

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 1752
TO BE ANSWERED ON WEDNESDAY, 29TH JULY, 2026**

EXPANSION OF OCEAN OBSERVATION NETWORK

**1752. SHRI BHARTRUHARI MAHTAB:
SHRI AVIMANYU SETHI:**

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) the details of progress made in strengthening the national ocean observation network including the deployment of ocean observation buoys, deep-sea moorings and coastal observation systems;
- (b) the details of contribution of these systems towards improving monsoon prediction, cyclone forecasting and Ocean State Forecasts;
- (c) whether the Government proposes further expansion of the ocean observation network and if so, the details thereof; and
- (d) the details of measures taken to integrate real-time ocean observations with forecasting systems of the India Meteorological Department (IMD) and the Indian National Centre for Ocean Information Services (INCOIS)?

ANSWER
THE MINISTER OF STATE (INDEPENDENT CHARGE) FOR
MINISTRY OF SCIENCE AND TECHNOLOGY
AND EARTH SCIENCES
(DR. JITENDRA SINGH)

- (a) The Government of India has significantly strengthened the national ocean observation network. The details follow:
 - i. **Ocean observation moorings:** 19 subsurface moorings (16 in the mainland Exclusive Economic Zone (EEZ) and 3 in the equatorial Indian Ocean) for monitoring ocean currents and zooplankton biomass, providing critical data for ocean model validation.
 - ii. **Tsunami monitoring network:** The Indian Tsunami Early Warning System comprises 17 broadband seismic stations, 7 deep-ocean tsunami buoys, and 36 coastal tide gauges, along with 35 Global Navigation Satellite System (GNSS) receivers and strong-motion accelerometers.
 - iii. **Coastal observation systems:** The Indian National Centre for Ocean Information Services (INCOIS) maintains a network of 17 Directional Wave Rider Buoys, 20 Acoustic Doppler Current Profilers (ADCPs), 32 Automatic Weather Stations (AWS), 2 Water Quality Buoys, and 50 tide gauges for continuous monitoring of coastal and ocean conditions.

- iv. **Deep-sea and autonomous observations:** INCOIS has deployed 302 Argo profiling floats (2014–2025), 12 deep-sea glider missions, 45 drifting buoys, 64 wave drifters, and advanced ocean observation instruments such as, Vertical Microstructure Profilers (VMPs), Underway Conductivity–Temperature–Depth (uCTD) systems, and Wire Walker systems.
- (b) The strengthened ocean observation network has significantly improved the accuracy of monsoon prediction, cyclone forecasting, and ocean-state forecasts by providing high-quality real-time observations for numerical weather and ocean models. Data from Argo profiling floats, moored buoys, tide gauges, and other ocean observing platforms are received at the Indian National Centre for Ocean Information Services (INCOIS) through the Global Telecommunication System (GTS), quality-controlled, and assimilated into numerical models to generate accurate initial ocean conditions. This data assimilation reduces forecast errors and enhances the reliability of monsoon and cyclone predictions as well as ocean-state forecasts. The real-time wave observations from these buoys are utilized by INCOIS for operational wave forecasting and coastal early warning services.
- (c) Yes Sir. The Government is continuously expanding and strengthening the national ocean observation network. Recent initiatives include installing 14 additional tide gauges and 15 co-located Global Navigation Satellite System (GNSS) receivers to enhance tsunami monitoring and coastal observations. A Directional Wave Rider Buoy has also been deployed off Mauritius to improve the prediction of Southern Ocean swells affecting the north Indian coastal waters. Further, regular pre- and post-monsoon research vessel cruises have been institutionalized for deployment and maintenance of ocean observation systems, while collaboration with the Council of Scientific and Industrial Research – National Institute of Oceanography (CSIR–NIO), National Centre for Polar and Ocean Research (NCPOR) and other partner institutions has been strengthened to ensure sustained operation and expansion of the observation network.
- (d) Assimilation of real-time observation of data from the network has improved wave forecast accuracy by about 43% compared to 2014, with sustained forecast improvements during the five-day forecast period. The enhanced observation network has also enabled coastal forecast systems with an accuracy of about 70%. In addition, observations from tsunami buoys, tide gauges, GNSS receivers, and strong-motion accelerometers enable INCOIS to issue tsunami advisories within the stipulated 10-minute window following a tsunamigenic earthquake as per International Standards. The data from ocean observation platforms received in real time at the Indian National Centre for Ocean Information Services (INCOIS) are assimilated into the INCOIS Global Ocean Data Assimilation System (INCOIS-GODS), which provides initial ocean conditions for the Coupled Forecast System (CFS) used for seasonal and extended-range forecasts, and the Hybrid Coordinate Ocean Model (HYCOM), which provides initial ocean conditions for the Hurricane Weather Research and Forecasting (HWRF) model used by the India Meteorological Department (IMD) for cyclone prediction. These systems substantially improve the country's monsoon and cyclone forecasting capabilities.
