GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 2953
TO BE ANSWERED ON WEDNESDAY, 17TH DECEMBER, 2025

FORECASTING OF HEAVY RAINS AND LANDSLIDES

2953. SHRI SHAFI PARAMBIL:

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

(a)   the efficiency of the current forecasting models used by the India Meteorological Department (IMD) in forecasting of heavy rains and landslides;

(b)   the reasons for the failure of the current forecasting models in identifying the chances of heavy rains and landslides;

(c)   whether the Government has invested in the research to invent new forecasting models; and

(d)   if so, the details thereof and if not, the reasons therefor?

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

(a)-(b) The current forecasting models used by the India Meteorological Department (IMD) are highly accurate. In 2024, the skill score for 24-hour (one-day) advance detection of heavy rainfall over meteorological subdivisions stands at 85%. At present, the accuracy of IMD's heavy rainfall forecasts, measured as the percentage of correct warnings, is 85%, 73%, 67%, 63% and 58% for lead times ranging from one to five days, respectively. Overall, forecast accuracy for heavy rainfall events across the country improved by about 40% in 2023–2024 compared to 2014.

The Geological Survey of India (GSI), under the Ministry of Mines, has been mandated to issue regional landslide forecasts/early warnings based on rainfall thresholds. Currently, GSI issues operational/experimental daily regional landslide forecast bulletins to 21 districts in 08 (eight) States during the monsoon period. GSI's landslide forecast model is primarily based on rainfall thresholds derived from historical rainfall and landslide occurrence data, in conjunction with daily rainfall forecast data received from institutions under the Ministry of Earth Sciences. Regarding the efficiency of this current forecast model, the evaluation shows a hit rate of more than 80% across the forecasting zones of operational districts, viz, Darjeeling, Kalimpong, Nilgiris and Rudraprayag.

Improving the accuracy of weather forecasts requires enhanced state-of-the-art observational networks, skilled human resources to undertake research and development for the development of numerical weather prediction models, and robust infrastructure, such as high-performance computing systems to run these models at the required high resolution to predict weather patterns caused by climate change. The Ministry is in continuous endeavour of augmenting the observational and R&D infrastructure towards achieving better accuracy in weather forecasting.

(c)-(d) The major new initiative undertaken by the Government is the implementation of the Mission Mausam. A couple of Doppler Weather Radars (DWRs) have already been installed under the mission. Currently, 47 radars are in operation across India, with 87% of the country's total area under radar coverage. Under the Mission Mausam, the Bharat Forecast System (BharatFS), an advanced weather forecasting model, has been developed and is operational at a high spatial resolution of 6-km. It also has the capability to provide predictions of rainfall events up to 10 days, covering the short and medium-range forecasts. Due to its higher resolution and improved dynamics, it generates weather forecasts at the panchayat or cluster of panchayats level. Further, a major achievement is the introduction of the Mithuna Forecast System (Mithuna-FS). This new-generation global coupled model integrates the atmosphere, ocean, land surface, and sea ice components with state-of-the-art physics and an upgraded data assimilation framework. Currently, this forecasting system operates at 12-km resolution, marking a significant advancement in India's medium-range localized weather forecasting capability. The Mithuna-FS suite also includes –

- A 4-km high-resolution regional model for accurate simulation of monsoon dynamics, cyclones, and mesoscale extreme events over the Indian subcontinent;
- A 330-m hyper-resolution urban model for fog, visibility, and air-quality forecasting over the Delhi region.

IMD consistently issues timely alerts and forecasts to the public and concerned stakeholders. Various steps have been taken to ensure effective dissemination of warnings to vulnerable populations. IMD's weather information, including alerts and warnings to the public, is provided through various platforms:

- Mass Media: Radio/TV, Newspaper network (AM, FM, Community Radio, Private TV), Prasar Bharati, and private broadcasters.
- Weekly & Daily Weather Video.
- Internet (e-mail), FTP
- Public Website (mausam.imd.gov.in)
- IMD Apps: Mausam/Meghdoot/Damini/Rain Alarm/Umang.
- Social Media: Facebook, X, Instagram, BLOG

    i. X: https://twitter.com/Indiametdept
    ii. Facebook: https://www.facebook.com/India.Meteorological.Department/
    iii. Blog: https://imdweather1875.wordpress.com/
    iv. Instagram: https://www.instagram.com/mausam_nwfc
    v. YouTube: https://www.youtube.com/channel/UC_qxTReoq07UVARm87CuyQw

IMD has launched seven of its services (Current Weather, Nowcast, City Forecast, Rainfall Information, Tourism Forecast, Warnings, and Cyclone) with the 'UMANG' Mobile App for use by the public. Moreover, IMD developed a mobile App, 'MAUSAM' for weather forecasting, 'Meghdoot' for Agromet advisory dissemination, and 'Damini' for lightning alerts. The Common Alert Protocol (CAP), developed by the NDMA, is also being implemented to disseminate warnings by the IMD.

IMD currently is equipped with a Decision Support System (DSS) based real-time multi-hazard impact based early warning system (EWS), which integrates all types of real-time and historical data, numerical weather prediction products, etc., to effectively monitor, detect and provide timely forecasts and impact-based warnings with suggested actions up to districts and city/station levels against all types of extreme weather events such as heavy rainfall events, droughts etc. IMD has Meteorological Centres (MCs) in each State and also special centers like Cyclone Warning Centers available for each impacted State, which provide services during cyclones and heavy rainfall seasons round the clock, respectively. As a result of these new initiatives, the overall skill of forecasting these severe weather events has been improved by 30-40% over the last 10 years.

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