**GOVERNMENT OF INDIA**
**MINISTRY OF EARTH SCIENCES**
**LOK SABHA**
**UNSTARRED QUESTION NO. 6057**
**TO BE ANSWERED ON WEDNESDAY, 1ST APRIL, 2026**

## CLIMATE MONITORING DATA

6057. SHRI SURESH KUMAR SHETKAR:

Will the Minister of EARTH SCIENCES be pleased to state:

(a) whether the climate monitoring data is being integrated in real time with national and State disaster response agencies to enable quicker evacuation and mitigation measures and if so, the details thereof along with operational framework;
(b) whether adequate budgetary allocation has been made for strengthening supercomputing infrastructure required for high-resolution climate modelling and long-term forecasting and if so, the details thereof along with the financial outlay and procurement status;
(c) whether India is collaborating with international climate research institutions for improved seasonal forecasting and early warning systems and if so, the details of agreements and technological exchanges undertaken;
(d) whether specialised monitoring mechanisms have been introduced to track rising urban heat island effects and air quality-related climatic changes in metropolitan cities and if so, the details thereof; and
(e) whether a future-ready National Climate Surveillance Grid is being developed to provide predictive analytics on heatwaves, extreme rainfall, drought cycles and sea-level rise and if so, the details thereof along with implementation roadmap and coordination mechanism?

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

(a) Yes. The India Meteorological Department (IMD), under the Ministry, has undertaken district-wise and long-term analysis of rainfall variability and trends across the country, which are critical for assessing drought and flood risks. IMD has been issuing impact-based forecasts and early warnings for extreme weather events such as cyclones, heatwaves, cold waves, and heavy rainfall, enabling quicker evacuations and mitigation measures. IMD and associated institutions have contributed to climate risk and vulnerability assessments, including analysis of monsoon variability, extreme rainfall events, heat waves, cold waves, and cyclone characteristics. IMD provides early warning services for all weather extremes, using the above-mentioned information and data, to national and State disaster response agencies to enable quicker evacuation and mitigation measures.

(b) Yes. The Ministry has installed HPC systems, namely 'Arka' at the Indian Institute of Tropical Meteorology, Pune, and 'Arunika' at the National Centre for Medium-Range Weather Forecasting, Noida. These supercomputing systems support high-resolution climate modeling and long-term forecasting.

(c) Yes. India Meteorological Department, under the Ministry of Earth Sciences, is an active member of the World Meteorological Organization (WMO) and plays a significant role in regional and global meteorological cooperation. IMD provides seasonal and monthly forecasts based on the multi-model ensemble techniques. The models used for this purpose include the Monsoon Mission Coupled Forecasting System (MMCFS) of MoES and other international ocean-atmosphere coupled climate forecast models.

IMD hosts the Regional Specialized Meteorological Centre (RSMC), New Delhi, which provides tropical cyclone forecasting and advisory services for the North Indian Ocean region, benefiting several countries in South Asia. IMD is also a WMO-recognized Regional Climate Centre (RCC) for the Asia region, contributing to long-range forecasting, climate diagnostics, and capacity building at the WMO Regional Training Center (RTC). The operationalization of the South Asian Climate Outlook Forum (SASCOF) in 2010 focuses on addressing the climate information requirements of countries influenced by the Asian southwest monsoon by providing regionally coordinated and consensus-based seasonal climate outlooks. Recently, IMD has achieved the status of a Global Producing Centre (GPC) for Long-Range Forecasts under WMO.

Further, IMD actively organizes and contributes to regional climate outlook initiatives such as the South Asian Climate Outlook Forum, which provides consensus-based seasonal forecasts for South Asia, and the recently initiated Third Pole Climate Outlook Forum, focusing on the Himalayan region and associated cryospheric processes. In addition, institutions under the Ministry of Earth Sciences (MoES) are engaged in various national and international collaborations under different projects. These include: Momentum Partnership (UKMO, UK); WCSSP–India (UKMO, UK); BIMSTEC Centre for Weather and Climate (BCWC); University of Colorado at Boulder (USA); ILRI (International Livestock Research Institute), Kenya; Northeastern University (USA); The University of Texas at Austin (USA); University of Victoria (Canada); Florida State University (USA); and Columbia University (USA).

These collaborations involve the exchange of meteorological data, numerical weather prediction models, satellite observations, and capacity-building initiatives, thereby strengthening India's capabilities in seasonal forecasting, cyclone prediction, and multi-hazard early warning systems. The above efforts are aligned with global initiatives such as WMO's "Early Warnings for All" and contribute to enhanced disaster preparedness and climate resilience in the region.

(d) Yes. The observational systems of IMD are utilized to monitor urban heat island effects in metropolitan cities. Specialized urban meteorological services are being provided by IMD for 150 cities (https://internal.imd.gov.in/pages/city_weather_main_mausam.php). It includes a real-time monitoring of temperature and heat waves over the cities. Also, IMD provides city-specific forecasts for severe weather for about 100 cities and air quality forecasts for 47 cities (https://nwp.imd.gov.in/silam_imd.php).

Heat Action Plans (HAPs) in 23 States and cities within, prone to heatwave conditions, are jointly implemented by the national disaster management authority in collaboration with the State Governments. HAPs also suggest long-term measures like tree planting, using heat-resistant building materials to reduce the urban heat island effect, and using cool roofing technologies to reduce solar absorption, thereby decreasing indoor temperatures for different stakeholders, including government agencies, healthcare providers, and emergency services.

The IMD issues special heat wave warning bulletins and impact based heatwave forecasts, providing details of guidelines or advisories for adopting heat-resilient urban planning measures such as cool roofs, urban forests, water bodies and reflective infrastructure at meteorological sub-division and district levels to various users, including the Ministry of Home Affairs, National Disaster Management Authority, State Disaster Management Authorities, Deputy Commissioners/District Magistrates, health departments, Indian Railways, road transport, and the media.

Since 2023, IMD has also commenced issuing seasonal and monthly Heatwave Outlooks to enable proactive measures in reducing heatwave-related risks across various parts of the country. IMD communicates all forecasts, including heat wave information, to the end user through offline and online media. Additionally, dedicated State websites provide district-specific heat wave information, and sector-specific bulletins are also available for the health and agriculture sectors. The latest outlook is available at https://imdpune.gov.in/latestnews/winter_outlook_Dec2025_Feb2026.pdf

(e) IMD has carried out hazard and vulnerability analysis with respect to heat waves, heavy rainfall, cyclones, droughts, etc. The same is available on the IMD website at https://imdpune.gov.in/hazardatlas/index.html. IMD provides daily heatwave warnings during the summer season based on various predictive analytics, including heatwave /severe heatwave, hot and humid day, warm night, extreme temperature (90th, 95th, and 99th percentile of both maximum and minimum temperature, heat index based on relative humidity and wind, and the composite index valid up to 5 to 7 days. The impact expected and action suggested are also included in the forecast bulletins.

Further, Mission Mausam and the National Framework for Climate Services (NFCS)–India integrate predictive analytics using IMDAA reanalysis, Mithuna-FS models, and AI/ML ensembles for assessment of heatwaves (district-level probabilities), extreme rainfall (6 km convection-permitting scale), drought cycles (S2S using NCUM), and sea-level rise (coupled ocean models). NFCS–India is the national adaptation of the World Meteorological Organization's Global Framework for Climate Services (GFCS).

Future projections of extreme temperatures, rainfall, and sea-level rise over India are derived using India's first Earth System Model, IITM-ESM, within the CMIP framework under different future pathways.

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