



PARLIAMENT QUESTION: IMPROVING WEATHER FORECASTING CAPABILITIES

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To improve India's weather forecasting capabilities, the Government has fully organized an institutional mechanism for strengthening the observational network and adopting new techniques and technology to integrate and assimilate all types of data through all computational and modelling supports for generating forecasts and warnings at a more granular scale of various severe weather events affecting the region. The India Meteorological Department (IMD), in coordination with other centers under the Ministry of Earth Sciences (MoES)- including the Indian Institute of Tropical Meteorology (IITM), Pune, National Centre for Medium Range Weather Forecasting (NCMRWF), Noida, is working in this direction. Additionally, the Ministry of Earth Sciences (MOES) launched Mission Mausam with the goal of making India a "Weather-ready and Climate-smart" nation, aiming to mitigate the impacts of climate change and extreme weather events.

The main objective of the project is to enhance India's climate and weather observation and monitoring capabilities, which includes the deployment of more radars and other modern monitoring systems in a time-bound manner. Under this project, Bharat Forecasting System (BharatFS) was launched, along with ensemble forecasting systems and Impact-Based Forecasting (IBF) approaches, to improve forecast accuracy and lead time for events such as heavy rainfall, heat waves, etc.

Mithuna-FS is NCMRWF's new-generation global coupled forecasting system for sharper medium-range weather predictions in India. It integrates atmosphere, ocean, land surface, and sea ice with advanced physics and upgraded data assimilation, running at 12-km global resolution. The suite includes a 4-km regional model for monsoons/cyclones and a 330 m hyper-local urban model for Delhi fog/air quality. Mithuna-FS reduces biases in rainfall, temperature, fog visibility; pairs with AI/ML post-processing for district-level extreme event probabilities (heatwaves, thunderstorms). Developed under Mission Mausam, it boosts severe weather forecast accuracy by 30-40% over the past decade.

IMD has developed indigenous, technology-driven, and citizen-centric weather forecasting systems that strengthen disaster preparedness and improve public safety across India. IMD's in-house developed Decision Support System (DSS) is a major step in the direction of promoting self-reliance under the "Atmanirbhar Bharat" initiative. Developed "Mausamgram" (Har Har Mausam, Har Ghar Mausam), a unique citizen-focused platform providing location-specific, hyperlocal weather forecasts down to the village level. "Mausamgram" delivers hourly forecasts for the next 36 hours, three-hourly forecasts for

the next five days, and six-hourly forecasts for up to ten days. Users can conveniently access weather information by searching through PIN code or location name, or by selecting the state, district, block, and gram panchayat. This user-friendly system ensures easy access to hyperlocal forecasts, enabling citizens to obtain accurate and timely weather updates tailored to their specific location.

IMD, in coordination with various centres of MoES institutes, has developed the following:

- Utilization of the AI/ML-based Advanced Dvorak Technique (AiDT) to estimate the intensity of cyclones.
- A novel deep learning model (meteoGAN) has been developed for the Delhi-NCR region and successfully tested for rainfall downscale using ground-based and Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) rainfall analysis at 300 m spatial resolution.
- A machine learning model based on a decision tree is developed to predict daily rainfall at Delhi during monsoon season.

NCMRWF has developed the multi-scale Mithuna-FS model suite for sharper medium-range forecasts, nowcasting, and district-level extreme event probabilities (rainfall, heatwaves, fog). This system integrates global AI/ML models like Pangu-Weather, GraphCast, and FourCastNet on the Arunika Supercomputer for rapid downscaling to urban scales using GANs and CNNs.

Government has taken various measures to extend real-time weather updates to rural farmers for better crop management. A weather-based crop advisory service is a step towards providing real-time information about weather updates, crop health, and appropriate measures to the farmers, enabling them to make informed decisions about various crop management practices leading to higher yields and increased income.

In order to cater to the needs of the farming community, the India Meteorological Department (IMD) runs a scheme, viz. Gramin Krishi Mausam Sewa (GKMS) to render weather forecast-based operational Agrometeorological Advisory Services (AAS) in collaboration with Indian Council of Agricultural Research (ICAR), State Agriculture Universities (SAUs), Indian Institute of Technology (IIT), etc. Under GKMS, 130 Agromet Field Units (AMFUs) covering 127 agroclimatic zones, located at various SAUs, IITs, ICAR institutes, etc., are operational across the country. IMD provides medium-range weather forecasts for rainfall, temperature, relative humidity, cloud cover, wind speed and direction at district and block levels for the next five days, along with subsequent week rainfall and temperature outlook at the meteorological sub-division level. Based on observed and forecasted weather, AMFUs prepare Agromet Advisories twice in a week (every Tuesday and Friday) in English as well as in Regional languages for their respective districts and communicate to the farmers to make appropriate decisions on day-to-day agricultural operations such as selection of type of crops and varieties, appropriate time for sowing, harvesting, fertilizer application, choosing windows for various intercultural operations e.g., weeding, hoeing, etc., appropriate time and method of irrigation, including

water-efficient methods, etc. as per the need of specific agro-climatic regions. Under the GKMS scheme, all the agriculturally important districts are covered across the country for providing weather updates, agromet advisories, and early warnings directly to the farmers.

Along with the AAS bulletins, daily weather forecast and nowcast information are also issued by Regional Meteorological Centers (RMCs) and Meteorological Centers (MCs) of IMD. Impact-based forecast (IBFs) and appropriate advisories for agriculture are also being prepared by AMFUs based on the severe weather warnings for different districts of various States and UTs across the country issued by the National Weather Forecasting Centre (NWFC), New Delhi, and RMCs and MCs of IMD.

To provide real-time weather updates and early warnings directly to farmers' mobile phones, including the farmers of climate-vulnerable districts, weather forecast and Agromet Advisories are disseminated through real-time mechanism or multichannel dissemination system, including print and electronic media, Doordarshan, internet and SMS under Public-Private Partnership (PPP) initiatives. Under PPP mode, about 5.56 million farmers are getting benefitted with weather forecast, alerts and Agromet Advisories. SMS-based alerts and warnings along with suitable remedial measures, are being sent during extreme weather events like cyclone, deep depression, etc. through Kisan Portal. Technological advancements have further enhanced accessibility, enabling farmers to receive location-specific forecasts and advisories through mobile apps such as 'Meghdoot' and 'Mausam', and Social media platforms like WhatsApp, Facebook, etc. Additionally, IMD has integrated its services with IT platforms of 21 State Governments, and about 15.6 million farmers are accessing the information in English and regional languages from these State Government IT platforms.

IMD, in collaboration with the Ministry of Panchayati Raj (MoPR), has recently launched Panchayat-level weather forecasts covering nearly all Gram Panchayats in India. These forecasts are accessible through digital platforms such as e-Gramswaraj (<https://egramswaraj.gov.in>), Meri Panchayat app, e-Manchitra of MoPR, and Mausamgram of IMD, MoES (<https://mausamgram.imd.gov.in>).

This information was submitted by Union Minister of State (Independent Charge) for Earth Sciences Dr. Jitendra Singh in Rajya Sabha on 12th February 2026.

NKR/JP/SG

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