



# The Global Forum on Oceans, Coasts, and Islands

Reports from the Third Global Conference on Oceans, Coasts, and Islands

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## THE TSUNAMI DISASTER AND DISASTER PREPAREDNESS: ONE YEAR LATER

Summary prepared by Stefano Belfiore,  
Intergovernmental Oceanographic Commission, UNESCO

*The Global Conference considered the issue of tsunami and disaster preparedness, using the goals of: reviewing progress achieved and obstacles faced in the process of reconstruction and the development of capacities for disaster preparedness in the countries of the Indian Ocean affected by the tsunami of 26 December 2005; learning lessons on reasons why some coastal communities may have fared better than others in the tsunami disaster (e.g., use of building codes, coastal protection measures, public education, etc.); and examining progress with the establishment of tsunami warning and mitigation systems in four main regions of the world (Indian Ocean, Pacific, North Eastern Atlantic, Mediterranean and connected seas, Caribbean). The expected outcome from the panel was further opportunities and next steps for mainstreaming an integrated, multi-hazard approach to address vulnerability, risk assessment and disaster management, including public awareness, prevention, mitigation, alerts, preparedness and response into the global ocean and coastal agenda, in particular into strategic, long-term coastal planning.*

*The panel was co-chaired by: William Brennan, Deputy Assistant Secretary for International Affairs, United States National Oceanic and Atmospheric Administration (NOAA); and François Schindelé, former Chair, Intergovernmental Coordination Group for the*

*Tsunami Early Warning and Mitigation System in the Indian Ocean (ICG/IOTWS). Panel participants included: Maitree Duangsawasdi, Director General, Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment, Thailand; Franklin McDonald, UNEP Adviser, former Director, Jamaican National Environment and Planning Agency, and former Project Manager, Pan-Caribbean Disaster Preparedness and Prevention Project; Russell Arthurton, Consultant, Coastal Geoscience, and formerly British Geological Survey; Lahsen Ababouch; Chief, Fish Utilization and Marketing Services, FAO; and Stefano Tinti, Chair, Intergovernmental Coordination Group for the Tsunami Early Warning and Monitoring System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS).*

*The dialogue session was led by: Arvind Anil Boaz, South Asia Co-Operative Environmental Programme; Ezio Bussoletti, Italian Delegation to UNESCO; and Stefano Belfiore, Intergovernmental Oceanographic Commission, UNESCO. Participants included: Lahsen Ababouch, Chief, Fish Utilization and Marketing Services, FAO; Bernardo Aliaga, Intergovernmental Oceanographic Commission, UNESCO; Russell Arthurton, Consultant, Coastal Geoscience and formerly British Geological Survey; Alessandra*

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*Cavaletti, Italian Ministry of Environment and Territory; Bernhard Glaeser, Social Science Research Center, Berlin; Marion Glaser, Center for Tropical Marine Ecology; Stefano Tinti, Chair, Intergovernmental Coordination Group for the Tsunami Early Warning and Monitoring System in the North Eastern Atlantic, the Mediterranean, and Connected Seas (ICG/NEAMTWS); and Uli Wolf, Intergovernmental Oceanographic Commission, UNESCO.*

### **Challenges in Reconstruction**

The panel addressed progress with respect to (a) the process of reconstruction and the development of capacities for disaster preparedness in the countries of the Indian Ocean; and (b) the establishment of regional early warning systems for tsunamis and other marine hazards in four regions of the world and their contribution to a global system. The panel also considered challenges and opportunities for enhancing mitigation of marine hazards and lessons learned from coastal disasters in the last year. The role of the IOC and the International Strategy for Disaster Reduction (ISDR) and other organizations was commended in developing and coordinating early warning systems for tsunamis and other marine hazards.

A review was given of the progress of reconstruction and rehabilitation in the areas affected by the December 2004 tsunami in Thailand. This process has involved the creation of emergency relief centers and important operations of beach clean up and forest and coral reef restoration. Resorts have been restored as best as possible and water resources have been rehabilitated. Measurement of water quality is also showing improvements. Thailand is actively engaged in the establishment of an early warning system for multiple marine hazards and new approaches to coastal planning and management. This includes the installation of buoys and warning-news broadcast towers, medium- and long-term environmental impact assessments for coastal infrastructure, recovery of livelihoods in the coastal zone, rehabilitation of the lifeline of mangroves and coastal forests, and the adoption of ecosystem-based management.

### **Progress Achieved and Obstacles Faced After the Tsunami of 26 December 2004 in the Indian Ocean – A Regional Overview**

Clean-up and reconstruction operations are now well advanced in many of the worst affected impact sites. However, the clean-up operations have themselves created many additional problems. The haphazard disposal of waste and debris has led to the degradation or destruction of sensitive ecosystems. Relief camps have also been sited in sensitive ecological areas. The

high demand for timber for reconstruction of settlements and boatbuilding has caused local destruction of coastal forests and woodlands.

Some progress has been made with the rehabilitation of coral reefs where these have not become exposed, but soil degradation and the pollution and disruption of water supplies from coastal aquifers are still widespread. Desalination plants have been installed on some of the islands.

Although there has been a rapid and generous response to the replacement of destroyed fishing boats and gear, there are concerns that the number of vessels are now in excess of those pre-tsunami and that this is leading to overcapacity, putting even more pressure on already dwindling fish stocks in coastal waters. Opportunities for co-management do not appear to have been taken. There is also concern over the safety of many of the rapidly built boats because of poor construction methods. There have been serious problems of coordination of the relief effort with so many different organizations with no fisheries technical background involved. There have been significant differences in the guidelines used by the various actors resulting in confusion and wasted or duplicated effort.

### **Lessons Learned - Why Some Communities Fared Better**

The severity of the impact on affected coasts has varied considerably according to the specific physical parameters of the shores, such as facing direction, headland protection, the nearshore shoaling, funneling, etc.; also the existence of barriers such as strongly founded buildings, mature trees, etc. at the backshore or on beach plains. As part of the process of risk assessment there is a need for detailed mapping of the nearshore, foreshore, and backshore zones in order to determine the susceptibility of specific coasts to inundation by extreme waves.

Generally no effective warning systems were in place at the time of the 26 December 2004 event, even though for several countries the lead-times were sufficiently long enough for emergency evacuations to have been successful. The case of Kenya was an exception where the local police were mobilized and provided warnings to coastal communities. Indigenous knowledge amongst the population of the Nicobar Islands is reported to have been instrumental in the small number of casualties sustained there. This type of knowledge needs to be mainstreamed in the education and training of coastal communities in susceptible areas.

The need for well-coordinated emergency plans to be in place and rehearsed by local authorities and communities are paramount, though the difficulty of maintaining the necessary level of awareness over the

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long-term (perhaps several generations) is acknowledged. The need for nations and local authorities to establish strategic land-use planning and implementation in the context of integrated coastal management is strongly accepted.

### **Fisheries**

Progress and challenges were addressed in rebuilding fisheries in Indian Ocean countries affected by the tsunami. From Indonesia to Somalia and Yemen, an estimated 35,000 fishermen died. The direct loss to the fishery sector amounted to US \$520 million, with 111,000 boats and 1.7 million of fishing gear units destroyed. FAO made a flash appeal for reconstruction and rehabilitation of the sector and currently 45 projects on fisheries, agriculture, and forestry have been launched totaling \$55 million with 20 more projects in the pipeline. 60-70% of these projects concern fisheries and aquaculture, and generous contributions have been provided by FAO, Japan, Norway, Germany, UK, Italy, Canada, Belgium, Spain, Sweden and EU. Developing countries such as China, Palau, Algeria, and Zambia have also contributed. FAO has developed a strategic framework and a 5-year plan of action for the reconstruction and rehabilitation of the fisheries sector. Lessons learned from the past year include: the need to adopt a community-based approach and involve beneficiaries and stakeholders from the earliest stages of the process; the need to improve coordination of stakeholders (UN agencies, NGOs, governments, direct beneficiaries); and the need for proper technical advice. Good governance and accountability should go hand in hand with procurement and operations. For example, well over 125 NGOs are now operating in Banda Aceh, and it has been estimated that funds for fisheries have created a 25% overcapacity with respect to the pre-tsunami conditions, which were already beyond sustainability. This creates the risk that traditional critical factors in fisheries will be exacerbated and developed to overcapacity. Challenges are also posed by the introduction of inappropriate types of gear and boats that do not meet fisheries safety standards.

### **Establishment of Warning Systems**

Progress and challenges posed by the establishment of early warning systems for tsunamis in the Mediterranean region were reviewed. The Intergovernmental Coordination Group for the Tsunami Early Warning and Monitoring System in the North Eastern Atlantic, the Mediterranean, and Connected Seas (ICG/NEAMTWS) was established at the end of 2005 to integrate the existing seismographic detection networks with real-time sea-level networks to be upgraded from existing ones. Several national and local warning systems under development will be fully integrated into this initiative.

Nations committed themselves to working toward upgrading legislation and existing detection systems and develop integrated national emergency preparedness and awareness plans. The Intergovernmental Coordination Group will work toward the formulation of a complete plan of action by December 2006, including the implementation of trials for key components of the early warning system, with the aim of having an initial operational system in place by December 2007. Such a system is needed in regions—the Mediterranean and the Northeast Atlantic—where there are numerous tsunami sources and historical records. Such sources, including earthquakes, landslides, and volcanic eruptions may cause catastrophic events in major coastal cities such as Lisbon, Naples, Messina, Istanbul, Heraklion, and Cairo. Most of the sources are very close to the coast and tsunamis may hit in a few minutes, exceeding the current ability for warning based on the national and regional real-time seismic, monitoring networks installed in the area.

Activities on the conduct and implementation of the renamed ICG/PTWS, which was set up in 2005, were presented. A task team has been established to convene a tsunami exercise in May 2006, and working groups have been set up on seismic measurements, including: data collection and exchange; sea-level measurements, including data collection and exchange; tsunami hazard identification and characterization, including modeling, prediction and scenario development; resilience building and emergency management; and interoperability of regional, sub-regional and national tsunami warning systems in the Pacific. Through the activities of the International Tsunami Information Centre (ITIC), the ICG/PTWS is also assisting in the implementation of comprehensive mitigation programmes. Tsunami risks are being reduced by facilitating technology transfer through expert missions and conducting training programmes and guidance on tsunamis and tsunami warning. The ICG is also engaged in the development and creation of educational and awareness materials in local contexts and acting as a clearinghouse for the distribution of these materials globally in multiple languages, as well as gathering and documenting information on tsunami events. Through these programmes, ITIC cooperates with other ICGs and interested stakeholders to increase awareness and facilitate coordination to implement regional tsunami warning centers and raise the level of community engagement and empowerment that is essential for an effective response to tsunami warnings and immediate response to local tsunamis. The key point in the establishment and implementation of tsunami warning systems is putting together tsunami scientists, governments, NGOs, and emergency managers to work

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toward a common planning and strategy that would benefit from a variety of fields and expertise.

The degree of susceptibility and vulnerability to coastal hazards in the Caribbean region where there are records of numerous tsunamis and related fatalities were presented. Through the work of IOCARIBE and UNEP, a more integrated approach to coastal zone management is being adopted in the region, incorporating coastal inundation considerations. At the beginning of 2006, the *Intergovernmental Co-ordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions* (ICG/CARTWS) was established. The Caribbean early warning system aims to provide timely and accurate forecasts and warnings of coastal flooding and associated hazards due to tsunamis, storm surges, and hurricanes, and it is expected to be operational by the end of 2006 as a system of coastal sensors, many of which are already in place. In the region, the most reliable warning system has a delay of 20 minutes, but marine and coastal hazards may have a shorter travel time. Safety of coastal communities cannot depend only on sensors but also requires improvement of public awareness, enhanced governance and coordination among institutions, and innovative partnerships among governments, the scientific community, and civil society.

Hazard mitigation strategies, including long-term coastal planning, were presented. The review centered on the concerns posed by hazards, including both extreme catastrophic events and long-term, incremental hazards. The focus of hazard assessment should be on the incidence of hazard events at local to regional scales, the susceptibility of coasts to inundation, and the vulnerability of the coastal population. Options to respond to hazards include partially reducing susceptibility to inundation and primarily reducing vulnerability of coastal communities. The first can be achieved by hard and soft engineering solutions and regulating human activities that exacerbate susceptibility. The second can be achieved by preparedness, better communication links at the global and local levels, and mobilizing contingency resources. More importantly, vulnerability can be reduced through strategic measures: introducing strategic planning, adapting to a changing physical environment, recognizing vulnerability of expanding urban areas, and weighing livelihood opportunities against vulnerability. People can contribute to vulnerability through employment opportunities, poverty, indifference (lack of awareness to risk), fading memories of catastrophes, and resistance to evacuation. Hazard mitigation strategies concern the credibility and effectiveness of risk assessment and the appropriateness, feasibility, affordability, and sustainability of the response. A number of global

lessons can be learned from the coastal catastrophic events of the last years: coastal populations are vulnerable to storm surges and extreme waves; surge and extreme wave events have recurrent costs on country economies; developed countries do not necessarily have effective emergency responses; strategic planning and development are key responses in reducing vulnerability, especially in coastal cities and mega cities; standards of protection need continual monitoring and maintenance; warning systems must be in place at global to local scales; and emergency plans must be tested, resourced, and implemented.

### **Establishment and Maintenance of Early Warning Systems: Regional Perspectives**

*Pacific:* The System has been reorganized with more island states added. There are still some gaps as well as a need to have instrumentation optimized with the addition of more sea-level stations. The System is providing assistance to the Caribbean and Indian Ocean TWS.

*Caribbean:* This is a Multi-Hazard system coping with storm surges as well as tsunamis. Puerto Rico is set to take over from Hawaii as the Regional Warning Centre.

*Indian Ocean:* The IOTWS is scheduled to be in place by September 2007, handling tsunamis only. An initial system should be in place by the end of 2006. Hopefully, the system will also eventually be used for storm surges. There are several Regional Warning Centres but no single Centre has been agreed.

*NE Atlantic, Mediterranean, and Connected Seas:* An initial system is projected to be in place by the end of 2007, with the planning stage complete by the end of 2006. Because of the near-field nature of tsunami impacts in the Mediterranean, there may be a need for more than one Warning Centre.

During the discussion, the issue of the participation and role of NGOs in the development and operation of early warning systems for marine multihazards was raised jointly with the issue of communication and distribution of powers among concerned institutions.

### **Recommendations**

The discussion group acknowledged a lack of clarity in the expected goals of the EWSs – whether the systems should in all cases be expected eventually to cope with storm surges as well as tsunami hazards. In many parts of the world, storm surges by far constituted the greater risk. Was a multihazard system one that coped with tsunamis and storm surges, or simply one that coped with tsunamis from different types of tsunamigenic sources – seismic, volcanic, landslide? This is an area to be resolved. While a truly multihazard system is ideal, it is acknowledged that setting these up may take some

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time. There was an immediate need to put in place systems that coped with the tsunami hazard.

The assessment of risk is an area where the science community can make (and is making) a major contribution. Deepwater and fine-scale coastal modeling can make a major contribution and it is felt that there is scope for much improved integration and coordination of modeling efforts and initiatives. Susceptibility mapping including integrated high resolution bathymetric and topographic survey is certainly achievable and needs to be addressed as a matter of urgency with respect to storm surge as well as tsunami hazards. This will require financial resources. The need to focus efforts on coasts with a high socio-economic importance was accepted. There is also a need to be aware of the rapid changes in population, and thus potential vulnerability, in the coastal areas, particularly with respect to the growth of coastal mega cities.

A priority regarding communication is to get high resolution, real time data to warning centers. There is also a need for a dedicated channel for disaster management.

Efforts should also be made to conserve, and wherever possible, rehabilitate mangroves, sand dunes, and coral

reefs that afford a natural barrier to tsunamis and storm surges.

Regarding long-term education and planning, there are many basic measures that can be undertaken without great cost. The inclusion of hazard awareness and emergency procedures should become standard in the education of coastal communities where a high risk is acknowledged.

Community involvement is essential. A priority should be placed on strategic land-use planning and implementation in the context of integrated coastal management. The realities of essential livelihoods and poverty should be considered in this respect and all reasonable steps taken by local authorities to make people aware of the risks involved in living in areas susceptible to inundation. The assessment of risk by the scientific community should, above all, be realistic – national governments and local authorities will need to be convinced of risk and this may be difficult to achieve where events are few and far between.