

GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
RAJYA SABHA
UNSTARRED QUESTION NO. 2915
ANSWERED ON 13/08/2026

STRENGTHENING CLIMATE RESILIENCE AND FORECASTING CAPABILITIES

2915. DR. M. DHANAPAL:
SHRI BABUBHAI JESANGBHAI DESAI :

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

- (a) whether Government has assessed the changing weather patterns, coastal vulnerabilities and risks arising from climate change in Gujarat, Maharashtra and Tamil Nadu;
- (b) the details regarding coverage provided by weather monitoring, Doppler radar and early warning systems in these States;
- (c) the manner in which scientific data generated by national meteorological and oceanographic agencies is being utilized for disaster preparedness and mitigation;
- (d) whether Government proposes to strengthen climate resilience and forecasting capabilities in these states; and
- (e) the details of major weather and ocean observation facilities operating in these states?

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

- (a) Yes Sir. The India Meteorological Department (IMD) under the Ministry of Earth Sciences (MoES) continuously monitors weather and climate across the country, including Gujarat, Maharashtra, and Tamil Nadu, through its observational networks and numerical weather prediction models. Key climate and risk assessments conducted by MoES institutes include the regular preparation of Monthly and Annual Climate Summaries, State-wise Climate Statements, and Climate Diagnostic Bulletins, which document regional, state, and district-level climate variations, including extreme temperatures, heatwaves, cold waves, and rainfall variability over the past 30 years.

The National Institute of Ocean Technology (NIOT) maintains the Ocean Moored Network for the Northern Indian Ocean (OMNI), coastal buoys, High-Frequency (HF) Radars, and Tsunami buoys in the Indian Ocean region, including two buoys in the Arabian Sea, to monitor real-time meteorological and oceanographic parameters.

The Indian National Centre for Ocean Information Services (INCOIS) has prepared a Coastal Vulnerability Index (CVI) at a scale of 1:100,000 for the entire Indian coastline, including Gujarat, Maharashtra, and Tamil Nadu, considering factors such as sea-level rise, shoreline changes, and tidal dynamics. In addition, Coastal Multi-Hazard Vulnerability Mapping (MHVM) has been carried out at a scale of 1:25,000 to support coastal risk assessment and disaster preparedness.

- (b) The India Meteorological Department (IMD) operates a nationwide observational network comprising Doppler Weather Radars (DWRs), Automatic Weather Stations (AWSs), and rain gauge stations for district- and block-level weather monitoring.

The Ministry of Earth Sciences, through the National Institute of Ocean Technology (NIOT), maintains dedicated coastal High Frequency (HF) Radar pairs, including those at Wasiborsi and Jegri in Gujarat, along with a network of open-ocean moored buoys for continuous ocean observations. The National Centre for Coastal Research (NCCR) provides urban rainfall forecasts and flood inundation mapping covering approximately 400 sq. km of the Mumbai Municipal Corporation area to support urban flood management.

Weather warnings and alerts are disseminated through multiple digital platforms, including the MAUSAM, Meghdoot, DAMINI, UMANG, and SAMUDRA mobile applications, as well as the SACHET platform based on the Common Alerting Protocol (CAP), ensuring timely last-mile dissemination.

- (c) Real-time data generated from oceanic and meteorological observation networks are assimilated into high-resolution operational oceanic and atmospheric models to enhance forecasting accuracy and support disaster risk reduction.

Scientific data and forecasts generated by IMD and the Indian National Centre for Ocean Information Services (INCOIS) are disseminated to the Ministry of Home Affairs, the National Disaster Management Authority (NDMA), State Disaster Management Authorities (SDMAs), and District Collectors for advance preparedness and monitoring of severe weather events such as cyclones, storm surges, and high waves.

Under the Panchayat Mausam Seva initiative, weather forecasts are integrated with the e-GramSwaraj and e-Manchitra platforms, enabling direct dissemination of advisories to Panchayat representatives through WhatsApp. IMD also extends agrometeorological advisory services through Krishi Sakhis, Pashu Sakhis, and more than 7,300 Farmers' Awareness Programmes across 373 districts. Under Mission Mausam, IMD provides Impact-Based Forecasts (IBFs) with dynamic, location-specific, crop-specific, and crop-stage-specific advisories through digital platforms such as KALP and Mausam SANKALP to support informed decision-making and enhance disaster preparedness.

- (d) Yes. Mission Mausam has been conceptualised as a transformative and outcome-oriented national initiative to improve weather forecasting, early-warning services and disaster preparedness. Based on a gap analysis of India's existing observational network, benchmarked against those of major developed countries, the mission provides for the commissioning of Doppler Weather Radars, RS/RW stations, disdrometers, wind profilers, microwave radiometers, solar radiation monitoring stations, Aerosol/Raman LiDARs, skyradiometers, BC/EC-OC aerosol monitoring stations.

The establishment of this infrastructure is linked to measurable outcomes, including a 10–15 percent improvement in forecast accuracy by 2030, forecasting of severe weather hazards at a spatial resolution of 5 km × 5 km, increased lead time for early warnings, dynamic impact-based forecasting and risk-based warnings for all severe weather events, and last-mile dissemination of early warnings to every household by 2030. Mission Mausam will thereby strengthen disaster-risk reduction and improve the delivery of weather and climate services to citizens and weather-sensitive socio-economic sectors.

- (e) The major weather and ocean observation facilities operating in the states include the observational network of the India Meteorological Department (IMD), comprising Doppler Weather Radars (DWRs), Automatic Weather Stations (AWSs), and rain gauge stations, as well as ocean observation facilities maintained by the National Institute of Ocean Technology (NIOT), including the Ocean Moored Network for the Northern Indian Ocean (OMNI), coastal buoys, High-Frequency (HF) Radars, Tsunami buoys, and open-ocean moored buoys.

In Gujarat, dedicated coastal High Frequency (HF) Radar pairs are maintained at Wasiborsi and Jegri. In Maharashtra, the National Centre for Coastal Research (NCCR) provides urban rainfall forecasts and flood inundation mapping covering approximately 400 sq. km of the Mumbai Municipal Corporation area to support urban flood management. The coastal and ocean observation systems, together with the meteorological observing network, provide continuous real-time monitoring of weather and oceanographic conditions in these states.
