western Sumatra, Indonesia.

- k.* **18th post-graduate course on Study and Management of Geological risks (18 April to 9 June), 18-19 April 2005, University of Geneva CERG, Switzerland.** The ITIC Director gave the keynote address at the opening ceremony of this short course on monitoring and mitigation of tsunami risks and a presentation the lessons learned from the Indian Ocean tsunami. The course's objective was to teach the use of an integrated approach to managing natural risks. The course is supported by United Nation University, UNESCO and the Swiss Development Agency.

During the week, the ITIC Director met a number of UN organizations, including the following:

- ISDR Secretariat where she gave a presentation on the ITIC and its roles in supporting the IOC global tsunami efforts, and PPEW Programme Specialist to plan the ISDR-IOC Japan and Hawaii Study Tours;
- World Meteorological Organization (WMO) Natural Disaster Prevention and Mitigation Programme Chief to discuss the conduct of the Country Assessments;
- Office for the Coordination of Humanitarian Affairs (OCHA) Response Coordination Branch for the Asia Pacific to discuss the activities of OCHA as related to the plans of the IOC in establishing a tsunami warning system;
- International Federation of Red Cross and Red Crescent Societies (IFRC) Secretary General Markku Niskala, Head, Disaster Prevention and Preparedness Department Eva von Oelreich, and Asian Tsunami Response Team Graham Betts-Symonds and Antony Spalton, to discuss ideas for cooperation and collaboration in delivering tsunami early warning to communities at risk.

- l.* **Asia Pacific All Hazards Workshop: Realizing Tsunami and Disaster Resilience through New Partnerships and Technologies, 6-10 June 2005, Honolulu, Hawaii, USA.** This Workshop, sponsored by the U. S. Trade and Development Agency (USTDA) and the National Oceanic and Atmospheric Administration (NOAA), brought together policy and technical representatives from APEC and Indian Ocean Region economies with leaders from major international organizations, private industry solution providers, and donor economies in an effort to assist them in preparing for future natural disasters and other hazards through the development of regional end-to-end, all-hazard disaster risk management systems. ITSU Member States that participated included Australia, China, Indonesia, Malaysia, Mexico, Philippines, Russia, Singapore, Thailand, USA, Vietnam, and SOPAC. The IOC was represented by the ITIC Director who provided a Progress Report on the Indian Ocean Tsunami Warning and Mitigation System. The ITIC Director also made a presentation on behalf of the UN International Strategy for Disaster Reduction. The IOC GLOSS programme was represented by the University of Hawaii Sea Level Center.

- m.* **Study Tours on National Tsunami Warning Systems were conducted in Japan (11-14 July 2005) and Hawaii (26-29 July 2005) for high level administrators responsible for tsunami warning activities.** The Study Tours presented information on the Japan and Hawaii systems, and complemented information received by participants of the JICA training held 7-18 March 2005 and the Japan Mission on Policy Dialogue for High Level Administrative Policy Makers held 22-24 February 2005 in Tokyo, Japan. Altogether experts from 22 of the 26 Indian Ocean countries participated in the Tours organized jointly by the Intergovernmental Oceanographic Commission (IOC/UNESCO) and the International Strategy for Disaster Reduction (UN/ISDR). In Hawaii, the IOC ITIC organized and hosted the meeting, and in Japan, the Cabinet Office of Japan (CAO) and Asian Disaster Reduction Center (ADRC) organized and hosted the meeting. Additionally, the World Meteorological Organization contributed their expertise to the Study Tours. Funding was provided through

the UN/ISDR Flash Appeal project “Evaluation and Strengthening of Early Warning Systems in Countries Affected by the 26 December 2004 Tsunami in South East and South Asia” (UN Flash Appeal Project TSU-REG-05/CS06-REGION). ITSU Members Australia, Indonesia, Malaysia, Singapore, and Thailand participated.

The main purpose of the Study Tours was for high level administrators responsible for tsunami warning activities in Indian Ocean rim countries to acquire, through the comparison of different types of systems in Hawaii and Japan, the necessary judgment and methods of assessment to identify the components of the national tsunami warning and mitigation system that need to be built or strengthened.

The study of the two systems provided participants with examples of two types of systems implemented to meet different tsunami warning requirements. Japan’s system can be viewed as appropriate for nations with a high level of national tsunami hazard, where a large monitoring system comprised of densely-spaced, real-time instrumentation to determine exactly earthquake parameters is required, or for nations with long coastlines which require additional local warning centers. In contrast, the study of Hawaii’s system may be a good example for small island nations, for nations wanting 'small' systems to provide baseline national monitoring, or for nations that must respond to distant tsunamis. Knowledge on and an understanding of why the solutions (instrumentation, analysis methods, message dissemination) were implemented is essential for the proper design of national systems that provide the greatest safety to its citizens

- n. **ISDR Planning Workshop on Public Awareness and Education Component of Early Warning Strengthening Project, 7-8 September 2005, Bangkok, Thailand.** The planning workshop brought together the key partners of the Public Awareness and Education component of the ISDR project in order to lay out, structure and prioritize the possible approaches and activities to be carried out over the next 10 months. The workshop identified target audiences and strategies to reach those audiences and developed a shared work plan/strategy for the next 10 months for implementation. Participant organizations included the ABU, ADPC, ADRC, DIPECHO, IFRC, ISDR, NHK, OCHA, UNESCO-IOC-ITIC, UNESCO (Education), UNESCAP, UNICEF, UNDP, UNEP, USAID, and WMO. The ITIC Director made a presentation on the activities of the IOC and ITIC, and specifically the *TsunamiTeacher* project that is being developed for launch in December, 2005. The ITIC Director chaired the Working Group on the needs of technical professionals.
- o. **Tsunami Reconnaissance Data Preservation Workshop, 21-22 September 2005, San Diego, California, USA.** The ITIC Director participated in the NSF-sponsored Tsunami Reconnaissance Data Preservation Workshop 21-22 September 2005 hosted by the San Diego Supercomputer (SDSC) and Oregon State University (OSU) to discuss the development of centralized tsunami reconnaissance data repository. Project funding is being provided by the U.S. National Science Foundation through the NEES Program (Network for Earthquake Engineering Simulation) to the SDSC and OSU for implementation. The repository will be hosted by the SDSC, and will include not only data management capabilities, but also tools for searching, exploring, analyzing and extracting data. The Information will be curated by experts, with special functions allowing the broader community to add commentary about the usefulness of data and its application in studying tsunamis and other hazards.

The site will be mirrored by the IOC at its IODE (International Oceanographic Data and Information Exchange) Project Office in Ostend, Belgium. The ITIC and the World Data Center/National Geophysical Data Center are encouraging broad usage of this facility for the archiving of tsunami data from the 26 December 2004 tsunami. While the repository is being initially developed to archive the Indian Ocean data, it is being designed so that it can support the multi-media tsunami data preservation needs of all historical and future tsunami events.

4. PROGRESS IN ITSU-XIX DECISION IMPLEMENTATION

The ITIC Director continued to work during the intersession on action items from ITSU-XIX, as summarized below.

4.1 WORKING GROUP ON A COMPREHENSIVE TSUNAMI HAZARD REDUCTION PROGRAMME

The opportunity to implement a comprehensive tsunami hazard reduction program has been realized by the building of the Indian Ocean Tsunami Warning and Mitigation System. The ITSU Officers, in their many presentations globally have stressed the importance of building an end-to-end system that ensures that technology-driven, science-based warnings are communicated immediately and reliably to vulnerable communities in an understandable and actionable manner so that ordinary citizens can get out of harm's ways in time. To do this in a sustainable manner will require active programs in hazard risk assessment, earthquake tsunamigenic potential evaluation and warning dissemination, and, preparedness, awareness, and emergency response.

In the Indian Ocean, each country has been asked to assess its national capabilities in each of these areas through an Assessment Questionnaire, and to identify areas of enhancement and capacity building that will implement a comprehensive tsunami hazard reduction program. IOC-led international multi-disciplinary expert assessment teams visited 16 countries, at their request between May and September 2005, to further understand their requirements and to assist, through introductory training and recommendations during the mission, in completing the Questionnaire. With this assistance, the nations have developed or improved existing proposals and funding estimates to achieve those goals.

In discussions by the ITSU Officers in the last few months, it has been proposed that a similar strategy be employed in the Pacific, and all oceans, and towards these ends, the ITSU Technical Secretary distributed the Assessment Questionnaire to all Member States with the request to complete them prior to ITSU-XX. Similar to the Indian Ocean, it is proposed that this Questionnaire would then be followed by a Country or Sub-Regional visit by an international expert team which would provide both training and recommendations for action in collaboration with the country.

The ICG/ITSU is asked to discuss this proposal and define terms of reference for any country or sub-regional assessment missions, and to consider the means of funding by which this might be accomplished in the near-term.

4.2 GLOBAL HISTORICAL DATABASE

The ITIC facilitated the interactions between the Novosibirsk Tsunami Laboratory (NTL) and the World Data Center - SEG / National Geophysical Data Center with the goal of merging the two existing databases into one high-quality database with a high degree of quality control on the validity of the included data. To date, this has not been accomplished though both institutions have enhanced their working applications; the NTL has concentrated on deploying an offline, PC-standalone application with user-friendly graphical controls and included the option for tsunami travel time calculations and display of time contours, and the NGDC has concentrated on a online, web-based, GIS-based application complemented by an extensive forms-based search capability.

The ITIC Director strongly believes the following:

- that only one database should exist, and as agreed previously by the parties, that the database be housed at the WDC-SEG;
- that distributed versions of the data include only those data that are deemed highly accurate, or that the data that is included be assigned a validity according to an agreed-upon standardized

validity criteria;

- that both the online, web-based, and the offline applications use the SAME, IDENTICAL databases to avoid confusion and thus possibly misinterpretation.

It is requested that the ICG/ITSU provide input on the course of action to be taken for the compilation and distribution of the Global Historical Tsunami Database by the IOC Tsunami Programme.

4.3 ITSU STRATEGIC PLAN

DEVELOPMENT OF AN ITSU MEDIUM-TERM STRATEGY

Discussion is referred to Section 4.1 regarding the conduct of National Assessments and their use in developing medium-term national strategies for comprehensive tsunami hazard mitigation.

4.4 ITSU COMMUNICATIONS PLAN

From 12-15 September 2005, the JMA Tsunami Warning Center Director, PTWC Director, and the ITIC Director met to: 1. coordinate issues of rapid sharing of earthquake parametric data between the warning centers prior to the issuance of tsunami information for the Indian and Pacific Oceans; 2. standardize the message formats and content sent by each center so that consistency is provided to Member States regarding hypocentral, magnitude, and tsunami evaluation; and 3. agree on a protocol message issuance and for calculating and providing estimated tsunami arrival times to designated forecast points. Specifically, the message products of the PTWC and the JMA's Northwest Pacific Tsunami Advisory Center and the Interim Indian Ocean Tsunami Information Service were reconciled, and the warning services provided by Japan will be incorporated into a single Communications Plan for the Interim Indian Ocean Tsunami Warning System, and for the Tsunami Warning System in the Pacific.

4.5 OBSERVATION SYSTEMS AND RELATED MATTERS

4.5.1 SEA LEVEL OBSERVATIONS

In the Indian Ocean, the ITIC and PTWC are working together with the WMO and IOC GLOSS to make sea level data transmitted over the WMO GTS available to National Meteorological and Hydrological Services (NMHS), and to permit them to decode, display, and manipulate (measure wave height, period) these time series. The PTWC has agreed to assist in the development of a regional package for data evaluation and display of GTS-transmitted sea level data. The PTWC solution is a platform-independent solution which will take a daily log file of data incoming chronologically over the GTS, decode the data file, and plot the time series on an operational computer.

In the Pacific Ocean, as sea level stations are upgraded to meet minimum tsunami monitoring data requirements (15-minute transmission of 1-minute sampled data), NMHS and their collaborating national warning partners should be provided the same capabilities as in the Indian Ocean.

At the same time, the UHSLC is working with the Australia Bureau of Meteorology and the WMO to standardize the format and header of stations transmitted by various institutions over various satellite systems. Until that is formalized and approved, the PTWC is willing to decode any format (header/platform ID) that is currently being transmitted.

4.5.2 SEISMIC OBSERVATIONS

In the Indian Ocean, an Intersessional Working Group on Seismic measurements, data collection, and exchange has been formed to identify and recommend enhancement to the network, communications, and real-time evaluation methods. In both the Indian and Pacific Oceans, international coordination in data sharing and network enhancement will be required. A US National Science Foundation sponsored GOESS meeting on seismology held in August 2005 in Washington, DC, also identified this critical requirement, and the USGS has proposed to hold coordination meetings. One such

meeting is planned for November 10-11, 2005 in Jakarta as part of the ICG/IOTWS Seismic Working Group.

The ITIC recommends that the ICG/ITSU also establish an Intersessional Working Group on Seismic measurements, data collection, and exchange to focus on the needs for the Pacific Basin, including its marginal seas. This group should be comprised of Member States, global network operators, and the tsunami warning centers.

4.5.3 DATA COMMUNICATIONS

In the Indian Ocean regarding the transmission of coastal sea level gauge data, the ITIC has been acting as an interface between the JMA GMS and the UHSLC for the official request for frequency allocation and transmission time.

As stations are upgraded or new stations are installed, both in the Indian Ocean, the Pacific, and the Caribbean, it will become increasingly important to standardize the procedure and protocols for requesting allocations and providing metadata for each station. This is especially important if there will be a number of station operators doing upgrades with different types of systems.

At the same time, in collaboration with NOAA Pacific Region Integrated Data Enterprise (PRIDE), the PTWC, and the UHSLC and GLOSS, the ITIC is developing a web-based, sea level station database inventory tool which can greatly facilitate the station enhancements, and provide for both the station installer and customer, provide easily- assessable status with the current and future status of sea level stations. The tool is being developed for the Pacific initially, but is easily extended globally. The tool should be available in early 2006.

The ITIC strongly recommends that such protocols be developed in advance and that some institution, agency, or nation take the lead in this coordination effort. The ITIC is willing, if requested, to take this lead since it is already building the sea level station inventory database.

It is requested that the ICG/ITSU provide comment on this issue.

4.6 TRAINING AND EDUCATION

4.6.1 ITSU TRAINING PROGRAMME (ITP) - HAWAII

The 2004 UNESCO/IOC ICG/ITSU Training Programme was held August 9 to 27, 2004 in Honolulu, Hawaii. This year, the program expanded in length from two to three weeks in order to allow more time for discussions on topics, and received a very large number of applicants; a total of 16 nominees were received from ITSU Member States and three were selected and a total of five participated. For the ITP-Hawaii 2004, the five participants were from Colombia (Camilo Botero, Secretario Técnico, Comité Nacional de Alerta de Tsunami. Comisión Colombiana del Océano), El Salvador (Carlos Pullinger, Director, Servicio Geológico, Servicio Nacional de Estudios Territoriales, SNET), the Philippines (Ishmael C. Narag, Supervising Science Research Specialist Philippine Institute of Volcanology and Seismology, PHIVOLCS), and the Netherlands (Steve Kuils, Dean Safety Management, and Cees Kersten, NIBRA (Dutch Institute for Crisis & Disaster Management)). Funding support was provided by the UNESCO/IOC, by the RANET Project, and individually by the NIBRA. Selections were based on the participant's potential to actively promote and initiate tsunami mitigation programmes upon return to his/her country, representation from regions or countries that had not had participants in recent years, participation of neighboring countries who after attending would be encouraged to actively coordinate regionally, and that each participant had a good command of English to ensure the fullest understanding of the information presented.

The ITP-Hawaii provides an overview of the history and operation of the Tsunami Warning System in the Pacific, with specific focus is given to the important role of regional and national tsunami warning

centers in monitoring and evaluating the tsunamigenic potential of earthquakes, and in issuing timely tsunami warning messages to government emergency officials. The Programme provides training and familiarization with the Tsunami Warning System in the Pacific and Regional Warning Systems, and how these are integrated into the response procedures of the Civil Defense agencies as carried out by the United States federal, state, and local governments. Tsunami mitigation and outreach programmes are discussed through examples, and an introduction to numerical modeling as it is used in the calculation of wave heights, inundation, and runup is provided.

Normally, the ITIC requests that each ITP participant write a about their experience and describe what they will implement on returning to their home countries. In 2004, C. Botero and C. Pullinger submitted reports, and these were published in the July-October issue of the Tsunami Newsletter.

In 2005, due to the heavy workload imposed by the Indian Ocean implementation, the ITP-Hawaii has not been carried out. A shortened version (5-days) was carried out for Indian Ocean Member States in July 2005 (see Section 3.2.2.m) in which ITSU Members Australia, Indonesia, Malaysia, Singapore, and Thailand also participated.

4.6.2 ITSU TRAINING PROGRAMME (ITP) - INTERNATIONAL

In 2004, the ITP-International was carried out as the collaborative South Pacific Tsunami Awareness Workshop in July 2004. See Section 3.1.e for description.

In 2005, the ITIC supported CEPREDENAC in conducting a meeting on the Central America - Pacific Coast Regional Tsunami Warning System held in April 2005. See Section 4.7.

In 2005, the ITIC and SOPAC, along with the NOAA NWS Pacific Region are planning to conduct the North Pacific Tsunami Awareness Workshop tentatively scheduled for 21-22 November 2005 in Palau. The planned format is to be similar to that of the SPTAW in which the 1st 1.5 will days involve information sharing and training, and the 2nd day will be devoted to the identification of a strategy, priorities, and action tasks.

In 2005, the ITIC is helping to sponsor The International Training- Workshop on Numerical Modeling of Tsunami for Developing Countries in Southeast Asia, the Pacific, and the Indian Ocean. The workshop is a joint effort between the International Association of Seismology and Physics of the Earth's Interior (IASPEI) and the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) working group on Subduction Zones Located in Developing Countries, the Philippine Institute of Volcanology and Seismology (PHIVOLCS), the UNESCO Intergovernmental Oceanographic Commission (IOC) International Coordination Group for the Tsunami Warning System in the Pacific (ITSU), and the IOC International Tsunami Information Centre (ITIC). The workshop will be held on 7-19 November 2005 at PHIVOLCS Building, Quezon City, Philippines. During the 10-day workshop, each participant will be taught how to model tsunami propagation, run up and inundation. The learning format will involved a series of lectures and hands-on computer exercises under the supervision of experts on tsunami modeling.

4.6.3 FUTURE TRAINING PROGRAMME

During this shortened Hawaii Study Tour (ITP-Hawaii), it was suggested that such a briefing might be useful for many nations and that it be conducted in the Pacific, and perhaps in cooperation with the East-West Center which has been conducting natural disaster management training courses for the past several years.

Further, it has been suggested that the Training Programme also focus on specific technical capacity

needs such as seismological practices, tsunami numerical modelling, or community-based disaster preparedness.

The ITIC seeks input from the ICG/ITSU on the potential value of such a Study Tour and what its focus and content should be. It is especially interested to know from those nations that participated in July 2005.

4.7 REGIONAL AND OTHER TSUNAMI WARNING SYSTEMS

4.7.1 WORKING GROUP ON THE CENTRAL AMERICA PACIFIC COAST TSUNAMI WARNING SYSTEM

On the Pacific Coast of Central America, The Centro de Coordinación de la Prevención de Desastres Naturales en América Central (CEPREDENAC), the regional disaster reduction organization for Central American, with support from ITIC, hosted a workshop 25-27 April 2005, in Managua, Nicaragua. The meeting brought together technical experts from the seismological and hydrometeorological fields, civil protection and emergency management personnel, representatives from education and capacity building institutions, telecommunications, and cooperating agencies, to discuss and identify further action towards the implementation of the Regional Tsunami Warning System for Central America on the Pacific Coast that was that was elaborated upon after the ISDR Hemispheric Consultation on Early Warning in Guatemala in 2003. For this, inter-ocean coordination must incur between the Caribbean and Pacific systems with countries that share both oceans. Coordination amongst the technical agencies and national disaster management organizations continues to be challenging in this region where funding has been minimal.

4.7.2 WORKING GROUP ON THE TSUNAMI WARNING SYSTEM IN THE SOUTHWEST PACIFIC AND INDIAN OCEAN

For the southwest Pacific Ocean, the IOC's ICG/ITSU and SOPAC continue to build upon the work programme developed in the South Pacific Tsunami Awareness Workshop in 2004. Priorities are to establish a sub-regional tsunami warning service in the southwest Pacific for this earthquake-prone region, and for the urgent need for National Disaster Management Organizations (NDMO) to develop, implement, and exercise national tsunami response plans and build capacity in disaster prevention to mitigate future losses. To support the warning service, Australia has announced USD \$2 million for technical capacity building. Of particular note, however, is that despite its proximity to the Indian Ocean and the known fact that more than 80% of the observed tsunamis occur in the Pacific, no significant investment beyond that offered by Australia has been identified to target proactive tsunami risk reduction of SIDS member states. For more information, see related information on the SOPAC Regional Planning Meeting on Early Warning 5-6 September 2005. The USA has also announced increased support to strengthen monitoring of all of the Pacific.

4.7.3 CARIBBEAN AND ADJACENT REGIONS TSUNAMI WARNING SYSTEM

In the Caribbean region, CDERA and the IOC's Regional Programme IOCARIBE have taken leadership roles in convening consultations to build support and develop an action plan for strengthening the real-time monitoring network, improving evaluation capabilities, and ensuring effective early warning dissemination. During 2005, a number of consultations took place in the Caribbean region. These included a 21 February 2005 CDERA-sponsored meeting in Barbados in response to the 15th Caribbean Community Council of Ministers meeting for establishment of EWS, which brought together seismic, disaster management, coastal, oceanography officials from 12 agencies to review existing monitoring networks, examine data sharing among the networks, and plan a programme of action. At the 7th Biennial Conference of the Faculty of Pure & Applied Science, University of the West Indies, in Jamaica 18 May 2005, participants endorsed the *Mona Resolution*, which called for tsunami awareness and risk-reduction programmes, including tsunami warning

arrangements, to be implemented in the Caribbean.

As a means to move towards implementation, the IOCARIBE convened with Mexico sponsorship, the International Conference for the Development of a Tsunami and Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, on 1-3 June 2005 in Mexico City. Altogether, 60 participants from 17 countries and eight regional and international organizations, representing national disaster management organizations, scientists, and other tsunami mitigation specialists, endorsed the Caribbean *TWS Communiqué*. The *Communiqué* recognized and supported the creation of an integrated, and sustained regional system for the detection, forecasting, warning, and mitigation of tsunami and other coastal hazards, and requested the PTWC to extend its warning guidance to the wider Caribbean Region on an interim basis until such time as this capability can be managed independently within the region. The newly established ICG/CARTWS will meet for the first session on 10-12 January 2006 in Barbados. High level advocacy and resources for implementation are still needed to realize the system. Although the USA has announced over USD \$35 million to support seismic and sea level network upgrades and enhancements in tsunami operations in the Caribbean and the Pacific to strengthen warnings of US residents, further support is still required to improve instrumental monitoring of the southern and eastern Caribbean region.

4.8 IUGG TSUNAMI COMMISSION

The IUGG Tsunami Commission has published the proceedings of the 2003 IUGG Tsunami Symposium, and is providing copies to ITSU Member States. The ITIC and ITSU Officers thank the IUGG for generously providing the funding to allow the purchase of the book and its distribution. Copies are available from the ITIC, and will be distributed upon request to Member States of other oceans.

4.9 FDSN/IRIS GLOBAL SEISMIC NETWORK

COMPREHENSIVE NUCLEAR TEST BAN TREATY ORGANIZATION (CTBTO)

See Section 4.5.2.

The PTWC and ITIC have established close working relationships with the IRIS Global Seismic Network which is providing the critical seismic waveform data for the real-time monitoring of earthquakes globally with data availability close to 90%.

Presently, the FDSN Domenico Giardini confirms that IRIS GSN Program Manager Dr. Rhett Butler and Data Management Center Program Manager Dr. Tim Ahern are available to attend ITSU-XX on Wednesday, 5 October. They are willing to make a presentation and participate in discussions and/or the Sessional/Intersessional Working Group.

In 2005, UNESCO IOC cooperation with the Comprehensive Nuclear Test Ban Treaty Organization for the sharing of real-time seismic data streams from their networks began with the potential for increasing station density with data availability of 98%.

With the IOC leading the efforts to implement global tsunami warning systems, it will be imperative to establish active cooperations with these international organizations. These global network operations should be included in all Tsunami Warning System Seismic Working Groups.

4.10 ISDR

The ITIC has built collaborative working relationships with the ISDR PPEW and Communications Liaison for the Indian Ocean, and has discussed similar activities that can extend into the Pacific. Currently, the ITIC is working with the ISDR on the following projects:

1. Media awareness building with Asian Broadcasting Union and Japan NHK (focus on Indonesia and Thailand, which are also ITSU members);
2. Participation in ISDR Tsunami Education and Public Awareness Meeting, 7-8 Sept 2005. See Section 3.2.2.n
3. Animated computer game on disaster reduction involving the building of communities and the

consequences of design and policy decisions when natural disasters, such as tsunamis, earthquakes, and volcanic eruptions, hit. Potential collaborators for tsunami science and modelling are Oregon State University which is developing integrated tsunami scenarios (see Section 3.1.d). Target audience to be both government officials and the public through the use of realistic scenarios providing informative consequences in an fun and educational manner.

4.11 WDC-SEG/NGDC

The ITIC, using NOAA PRIDE funding, is providing funding for database quality control of data from Alaska and California, and has purchased the tsunami travel time code used operationally by the PTWC for inclusion in NGDC tsunami products (online and offline).

See Section 4.2 for discussion of the high-priority need for merging the tsunami databases into one high-quality, referenced database.

4.12 SOPAC

See Sections 3.1.e and f for information on previous collaborations between ITIC and SOPAC.

The ITIC supports the SOPAC Draft Strategy from the 5-6 September 2005 meeting, but wishes to make the following intervention for action:

The ITIC Director Strongly recommends that SOPAC identifies an actual person that will be dedicated to advocate and facilitate tsunami mitigation efforts with SOPAC Member States. It is felt that a Virtual Centre will not be adequate for sustaining the active, ongoing effort that is needed.

The person should be able to work on both the technical aspects concerned with sea level and seismic monitoring and evaluation and hazard risk assessment and numerical modelling, and the non-technical aspects of national tsunami response plans, emergency management, preparedness, education, and outreach.

As appropriate, it is recommended that this person spend at least some of the time at the ITIC and PTWC to understand the processes, protocols, and activities which build an effective system.

Possible means of resource mobilization include ITSU Member State secondment, ITSU Member State funding support to the IOC Trust Fund for such a position, and/or SOPAC-generated support through the Pacific Island Forum. In this regards, attention is called to the Commonwealth Secretariat Report for SIDS Early Warning (8-9 August, Barbados, See Section 3.2.1.c) calling for high-level advocacy and support for the Pacific in regards to tsunami hazard mitigation and preparedness.

5. ITSU PUBLICATIONS AND AWARENESS TOOLS ITIC INFORMATION SERVICES

5.1 LIBRARY

5.1.1 Library. The ITIC Library currently contains about 2000 shelved items (books, series, reports) and 1250 documents (reprints, abstracts, manuscripts, photocopies). A dedicated PC hosts the library database using FileMaker Pro v.6 software to provide web-based, Internet accessibility through the ITIC web site. A search engine allows the user to specify different search attributes, including author, title, keyword, and event date, and upon submission, returns a list of references that the ITIC Library holds. Brochures and other tsunami informational materials created by Member States continue to be collected in order to create a reference multi-language tsunami awareness inventory of existing awareness materials. The library has no paid subscriptions to any journals. The ITIC is on the distribution list for titles

from the IOC, Natural Hazards Research and Applications Information Center (Boulder), Ocean University of Qingdao, National Tsunami Hazard Mitigation Program's TsuInfo Alert, and several other organizations routinely send their publications. Other earthquake or disaster related organizations send their newsletters. (UH SeaGrant, PAHO, IAEM, EPA, AGSO, and Mid-America Earthquake Center).

5.1.2 Digital conversion of documents. The ITIC continued its efforts to make documents electronically available through its web site. Digital documents were either scanned or obtained from the original sources, and permissions obtained for public posting and dissemination. At the same time, the ITIC is assessing and creating a digital database to identify the value and fragility of each document in the ITIC Library Collection; this database will be used to take priority actions on the most perishable documents and to provide a means by which to monitor progress. Additionally, the ITIC is digitally preserving the approximately 900 historical photos it holds in its collection.

5.2 TSUNAMI NEWSLETTER

Four issues of the Tsunami Newsletter were produced for 2004; the fourth issue of the Tsunami Newsletter contained the ITSU-XIX National Reports. For 2005, the ITIC is presently preparing for the distribution of Issue #1 which will cover tsunami events from November through December, 2004, and meetings through September 2005. All issues are available in Adobe PDF-format at the ITIC web site at <http://www.tsunamiwave.info>. In addition, hard copies were sent to those requesting this option. Total electronic and hard copy circulation numbers about 700 to 40 countries.

5.3 ITSU / ITIC WEB SITE (<http://www.tsunamiwave.info>)

During 2004, the ITIC USA web site continued to be improved and enhanced with new content added. The ITIC and IOC Technical Secretary met in Honolulu during February, 2004, to discuss the reorganization of the ITIC web site content, and during the ITSU Officers Meeting in December 2004, a new ITSU web site structure was agreed upon, in which the ITIC web site content would be moved to a newly-organized ITSU web site to provide a simpler and more comprehensive site that could be visited by all kinds of the users. A new web banner was designed, and the content transferred starting in March 2005. The ITIC web site now serves as the information service for ITSU, and provides information for the general public, as well as technical and other ICG/ITSU reports and other technical documents.

5.4 TSUNAMI BULLETIN BOARD

The ITIC Tsunami Bulletin Board (TBB), which provides email list serve information to more than 300 members, continued to be used often by tsunami professionals using Lyris ListManager V.7.0 software maintained by the USA NOAA National Weather Service. The system performed extremely well in the days and months following the December 26, 2004 tsunami. The ITIC facilitated the organization and information sharing of Post Tsunami Scientific Survey Teams through its hosting of the Tsunami Bulletin Board (TBB). The 1st tsunami propagation models were posted to the TBB within hours of the event, and through January 14, 2005, more than 300 messages had been posted on the science of the tsunami event. The TBB has hosted the sharing of survey results from more than 15 surveys involving more than 100 scientists; these data are being collected and compiled and made available to the impacted countries for their use in developing national tsunami warning systems.

5.5 INFORMATION REQUESTS AFTER THE 26 DECEMBER 2004 TSUNAMI

In the first two weeks after the tsunami, the ITIC received about 500 email messages to its general

email addresses, and the ITIC Director individually received another 1200 messages. The ITIC Director in turn responded with more than 1000 emails. The ITIC received more than 300 media or other information requests by phone, FAX, and by written communication. Starting immediately after the event, the ITIC and Intergovernmental Oceanographic Commission (IOC) worked to post high-quality scientific information on the tsunami on the ITSU web site hosted in Paris. The ITIC and IOC also set up a Public Listserv through its ITSU site for the public to sign up for the immediate, but non-operational, delivery of tsunami information messages issued by the Pacific Tsunami Warning Center and West Coast/Alaska Tsunami Warning Center. Currently, there are several thousand people subscribed for this free public service.

5.6 TSUNAMI AWARENESS AND EDUCATIONAL MATERIALS

5.6.1 REVISED AND CUSTOMIZEABLE INFORMATIONAL PUBLICATIONS

The ITIC has revised and updated several english-language informational brochures, and will make these available in October in an electronic format that provides easy translation and localization of graphics. Additionally, hard copies of existing materials are available for distribution upon request. The electronic files are available for download from the ITIC web site (www.tsunamiwave.info) as both PDF-format and layered Microsoft Word files in which the text and graphics are separated into separate objects for manipulation and customization.

Newly revised 2005 editions of the following products are available:

- Great Waves, June 2005 edition.
This booklet was revised to include information about the Indian Ocean tsunami and more strongly emphasize that tsunami mitigation programmes must include comprehensive efforts at hazard risk assessment, warning guidance, and preparedness and education.
- Tsunami Glossary, October 2005 edition.
The Glossary will be updated to include information on the recent establishment of global intergovernmental coordination groups for tsunami warning and mitigation, and to include more modern definition of terms.
- Tsunami Warning! 2005 edition.
This children's booklet with cartoon-like illustrations describes what happens when a large Alaskan earthquake causes a tsunami warning and evacuations to be issued in Alaska and Hawaii. The format of the document should allow easy customization for the source event and national/local response. A Spanish language version exists for a Chile earthquake and tsunami warnings issued in Mexico that was produced by CICESE.

The ITIC will also have available a tsunami safety poster that can serve as a template for national or local tsunami safety posters customized using local languages and photos or graphics. The safety poster will contain a standard set of information that the public should be aware; these are "what a tsunami is and how it acts when it comes ashore," "what the natural tsunami warning signs are and what a person should do when a tsunami warning is issued," and "where to find out more tsunami information nationally or locally." The original design (A3-size) is being done in collaboration with Sri Lanka National Science Foundation and the Department of Meteorology for its 3-month Awareness Programme to commemorate tsunami victims on the first anniversary starting from 26 October 2005 and ending on 26 January 2006.

5.6.2 TSUNAMI WARNING AND EVACUATION TRAINING VIDEO B-ROLL TSUNAMI INFORMATION VIDEO

With funding from the U.S. National Tsunami Hazard Mitigation Program and in collaboration with NOAA Public Affairs, the ITIC has produced three informational videos.

The Hawaii Tsunami Warnings 1986, 1994 training video is a compilation of news announcements

and stories aired during the 1986 and 1994 tsunami evacuations in Hawaii. The video is comprised of actual footage of the evacuation of coastlines and boats in harbors, sirens and voice alert systems, emergency officials working to clear beaches prior to the first-wave arrival, the traffic problems, and the issuance of the “all-clear” announcement when the non-destructiveness of the tsunami was determined. The video also includes rare footage of the 1946 tsunami, the 1995 Greenland tsunami wave, and simulations of tsunami waves destroying a parking lot and building. It was developed for use by emergency managers and other government officials for education and training. The video is 11.50 minutes long and is available in DVD format.

The Tsunami B-Roll is a collection of interviews, tsunami science and numerical tsunami propagation animations, and other graphics for use by Broadcast Media as filler or background footage during a TV news presentation or a documentary program. It may also be useful to emergency managers, educators, and for training. The subject matter covers the science of tsunamis, the U.S. tsunami warning programs and centers in Hawaii and Alaska, the U.S. Tsunami Hazard Mitigation Program, Tsunami Ready preparedness programs, and the ITIC. The video runs 57 minutes and is available in Beta-SP and DVD format. By the end of 2005, the B-roll product will also be comprised of tsunami science graphics and numerical modelling animations.

5.7 ALERT SERVICES

In 2005, the ITIC has developed and is making available several additional services to government officials in charge of tsunami warning for their countries. These include: 1. a public list serve that immediately sends an email to all subscribers upon receiving a message from the PTWC, WC/ATWC, and JMA; 2. a real-time earthquake display and alerting system (CISN) developed by the U.S. Geological Survey (USGS) in partnership with California Institute of Technology and the State of California Emergency Services; and 3. a heads-up SMS text messaging service for PTWC tsunami messages through the RANET Project.

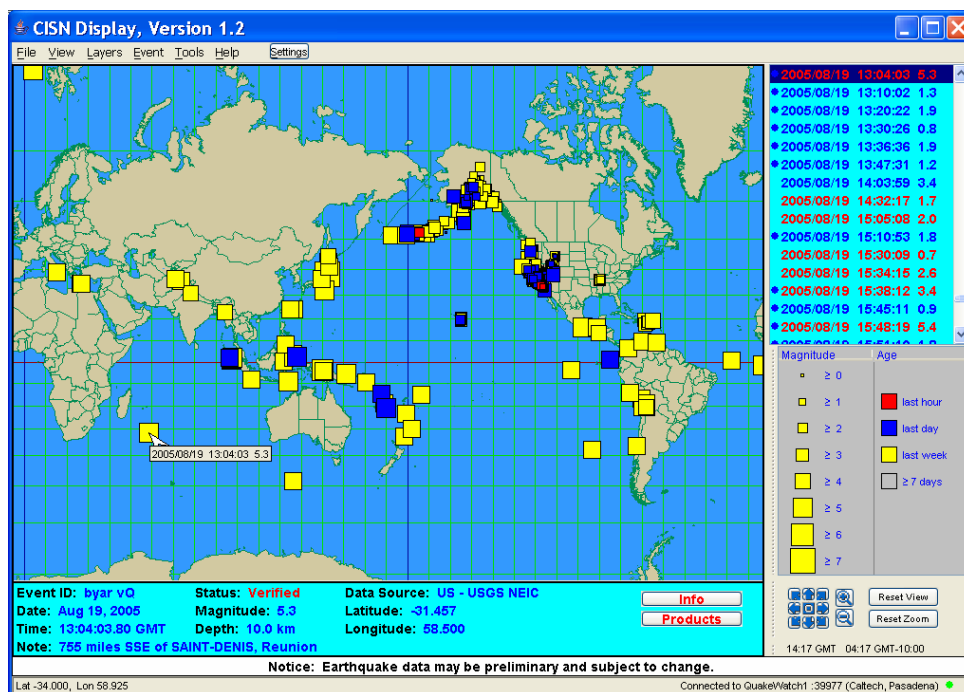
5.7.1 PUBLIC TSUNAMI WARNING LIST SERVE

The UNESCO IOC and ITIC has set up a PUBLIC TSUNAMI WARNING LIST SERVE for the public to receive by email tsunami warning center information messages as they are issued. To subscribe to this service, visit http://ioc.unesco.org/indotsunami/subscribe_warning.htm. This is not an operational service and these messages should not be considered as official warning messages. The IOC cannot guarantee that this service will be operational 100% of the time and that there will be no delays in the receipt of the messages by subscribers. Official warning messages are assured of delivery only to the Tsunami Warning System National Operational Contacts. This service went into operation on 31 Dec 2004 and broadcast messages posted by the Pacific Tsunami Warning Center and the West Coast/Alaska Tsunami Warning Center for the 1 January 2005, 0625 UTC, M6.5 earthquake that occurred in the same region. The Warning Centers posted these messages about 15 minutes after the earthquake occurred. The Warning Centers contributing to this service are the Pacific Tsunami Warning Center, the West Coast / Alaska Tsunami Warning Center, and the Japan Meteorological Agency.

5.7.2 REAL-TIME EARTHQUAKE DISPLAY AND ALERT SERVICE

For the CISN, the ITIC has worked with the USGS and its development partners to offer this product as a solution for a multi-platform, Internet-based earthquake broadcasting tool with GIS capabilities that is freely available to government and other official agencies. More robust tsunami warning notifications are being built by the end of 2005 that will upgrade and improve the software. The ITIC will act as the local administrator for requests from Member States globally with tsunami alert interests. To sign up, send email to l.kong@unesco.org or itic.tsunami@noaa.gov

Below is shown a sample screen from CISON Display showing map epicenters (coded by magnitude and origin time), listing of events (right, with events were analyst has reviewed event highlighted), and hypocentral parameters of most recent event (lower left). The display, alarm triggering, and earthquake alerting is user-selectable and the maps localized through the import of GIS shape files.



5.7.3 SMS TEXT MESSAGING ALERT SERVICE

The USAID-funded RANET Project is currently providing a SMS-text message heads-up alerting service for PTWC-generated tsunami bulletins. The ITIC Director and the RANET Project Leader Kelly Sponberg (NOAA NWS International Affairs) have implemented this pilot service to provide a heads-up alert to a limited number of government and emergency officials that an official message has been sent by the PTWC. Worldspace satellites and dedicated phone lines are being used with service to Africa, Indian Ocean, and the Pacific. The RANET project has been successful in Africa and is being piloted in the Pacific in collaboration with Australia's Bureau of Meteorology. For the past few years, the ITIC has been in discussions with RANET to request that the project be able to provide time-critical warnings (e.g., tsunami warnings) to remote customers through its community radio stations in rural communities. The SMS-tsunami alert service is not a replacement to the official PTWC bulletins issued through official channels. To sign up, send email to l.kong@unesco.org or itic.tsunami@noaa.gov. Indicate a request to receive heads-up tsunami alerts from the PTWC.

6. ITIC NEW PROJECTS AND ACTIVITIES

6.1 IOC TSUNAMI EVENT DATA

6.1.1 TSUNAMI DATA PRESERVATION

See Section 3.2.2.o

6.1.2 SEA LEVEL INVENTORY WEB SERVICE

See handout and ITSU-XX Summary Report.

6.1.3 EXTREME WATER EVENTS

See handout and ITSU-XX Summary Report.

6.2 AWARENESS AND EDUCATION

6.2.1 TSUNAMITEACHER

See Section 3.2.1.d, handout, and ITSU-XX Summary Report

6.2.2 ISDR-ITIC MEDIA AWARENESS

See Section 4.10

6.2.3 ISDR-ITIC CHILDREN'S COMPUTER GAME

See Section 4.10

7. CONCLUSION

This report is an overview of what we have been involved in during the intersessional period regarding the ITIC ICG/ITSU activities and the ITIC contributions in support of the implementation of tsunami warning and mitigation systems in the Indian Ocean and globally.

The ITIC and its staff look forward to providing continued service to the Pacific, and all nations and regions around the world.

ANNEX 1.

**TSUNAMI RISK REDUCTION IN SMALL ISLAND DEVELOPING STATES****Session III - New EWS Initiatives****Background Paper by Dr. Laura Kong, Director****International Tsunami Information Centre****On behalf of the Intergovernmental Oceanographic Commission of UNESCO
for distribution at****A Regional Planning Workshop Enhancing Early Warning for Pacific Island Countries, Suva,
Fiji, 5-6 September 2005**

Small Island Developing States are especially vulnerable as the intensity and frequency of natural and environmental disasters is greater and has disproportionately high economic, social and environmental consequences. In reducing risks, the Pacific Island States, under SOPAC leadership, are developing a comprehensive and detailed Framework for Action that emphasizes the development of integrated disaster risk management systems (CHARM) that are both easily understood and people-focused with an emphasis on education and public awareness. A primary challenge continues to be in strengthening National Disaster Management Organisations (NDMOs), and in empowering the NDMO to implement disaster preparedness programs and organize an effective disaster response that engages local communities.

Although it does not have the mandate to develop and operate a tsunami early warning centre, SOPAC continues to play a regional facilitator role through its sponsorship of the Tsunami Working Group - Southwest Pacific. The TWG provides a collaboration and coordination mechanism amongst member states and the IOC ITSU/ITIC for the implementation of the Southwest Pacific Tsunami Warning Service and National Tsunami Response Plans.

We must be able to respond to both local tsunami, those generated by a small earthquake or an underwater landslide that only affect areas less than 200 km away, and to a huge earthquake, like the one in Sumatra the 26 of December, which generates a destructive ocean-wide tsunami that travels thousands of kilometers across the ocean before hitting the coastline. In 1960, the Pacific experienced the M9.5 Chile tsunami which caused deaths in Hawaii and in Japan 15 hours and 22 hours after the earthquakes, respectively. Because of the existence of distant tsunamis, a single country cannot adequately protect itself from tsunami risks without a regional network of observation stations.

A tsunami warning system can exist only through international regional cooperation under the principle of open, free and unrestricted exchange of observational data, and the availability of an effective National Tsunami Response Plan that is activated when warnings are issued. These are important lessons learned from our past experience. Important as they are, the instrumental networks used for tsunami detection and early warning are just one element in the chain to achieve mitigation of the hazards from tsunamis. Comprehensive tsunami mitigation requires progress in three mutually dependent components: **first**, the assessment of tsunami hazards; **second**, the detection/warning system; and **third**, the adoption of preparedness measures. Programme activities need to be targeted at all levels within the government and down to households at the community level, and it is the role of the National Disaster Management Organization to provide leadership.

Tsunami preparedness programmes educate not only the general public, including transient populations such as tourists staying at beachfront hotels, but also government officials and other local community leaders, so that good government emergency action decisions will be made without delay. The programmes should build capacity and awareness at the local level, place the tsunami hazard and response in the local context, and empower communities to collectively engage in developing an appropriate tsunami response and in pre-disaster mitigation activities.

Specifically, national pre-disaster mitigation programmes must identify vulnerable coastal communities through an assessment of national tsunami risk and implement plans at the local level for tsunami response through the development and widespread publication of evacuation or tsunami safe zone maps along with instructions to the public on how to respond. Engineering and other non-structural countermeasures, such as sea walls, water gates, and vegetative barriers and the design of seismic and tsunami-resistant buildings and critical lifeline infrastructure, to reduce the impact of tsunami on life and property, should also be considered as equally important pre-disaster activities. Finally, social science plays a crucial role in understanding how humans perceive and respond to natural disasters and disaster warnings; these perceptions must be taken into account to ensure that the tsunami risk is communicated in an understandable and actionable manner to the public.

Early Warning Systems can save lives. In particular, a number of activities are critical for an effective system to operate, and can be summarized as follows:

1. **Proper instruments which enable the early detection** of potentially harmful earthquakes and tsunamis;
2. **Warning systems that reliably inform the vulnerable populations** immediately and in an understandable way;
3. **Awareness activities that enable ordinary citizens to recognize** a tsunami so that they know what to do
4. **Preparedness activities which educate and inform** a wide populace, including government responders and those providing lifeline and critical infrastructure services, on the procedures and activities that must be taken to ensure public safety;
5. **Planning activities which identify and create** the public safety procedures and products and build capacity for organizations to respond faster;
6. **Strong buildings and safe structures that save lives and reduce property damage** that are designed as pre-disaster mitigations;
7. **Stakeholder coordination as the essential mechanism** that facilitates effective actions in warning and emergency response;
8. **High-level advocacy that ensures** a sustained commitment to mitigate against infrequent, high-fatality natural disasters such as tsunami.

During an inter-regional consultation on Disaster Warning and Response held in Barbados 8-9 August 2005 in which SOPAC and the UNESCO/IOC participated in, several important recommendations were highlighted which have high relevance for Pacific Island States. These include the need for:

- Sustained political will at the highest levels – both nationally and internationally – to ensure a consistent and long-term approach to disaster risk management, ensure that early warning systems are effective right down to the community level, and that disaster response and recovery plans are in place and reviewed so that lessons are learned over time. Leadership is needed at all levels in disaster risk management, and champions in the process are required for success.
- Broadly speaking, national institutional capacities should support the research and development, monitoring and evaluation, education, training and professional development for early warning. If not already accomplished, this can best be identified and planned for by conducting a clear

assessment audit of the existing structure, roles and responsibilities in risk management of the full gambit of stakeholders. The IOC of UNESCO has already undertaken a comprehensive baseline survey of this kind in the Indian Ocean Region, and the IOC's ITSU is planning to undertake the same baseline survey in the Pacific.

- Disaster management practices that are developed need to consider social, psychological and economic aspects and existing practices and infrastructure. There is also an important need to strengthen data, information exchange and communication from, to and at the community level. Success may require novel integral approaches that enable all communities at risk, and all citizens, men and women, to be involved, including:
 - traditional and non traditional mechanisms for disseminating early warnings;
 - how socio-psycho aspects of the impacts of disaster/trauma will be addressed
 - how technical solutions and warnings need to take account the specificities of the local situation, including traditional knowledge, geography, language, needs and cultures of different communities and individuals and other factors;
 - the identification and protection of 'lifeline' infrastructure and resources to ensure their availability after a disaster (schools, hospitals, community shelters); and
 - the effectiveness or different models for community engagement and participation.
- The development of model legislation, national disaster policies/strategies/ frameworks, and the mainstreaming of disaster management in development planning are required. Training manuals and guidance for policy, planning and implementation should be developed and published. As elements of risk management systems are often housed within different geopolitical bodies. Existing agreements for co-ordination and collaboration on information and sharing of experience should be used to ensure the effective integration of all systems in a region, and across regions.

To build awareness of the tsunami hazard and develop a regional strategy, the IOC ITIC and SOPAC Community Risk Programme organized the South Pacific Tsunami Awareness Workshop (SPTAW) last July, 2004 in Suva, Fiji. The SPTAW brought together NDMO and technical experts from eight island nations (American Samoa, Cook Islands, Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu) and international experts to discuss the tsunami threat in the southwest Pacific and to identify priorities and actions to mitigate the tsunami risk. The group identified as highest priorities the establishment of the sub-regional or local tsunami warning service for the southwest Pacific, and the development of tsunami National Tsunami Response Plans. This Work Programme was presented at the 2004 STAR Meeting, which endorsed the Programme and established under SOPAC a Tsunami Working Group for the Southwest Pacific. This group is currently composed of members of the ITSU Southwest Pacific and Indian Ocean Tsunami Warning System Intersessional Working Group, and augmented by scientists and other professionals who attended the STAR meeting.

The SPTAW Work Programme is being presented at this Planning Workshop to confirm the importance and priorities of the activities that were identified in 2004. The outcomes of this meeting's Tsunami Hazards Working Group (chaired by C. McCreery, PTWC Director and ITSU Vice-Chair) will be presented at the STAR Meeting and SOPAC's 34th Annual Session 23-30 September 2005, and at the IOC ITSU XXth Session 3-7 October 2005. A tsunami-specific meeting will then be convened in late 2005 or early 2006 to discuss and establish an action plan for addressing the various component activities.

ANNEX 2.

**THE ROLES OF THE NATIONAL DISASTER MANAGEMENT ORGANISATION IN
REDUCING RISKS FROM TSUNAMI HAZARDS**

**Session I - Statement by Dr. Laura Kong, Director
International Tsunami Information Centre**

**On behalf of the Intergovernmental Oceanographic Commission of UNESCO
Delivered by Brian Yanagi, Deputy Director, at
A Regional Planning Workshop Enhancing Early Warning for Pacific Island Countries, Suva,
Fiji, 5-6 September 2005**

Distinguished Delegates, Colleagues, Ladies and Gentlemen,

First of all let me thank you for inviting the IOC to participate in this important planning workshop to discuss proactive actions to improve early warning systems in the Pacific.

The December 26, 2004 Indian Ocean tsunami has tragically demonstrated that there is an urgent need for early warning systems that provide timely, understandable warnings which motivate ordinary citizens to quickly move out of harm's way. While implementation of the Indian Ocean tsunami warning and mitigation system is being pursued with highest urgency, the tsunami hazard exists in all oceans and seas. And, because more than 80% of the tsunamis occur in the Pacific, it is very probable that the next tsunami catastrophe will impact our Pacific Basin.

The international community was shocked by the magnitude of the Indian Ocean tsunami disaster. Over 200,000 people lost their lives. Many more lost their homes, property and livelihoods. Recovery of this disaster will take a long time. However the response from the international community was immediate and assistance was provided by individuals, the private sector and governments around the world.

The United Nations has been engaged for fifteen years in a process of creating awareness and promoting the development of policies to diminish the loss of life and property from natural and man-made disasters - first through the International Decade for Natural Disaster Reduction and then through the International Strategy for Disaster Reduction that followed, and the establishment of the UN Disaster Task Force, in which UNESCO and IOC participate. This process of awareness-raising and policy development culminated in the World Conference on Disaster Reduction held in Kobe, Japan, in January 2005.

The Kobe Conference adopted the "Hyogo Framework for Action 2005-2015", a document that commits governments and the international community to achieving a set of concrete goals, among them the commitment to halve the loss of life caused by disasters, to make all schools and hospitals disaster-proof, and to establish national natural disaster platforms in each country.

The Hyogo Declaration states that "[...] we are far from powerless to prepare for and mitigate the impact of disasters. We can and must alleviate the suffering from hazards by reducing the vulnerability of societies. We can and must further build the resilience of nations and communities to disasters through people-centered early warning systems, risks assessments, education and other proactive,

integrated, multi-hazard, and multi-sectoral approaches and activities in the context of the disaster reduction cycle, which consists of prevention, preparedness, and emergency response, as well as recovery and rehabilitation.”

However, in the face of the Indian Ocean tsunami disaster and because today we do have the knowledge and technology to avert such a human catastrophe, one cannot avoid feeling part of a major collective failure - failure to effectively communicate between science and government; failure to communicate with and prepare society; failure to build or renovate the necessary institutions; and failure to bring all these assets into play for the benefit of humankind.

After the devastating event of 26 December 2004 we must not, and we cannot fail again. The UN agencies have responded by agreeing to undertake the immediate creation of an Early Warning System for the Indian Ocean, building upon the experience of the International Coordination Group for the Tsunami Warning System in the Pacific – ITSU - of UNESCO/IOC.

Intergovernmental Coordination Groups have been established for the Indian Ocean, the Caribbean Sea region, and the Northeastern Atlantic and Mediterranean Sea, thus showing the high-level commitment by governments to build comprehensive tsunami risk reduction programmes. The systems are being implemented with the close collaboration with the World Meteorological Organization (WMO), whose Global Telecommunications System is used to deliver timely warnings and transmit the important wave-confirming sea level data, and with the International Strategy for Disaster Reduction (ISDR) which will seek to ensure synergy between disaster risk reduction and disaster response activities.

At the core of the system is the National or Sub-Regional Tsunami Warning Center that is designed to respond to the more frequent smaller earthquakes occurring in the region. These Centers should be fully interlinked with the National Disaster Management Organisation, so that long-term preparedness and mitigation plans can be implemented and timely alerts issued by the responsible agencies.

An effective tsunami early warning system is achieved when all persons in vulnerable coastal communities are prepared and respond appropriately and in a timely manner upon recognition that a potential destructive tsunami may be approaching. While timely tsunami warnings issued by an officially-recognized regional tsunami warning centre using real-time seismic, sea level, and other geophysical data streams from throughout the monitoring region, are an essential component of the system, it is absolutely critical that these scientifically-based warning messages are communicated to the public in an understandable manner that clearly and simply instructs ordinary citizens on the actions they should take to ensure their safety.

These actions include the evacuation of people located in areas of potential flooding to safe zones or shelters, along with instructions on who should evacuate, where and how they should go, when to go, what to bring, and how they will know when it will be safe to return. In this regard, pre-disaster tsunami awareness and preparedness are essential activities for educating and familiarizing the public in advance so that they are able to respond immediately and knowledgeably during the actual emergency.

The success of any warning system lies in its ability to reach people, e.g., that the people with important specialized knowledge of the impending hazard are able to quickly and efficiently pass on actionable information to all the people who are at risk - although technology is essential for information analysis and delivery, successful early warning ultimately relies on the abilities of people to reach people.

Coordination is essential and the National Disaster Management Organisation must play the essential and

key role. Specifically,

The NDMO must:

- **Prepare the public** for all-hazards, including tsunamis, through education and awareness, communication of risk to communities and involving communities in hazard mitigation activities
- **Identify the hazards** and vulnerable communities (risk evaluation), through cooperation with technical institutions locally and internationally
- **Ensure information flow** from warning centres to the public for safety, through coordination and reliable / robust dissemination of understandable / actionable information

The NDMO staff must have experience in:

- **Leadership**, to be able engage, instruct, and motivate citizens to act
- **Public speaking**, to lead, educate, and re-assure citizens in times of disaster
- **Community Education**, to translate science and safety into simple and clear public action
- **Process Management**, to build natural hazard/threat scenarios, and develop preparedness programmes and carry out drills
- **Programme Management**, to identify needs, develop the strategy and plan, and implement the plan

The NDMO will be successful if it:

- Acts as the **Leader**,
 - in pre-disaster mitigation planning and implementation of projects;
 - before and during the event to inform/evacuate the affected public;
 - after the disaster to inform public of the 'all-clear' when it is safe to return;
 - in search-and-rescue and disaster recovery.
- Acts as the **Translator** of science and technology to ordinary citizen-understandable concepts/language;
- **Builds high-level advocacy** to maintain existing and create new programme funding;
- **Builds all-stakeholder coordination** (local and national) for effective emergency response;
- **Builds community-level linkages** to implement people-centred early warning and mitigation.

Ladies and Gentlemen,

Tsunamis are low frequency, but high impact, natural disasters that are also unpredictable. We may not see another destructive tsunami in a hundred years or we may see another one tomorrow. What we have learned on 26 December 2004 however, is the need to be prepared.

Ensuring that an effective national tsunami warning and mitigation system is implemented in every Pacific island nation is a considerable task. The 17 Member States of SOPAC have a population of only ~7 million, with 5 million in Papua New Guinea, that is scattered over a vast region 10,000 km from east to west and 5,000 km from north to south, and many small islands are only minimally connected by reliable communications. To be effective, every island will have to know when a tsunami is approaching and be prepared to respond. And, national and local disaster management organizations must provide the leadership in emergency response, search and rescue, and disaster recovery for its people.

Facing this challenge will require a strong and effective national disaster management system, a well-designed strategy, and close and effective cooperation and coordination between all stakeholders. Relevant legal and administrative arrangements will be required and the necessary human resources will need to be put in place, in addition to technical and scientific infrastructures.

This is the challenge we must collectively address, and that we must work together to achieve. The ITIC, ITSU, and the IOC of UNESCO stand ready to assist in every way and to work with you to build tsunami resilient communities.

We look forward to a productive meeting and to working with every nation to implement an effective tsunami warning and mitigation system that will save lives and property.

Thank you for your attention

[end]