

**GOVERNMENT OF INDIA  
EARTH SCIENCES  
LOK SABHA**

UNSTARRED QUESTION NO:4324

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PREDICTION OF NATURAL CALAMITIES IN COASTAL AREAS

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**Will the Minister of EARTH SCIENCES be pleased to state:**

- (a) the details of instruments developed and installed so far on latest technology to predict natural calamities in coastal areas;
- (b) the extent of success achieved in this regard by the Government; and
- (c) the details of efforts made by the Government so far to check the natural calamities in coastal areas in the interest of people living near the coastal areas?

**Answer**

MINISTER FOR MINISTRY OF SCIENCE AND TECHNOLOGY AND MINISTRY OF EARTH SCIENCES (SHRI S. JAIPAL REDDY)

(a) Earth System Science Organization –India Meteorological Department (ESSO-IMD) has installed Doppler Weather Radars network over the coastal areas of the country to identify zones of strong wind and heavy precipitation associated with cyclone as and when cyclone moves in to the 500 km radial coverage range.

ESSO-IMD has established network of Automatic Weather Stations (AWS) and Automatic Rain Gauges (ARG) over the coastal districts to further authenticate the ground level impact associated with the cyclone landfall.

To acquire information from the seas around India, Moored Buoys, Drifters, Argo Profiling Floats, Current Meters, Wave Rider buoys, Tsunami buoys have been installed. These equipments are fitted with the state-of-the-art technology sensors, which are capable of transmitting information in near real-time through satellites from the seas around India, except those deployed in the sub- surface. Each of the equipment is designed to acquire a set of specific parameters viz., Temperature, Salinity, currents, winds, waves, depth, atmospheric pressure and humidity.

Observing systems support for the Indian Tsunami Early Warning Centre (ITEWC) comprises of real-time seismic monitoring network of 17 broadband seismic stations apart from other national and international seismic stations to detect under-sea tsunamigenic earthquakes from the two known subduction zones of Andaman-Sumatra and Makran in Indian Ocean which can potentially affect entire Indian coastal states and Island regions, a network of real-time sea-level sensors with Bottom Pressure Recorders (BPR) in the open ocean, HF Radars for coastal currents and coastal tide gauge stations to capture tsunami wave speed and amplitude on 24 X 7 basis.

(b) A full proof 24x7 operational cyclone detection and movement mechanism exists for the assessment of intensity, track and landfall over the coastal areas of the country. Details of such monitoring mechanism include genesis of the possible cyclonic circulation over the open seas is generated by the meso-scale short range (72hrs in advance) prediction models and global scale medium range (120hrs in advance) prediction models along with monitoring sea surface temperature and moisture convergence, satellite monitoring is pursued for detecting cyclogenesis and monitoring further intensity, movement and landfall of cyclones. By leveraging all available modeling and observing systems, IMD is able to reduce the track and landfall errors of cyclones by about 7% over the last 3-4 years due to the implementation of the phase-I of the IMDs modernization programme that got quantitatively manifested with the landfall forecast of Phailin cyclone during 08-14 October 2013.

Earth System Science Organisation- Indian National Centre for Ocean Information Services (ESSO-INCOIS) has installed the Indian Ocean Forecasting System (INDOFOS) integrating existing forecasts of high ocean wave and the surface and subsurface parameters of the Indian Ocean. The system, at present, provides forecast on wave heights, wave direction, sea surface temperature (SST), surface currents, mixed layer depth (MLD) and depth of 20oC isotherm up to 5-7 days in advance. This system is operational since January 2010.

ITEWC was established and made fully functional since 2007 and is now rendering operational services as a Regional Tsunami Watch Provider (RTWP) for whole of the Indian Ocean Region by the ESSO-INCOIS of the Ministry of Earth Sciences located in Hyderabad. All types of data collected from the ITEWC are fully archived and is fully accessible to the Decision Support System (DSS).

(c) As a part of "Establishment of National Early Warning System for Tsunamis and Storm Surges", the Ministry had taken up development "Coastal Vulnerability Modeling and Inundation Mapping". Under this endeavor, a wide range of coastal vulnerability maps on different spatial scales are being generated for the entire coast of India by various agencies primarily for use in the

forewarning of various ocean hazards viz., Tsunami, Cyclones and Storm Surges.

The tsunami wave arrival time to different coastal locations depends upon the location of the under-sea earthquake and intensity. In general the tsunami reaction time will be around 2h for the Indian mainland if the earthquake has occurred in the vicinity of the two known subduction zones. As far as the Andaman & Nicobar Islands is concerned, the reaction time is around 30-minutes. Hence the standard operational procedure (SOP) and the emergency response plans are formulated in consultation with the Ministry of Home Affairs and the disaster management agencies of coastal states and UTs.