

## **INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION OF UNESCO**

### **Status of the Indian Ocean Tsunami Warning and Mitigation System (IOTWS)**

**June 2007**

I am happy and proud to report to you again on what has been achieved in establishing the Tsunami Warning System for the Indian Ocean. The 26 December 2004 tsunami killed over 230,000 people, displaced more than 1 million people and left a trail of destruction around the coasts of the Indian Ocean. Although the tsunami took over 2 hours to cross the Bay of Bengal, more than 50,000 people in India, Sri Lanka, Maldives and East Africa lost their lives. An early warning system would have saved many thousands of lives, but none was in place at the time.

Recognising the need for an early warning system, the nations of the Indian Ocean responded quickly. Following two intergovernmental meetings in Paris and Mauritius, the Indian Ocean member states formed an Intergovernmental Coordination Group (ICG) to implement an Indian Ocean Tsunami Early Warning and Mitigation System (IOTWS), formally established at the IOC General Assembly in Paris in June 2005, with governance and secretariat support provided by UNESCO IOC. Since its inception, the ICG has made steady progress towards the development and implementation of an end-to-end warning system and today the coastal populations of the Indian Ocean are much safer than they were in December 2004. However, more work remains to be done before the system can be considered truly complete and fully operational.

The main objective of the IOTWS is to identify and mitigate the hazards posed by local and distant tsunamis. The goal is to create a fully integrated end-to-end warning system comprising three key components: tsunami detection and arrival forecasting, threat evaluation and alert dissemination, and community preparedness and response.

The reliability and timeliness of warning messages depends on having a sufficient array of detection equipment installed and operational, and on having fast and reliable communications links to and between the warning centres. Since December 2004 there has been significant progress in the installation of vital detection equipment. By the end of 2006, 38 out of a total of 75 identified core seismic stations had been installed, with the remainder to be installed progressively up to 2010. This enhanced network of broadband seismometers will allow earthquake hypocentres to be identified more rapidly, within a target of 5 – 10 minutes compared to 15 – 20 minutes today. This improvement will be crucial in providing early warning particularly for local tsunamis, for which every minute is important in saving lives.

Significant progress has also been made in the installation and upgrade of coastal sea level measurement gauges. By February 2007, 41 gauges were in operation, compared to just 11 before the 2004 tsunami. Deep-ocean sea level measurement equipment has also been installed. Malaysia, Indonesia, and India installed deepwater such instrumentation in 2006, and a US-Thai Deep-ocean Assessment and Reporting of

Tsunamis (DART) buoy was deployed at a key location in the middle of the Bay of Bengal in December 2006. This latter deployment was an important milestone for the IOTWS because it was the first such instrument to share data over the Global Telecommunication System (GTS). Improvements in the coverage and operations of the detection equipment still are needed, as are considerable improvements in the availability and access of all these data.

To assess the threat of a potential tsunami, scenarios are to be developed based on generation characteristics, deep water propagation and coastal inundation. A number of numerical models have been developed to simulate these problems and scientists in many Indian Ocean countries are using these tools now to develop their own scenarios. Not all coastlines of the Indian Ocean are equally vulnerable to tsunamis so it is important to conduct hazard and vulnerability assessments to ensure that the most vulnerable coastal populations are well prepared. UNESCO IOC is assisting this process by running training courses and workshops on a variety of subjects, supported by extrabudgetary funds.

The initial IOTWS was declared operational in July 2006, but the interim tsunami advisory service is still provided by the Pacific Tsunami Warning Centre (PTWC) in Hawaii and the Japan Meteorological Agency (JMA) directly to the 24/7 National Tsunami Warning Centres (NTWCs) in 26 of the IOTWS member states. The ICG has decided that this should be regarded as a regional responsibility and to this end proposes to establish a network of Regional Tsunami Watch Providers (RTWPs) to provide 24/7 tsunami advisory services. At the national level, each member state is responsible for issuing warnings to its own citizens through their NTWC, which will be closely linked to one or more RTWP.

Although there has been considerable progress and improvement at the detection end of the system, much remains to be done to ensure dissemination of effective warnings and to improve the preparedness of communities to respond to these warnings. In an integrated end-to-end system, information must flow from one end (detection) to the other (community response) without interruption or ambiguity. Just as equipment must be maintained and warning centre personnel must be trained, awareness and preparation to respond must be ingrained in communities for the system to be sustainable.

In summary, much and considerable progress has been made in the development and implementation of the Indian Ocean Tsunami Warning and Mitigation System during the past two and a half years. However progress has not been uniform across the system and some activities and countries lag behind others. Problems also remain in areas such as communications; data sharing, lack of bathymetric data etc. and future problems lie ahead in the form of equipment maintenance, sustained support and maintenance in each member state and in the establishment of the Regional Tsunami Watch Providers. The challenge for the ICG is to ensure that the IOTWS is implemented within a reasonable timeframe, that it serves all member states in the Indian Ocean community and that it is sustainable in the long term.