

## **PRESS BRIEF**

### **Press Conference by Hon'ble Minister of S&T and Earth Sciences on 26th December 2006 on Establishment of National Early Warning System for Tsunami & Storm Surges in the Indian Ocean**

Tsunami is a series of ocean waves of extremely long wavelength of the order of about 100 kilometers to 250 kilometers in the deep ocean, generated primarily by earthquake occurring below the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunami. After the December 26, 2004 Tsunami, resulting in colossal loss of life and property, it was decided to set up an early warning system to mitigate such potential losses. In the vicinity of India, there are two tsunamigenic zones, Andaman-Sumatra trench and the Makran coast.

The project on "Establishment of National Early Warning System for Tsunami & Storm Surges in the Indian Ocean" was approved by the Government of India in October 2005 for implementation at a cost of Rs.125 Crore with the Ministry of Earth Sciences as the nodal ministry. The National Early Warning System is targeted to be made operational by September 2007 after necessary testing and simulations. The system will be set up at Indian National Centre for Ocean Information Services (INCOIS), Hyderabad.

#### **Interim Tsunami Warning Centre**

An Interim Tsunami Warning Centre, following the Standard Operational Procedure, has already been made operational at INCOIS since July 2005 on 24X7 basis. This centre receives earthquake information from India Meteorological Department, Japan Meteorological Agency, Pacific Tsunami Warning Centre. 17 Tide Gauges have been established by Survey of India (SOI) and National Institute of Ocean Technology (NIOT) and the data is being received in real time at INCOIS. One Bottom Pressure Recorder deployed in the deep ocean near Andaman Nicobar Island, is sending data and another is being installed. These recorders are key sensors whether a tsunami has been generated or not, and further confirmation is done by the Tide Gauges, located at coasts.

#### **Seismic Network**

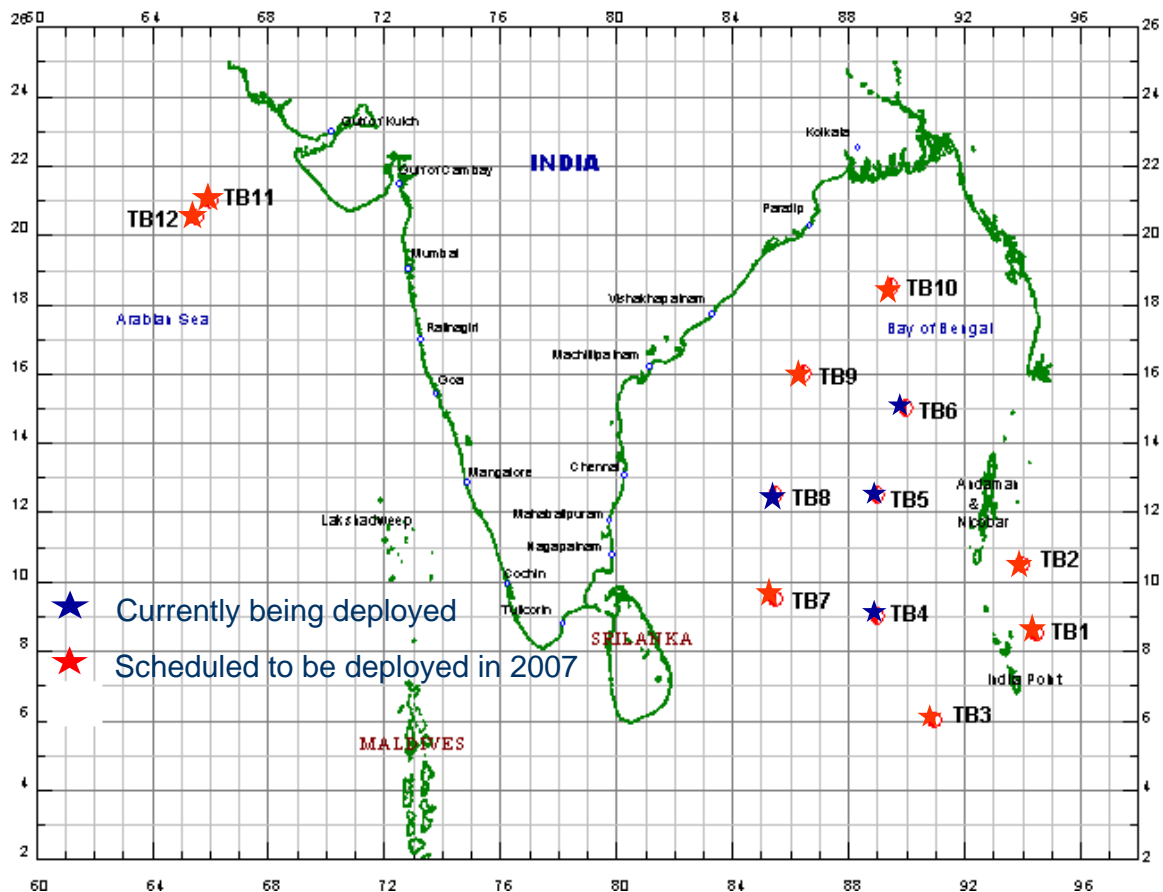
As a part of strengthening seismic net work for near real time monitoring of the potential Tsunamigenic earthquakes, 17 interconnected broadband seismic stations will be set up and for real time communication of data to the Central Receiving Station (CRS) of India Meteorological Department at New Delhi and to the Parallel CRS at INCOIS, Hyderabad. The strengthened network of earthquake monitoring is likely to be operational by mid 2007. However the existing system is able to provide the requisite information, adequate to generate alert to look for other sensors.

#### **Monitoring Sea Level**

Propagation of Tsunami waves in the ocean and consequent sea level changes will be monitored by installing bottom pressure recorders (BPRs). India is installing such bottom pressure recorders in both the Bay of Bengal and in the Arabian Sea at appropriate locations.

12 bottom pressure recorders are planned to be installed as part of this network. 10 Systems will be installed in the Bay of Bengal and 2 in the Arabian Sea. Six BPR's have

been procured and integrated with indigenous surface buoy systems. 4 BPRs are being deployed in Bay of Bengal. One BPR data is being received and another is expected to provide by December 2006 end. Two will be deployed by end January 2007. Two more will be deployed in the Arabian Sea by March 2007.



Picture: Deployment Location of the BPRs

50 Tide Gauges are planned to be installed as part of this network ((36 by Survey of India and 14 by NIOT). 17 Tide Gauges along the Indian coastline including the Andaman & Nicobar Islands have been installed and data is being received in real time by INCOIS. The critical locations from the point of view of validating the Tsunami by monitoring sea level changes have been covered. The effectiveness of these sensors has been proved in deterministically concluding that there was no TSUNAMI subsequent to last two high magnitude undersea earthquakes in the Indian Ocean region.

Five Coastal Observing Radars and two Current Meter Moorings are planned to be installed towards monitoring storm surges and understanding physical behavior of oceans. One HF Radar installed by has been successfully used to detect and measure the strength of advancing waves.

### Coastal Vulnerability Modelling and Inundation Mapping

The information about magnitude, location and depth at which an earthquake has occurred have been used to model travel time, inundation and run-up of tsunami in coastal regions. The possible risks of coastal inundation due to tsunami and storm surge by using tsunami and storm surge models constructed using numerical equations have been implemented. Inundation model prepared for specific coastal areas i.e. nagapattinam and Cuddalore belt on the basis of existing topographic and bathymetric (water depth) data, closely matches with the actual inundation in these areas during the tsunami.

Inundation along the entire coast for various earthquake scenarios (magnitude, hypocenter location, rupture orientation etc.) is being generated for integration with the warning system.

High resolution topography of the coastal belt and bathymetry of shallow water has been initiated to refine the inundation scenarios by feeding the parameters in the existing model. National Remote Sensing Agency (NRSA) is responsible for Topographic Mapping of 15, 000 Sq km area (for 7500 line km and 2 km inland from the coastline) with airborne LIDAR & Digital Camera data in conjunction with GPS control survey using photogrammetric techniques. NRSA has already acquired required airborne data for Machilipatnam – Kochi stretch i.e. for an area of 3,300 sq. km.

Communication of real-time data from Seismic Stations, Tide Gauges, BPR's to the early warning centre is very critical for generating timely tsunami warnings. An end to end communication plan has been worked out in collaboration with the Indian Space Research Organisation. The possible risks of coastal inundation due to tsunami and storm surge by using tsunami and storm surge models constructed using numerical equations have been implemented. Inundation Maps of coastal locations have been generated by ICMAM on 1:4000 scale for 5 scenarios of historical Earthquakes and Storm Surges. Storm surge model has been customised.

INCOIS has set up reliable connectivity facilities to the Ministry of Home Affairs for dissemination of Warnings

### **Capacity Building, Training and Education**

An easily understandable publicity material on earthquake, tsunami and storm surges in vernacular languages being created to be distributed to the general public. A dedicated multi-lingual web-site is also being developed to provide information on Tsunamis and Storm Surges.