

PARLIAMENT QUESTION: STUDIES TO ASSESS THE IMPACT OF EXTREME WEATHER CONDITIONS

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The Ministry of Earth Sciences (MoES) has published a Climate Change report entitled "Assessment of Climate Change over the Indian Region", which covers all aspects of regional climate change, including the climatic extreme conditions across India. The report is available at <https://link.springer.com/book/10.1007/978-981-15-4327-2>. The India Meteorological Department (IMD) has developed a web-based "Climate Hazard and Vulnerability Atlas of India", which covers 13 major hazardous meteorological events that cause significant human, animal, and economic losses. The web Atlas is depicted using Geographic Information System (GIS) tools and is made available on the IMD, Pune website (<https://www.imdpune.gov.in/hazardatlas/index.html>). Further, IMD also studied changing rainfall patterns in the country and extremes in the recent 30 years at different spatial scales (States and Districts). A total of 29 reports on "Observed Rainfall Variability and Changes" for various States/UTs were published, and they are available at the following (<https://www.imdpune.gov.in/Reports/rainfall%20variability%20page/raintrend%20new.html>).

To enhance the early warning capability of IMD and improve warning for extreme weather incidents, the Government has taken various steps during 2021-26 under the umbrella scheme "Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS)" of the MoES. Subsequently, the scheme ACROSS was merged as a sub-scheme under the overarching Scheme "Prithvi Vigyan (PRITHVI)" of MoES in 2024. To further enhance weather monitoring and forecasting across India and surrounding regions by leveraging advanced observational and computing technologies for greater precision and resolution, the Union Cabinet approved the central sector scheme Mission Mausam in 2024, with a budget outlay of 2,000 crore over two years (2024-25 to 2025-26). The scheme seeks to exponentially enhance the country's weather and climate observations, understanding, modeling, and forecasting, leading to better, more useful, accurate, and timely services. The ACROSS sub-scheme under the PRITHVI scheme was merged into the Mission Mausam scheme.

Within these projects, two global forecast systems, such as GFS 12 km and NCUM 12 km, are operationalised in real-time. It has also launched the Bharat Forecasting System (BharatFS), operational since May 2025, at a very high resolution of up to 6 km to cater to block-level and, further, panchayat-level needs. Further, to support such high-resolution models running regularly, the Computing facilities have also been substantially increased to integrate voluminous data and to run meso-scale, regional, and global models at higher resolution. Recently, with the implementation of the High Power Computing Systems "Arunika" and "Arka", the Ministry of Earth Sciences has enhanced its total computing power to 28 Peta FLOPS in 2025, a substantial increase from the previous capacity of 6.8 Peta FLOPS in 2014.

For effective utilization of observational and NWP products and for providing timely early warning against all types of severe weather, IMD has developed an end-to-end GIS-based Decision Support System (DSS), which serves as the front end of the early warning systems for the timely detection and

monitoring of all-weather hazards. It is supported by specific severe weather modules to provide timely, impact-based early warnings for extreme weather events such as cyclones, Heavy rainfall, Thunderstorms, lightning, Fog, and heatwaves, which have devastating impacts on human lives, livelihoods, and infrastructure. This system uses all historical data, their extremes, as well as real-time surface and upper-air meteorological observations available to it for the Indian region and neighbourhood. It also includes radar observations available every 10 minutes and Satellite products available every 15 minutes. It also uses Numerical Weather Prediction (NWP) products from a suite of models run in MoES. The models include mesoscale (including hyperlocal), regional, and global models. Various models are currently operational in real time at the IMD and other centres of MoES at the hyperlocal and mesoscale. To provide impact-based forecasts and warnings, the DSS integrates exposure data with hazard data within the system.

IMD is collaborating with organisations such as ICAR, ICMR, etc., to develop sector-specific weather and climate services.

This information was submitted by Union Minister of State (Independent Charge) for Earth Sciences and Science & Technology Dr. Jitendra Singh in Lok Sabha on 11th February 2026.

NKR/JP

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