GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
RAJYA SABHA
UNSTARRED QUESTION NO. 1314
ANSWERED ON 11/12/2025

R&D FOR METEOROLOGICAL AND OCEANIC SERVICES

1314. SHRI SUJEET KUMAR:

Will the Minister of EARTH SCIENCES be pleased to state:

(a) the infrastructure developed to carry out R&D activities related to meteorological and oceanic services in the country;
(b) the number of new research vessels inducted for ocean research/survey this year;
(c) the details of objectives, scope and technological features of the country's Samudrayaan Mission, as part of the Deep Ocean Mission; and
(d) the details of data and findings that have emerged from deep-sea exploration activities conducted under the Samudrayaan Mission since its inception, including surveys, deployments and scientific outcomes?

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

(a)-(b) The advanced High Performance Computing (HPC; Arka and Arunika) facilities have been installed at the Indian Institute of Tropical Meteorology (IITM)-Pune and the National Centre for Medium Range Weather Forecasting (NCMRWF)-Noida, under the Ministry, to support the R&D activities related to meteorological and oceanic services in the country. Apart from this, the Ministry has also installed other instruments across India, including radars, lidar, and sodar systems.

The Indian Tsunami Early Warning System, operated by the Indian National Centre for Ocean Information Services (INCOIS) under the Ministry, integrates a robust real-time monitoring network that includes 17 broadband seismic stations, seven deep-ocean tsunami buoys, and 36 coastal tide gauges to detect tsunamigenic earthquakes and monitor tsunami waves. INCOIS has also installed GNSS receivers and strong-motion accelerometers at 35 locations across the Andaman & Nicobar Islands, enabling rapid estimation of earthquake source parameters using near-field ground displacement data.

INCOIS also maintains a network of 16 Directional Wave Rider buoys to monitor and forecast wind-wave activities along the entire Indian coast. With support from the National Institute of Oceanography, Goa, INCOIS maintains a network of coastal Acoustic Doppler Current Profilers to measure coastal currents continuously. INCOIS has acquired many state-of-the-art ocean observation equipment, such as Sea Gliders, Direct Covariance Flux System, underway CTD, Vertical Microstructure Profilers, etc.,

for making specific observations for understanding oceanographic processes. INCOIS also established a dedicated National Glider Facility, wet and dry labs at the INCOIS campus. INCOIS has configured a suite of numerical ocean models for understanding the ocean processes and making short-term predictions of essential oceanographic parameters. INCOIS established a high-performance computing facility to run the numerical ocean models required for providing early warnings and advisories in the oceanic realm. The Ministry has six research vessels of its own. These six vessels are used for ocean research/survey.

(c) Objectives of Deep Ocean Mission Vertical 2 is to provide the future projections or predictions on the trends in sea level along the Indian coast, cyclone intensity and frequency, storm surges, wind waves, biogeochemistry, and ecosystem. The scope of this vertical includes developing numerical models for the dynamic downscaling the climate projections, identifying the most suitable atmospheric forcing for integrating ocean climate projection models, and developing methods to estimate the projected changes in coastal inundation due to various extreme events. An interim report titled 'Projected Climate Change-Induced Extreme Sea Levels and Coastal Vulnerability along the Indian Coasts' has been published as a technical report by INCOIS.

The objective of India's Samudrayaan mission is to develop a 6000 m depth-rated human scientific submersible, Matsya 6000. It is being built to carry three persons for a mission period of 12 hours and cater 96 hours of emergency. The technological features include 80 mm thick titanium alloy human cabin, electron-beam welded titanium alloy exostructure, pressure-balanced lithium-polymer batteries, human-rated ballast management system, digital-twin aided emergency decision support system, and high-definition lights and cameras.

(d) A wet test was carried out for the 500 m depth-rated system by MoES-NIOT during January-February 2025, and mission-critical systems are qualified in the shallow waters of the L&T Shipyard, Kattupalli.

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