GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 551
TO BE ANSWERED ON WEDNESDAY, 23RD JULY, 2025

EARLY WARNING SYSTEMS FOR NATURAL DISASTERS

551.   SHRI K SUDHAKARAN:

Will the Minister of EARTH SCIENCES be pleased to state:

(a)   the reasons for delays and inaccuracies in early warning systems for natural disasters like floods and cyclones which have caused significant loss of life and property in States like Gujarat, Odisha and Kerala;

(b)   the specific steps taken/being taken by India Meteorological Department to enhance the accuracy and timelines of disaster warnings, especially for coastal and rural communities;

(c)   whether the Government has assessed the gaps in the Bharat Forecast System launched in 2025 to address these issues and if so, the details thereof; and

(d)   the measures proposed to ensure effective dissemination of warnings to vulnerable populations including through collaboration with State Governments and local agencies?

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

(a)   There has been no delay in disseminating early warning information by the India Meteorological Department (IMD) regarding various natural disasters, including heavy rainfall events, floods, and cyclones, in States such as Gujarat, Odisha, and Kerala. The IMD has consistently issued timely alerts and forecasts to the public and concerned stakeholders. The Central Water Commission (CWC) is mandated to issue short-range flood forecasts with a lead time of up to 24 hours to concerned State Governments at identified locations. Timely flood forecasts are being issued when a certain threshold limit is reached.

IMD follows standard global best practice and operating procedures to deliver effective and efficient weather and climate forecasting services to the nation. The skill of the operational forecasts issued by IMD for various extreme weather and climate events is comparable to other national meteorological services of developed countries in the world. Overall, there has been significant improvement in the forecasting of various severe weather events like cyclones and heavy rainfall over the country during recent years (details about the IMD forecast accuracy are given in Annexure-1).

IMD uses a state-of-the-art dissemination system to share all severe weather information and early warning with Disaster Management Authorities as well as the general public through various platforms for necessary preparedness and to support mitigation measures. It includes Social media, Sachet-Apps via Common Alert Protocol (CAP), Mobile Apps, WhatsApp, and API. As a result, the vulnerable population gets evacuated from the damage-prone areas in a timely manner to safe shelters, thereby reducing the human death toll to a bare minimum. For this, IMD is issuing a seamless forecasting system at seasonal to nowcast scale and has implemented a well-defined Standard Operation Procedure for monitoring & forecasting the weather hazards and issuing impact-based warnings in consultation with NDMA, SDMA, and other various user agencies like Aviation, power, Railways, etc.

(b)   IMD has adopted new techniques and technology from time to time to detect, monitor, and provide timely early warnings (for the entire country, including coastal and rural communities) for all types of extreme weather events like cyclones, floods, and heatwaves, which have devastating impacts on human lives, livelihoods, and infrastructure. There has been significant progress in this direction with:

- Strengthening of the observing system with installation of additional AWS, ARG, and DWR, etc.
- Improvement of the data integration and development of GIS-based DSS.
- Improvement of NWP models and climate models, as well as a real-time seamless monitoring, forecasting, and early warning system.
- Shifting from conventional weather forecast and warning to sector-specific color-coded Impact-based forecast (IBF) and risk-based warning (RBW) upto district/sub-city levels with dynamical impact and risk matrix
- Application of AI/ML
- Customisation of bulletins and warnings
- Substantial increase of computational power to integrate voluminous data and to run meso-scale, regional, and global models at a further higher resolution scale with improvement of process understanding and model physics. Supercomputers (Arka and Arunika) are being used for this purpose.
- Panchayat Mausam Seva.
- A state-of-the-art dissemination system with the use of a mobile app, Common Alerting Protocol (CAP), WhatsApp groups, etc.

Recently, a new Central Sector Scheme, "Mission Mausam," was launched by MoES with the goal of making Bharat a "Weather-ready and climate-smart" nation.

(c)   No. Bharat Forecast System (BhartFS) was launched very recently (on 26th May 2025). The validation of the accuracy of forecasts from BhartFS for real-time situations is yet to be carried out, as it needs data of a longer period.

(d)   To ensure effective dissemination of warnings to vulnerable populations, various steps have been taken. IMD's weather information including alerts and warning to the public are 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 (email), FTP
- Public Website (mausam.imd.gov.in)
- IMD Apps: Mausam/Meghdoot/DAMINI/RAIN ALARM
- 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

Last year (2024), a joint collaborative programme of the Central and State Governments was launched by the Ministry of Panchayati Raj (MoPR). Under this program, the MoPR implemented the Gram Panchayat-Level Weather Forecasting (GPLWF) for nearly all Gram Panchayats in India on 24th October 2024. These forecasts are accessible on digital platforms such as e-Gramswaraj (https://egramswaraj.gov.in/), the Meri panchayat app, e-Manchitra of MoPR, and Mausamgram of the IMD (https://mausamgram.imd.gov.in/).The main aims and objectives of the GPLWF are to provide weather forecasts up to Gram Panchayat Levels, covering critical parameters such as temperature, rainfall, humidity, wind, and cloud conditions—essential data that farmers need for informed decision-making regarding sowing, harvesting, and irrigation. The platform makes weather forecast information accessible anytime and anywhere at the panchayat level across the country. Attempts have been made to reach a larger number of people for this weather information through Pashu Sakhis and Krishi Sakhis under the Ministry of Agriculture and Farmers Welfare and the Ministry of Rural Development.

IMD has also brought out a web-based online "Climate Hazard & Vulnerability Atlas of India" prepared for the thirteen most hazardous meteorological events, which cause extensive damage and economic, human, and animal losses. The same can be accessed at https://imdpune.gov.in/hazardatlas/abouthazard.html. This atlas will help State Government authorities and disaster management agencies identify the hotspots and plan and take appropriate action to tackle extreme weather events. This product is helpful in building Climate Change resilient infrastructure.

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.

The CWC has taken several steps by adopting various dissemination mechanisms to get maximum reach to the flood warnings, so that mitigation measures can be adopted by State Governments, SDMA, NDMA, and the public. Further, with an aim of disseminating information related to the flood situation in the country and flood forecasts up to 7 days on a real-time basis to the public through mobile phones, version 2.0 of the 'Flood Watch India' mobile application has been developed by the CWC, which provides current information on flood conditions across the country. Further, it also provides additional information regarding the storage positions of 150 major reservoirs in the country, which helps in a better understanding of the possible flood situation in their downstream areas. The 'Flood Watch India' app is available for download.

Forecast and warning skill improvement of short-range to medium-range real-time:

Cyclone Forecast Performance -5 years comparative (2020-24 vs 2015-19)

- There is a significant improvement in Forecast Accuracy. During 2020-24, IMD's Average Track forecast Error has improved 10-15% upto lead period 72 hours & 25-30% beyond that than that of 2015-2019.

- During 2020-24, IMD's Average Intensity Forecast Error has improved 33-35% upto lead period 72 hours, 10% for lead period 96 hours compared to 2015-2019.

- During 2020-24, IMD's Average Landfall point Error has improved 64-72% upto lead period 96 hours & 90% for lead period 108 hrs beyond that than that of 2015-2019.

Heavy rainfall forecast- skill 2014 to 2024 and (2016-2020) versus (2021-2024)

- By 2024, the Probability of Detection (POD) for south west monsoon heavy rainfall warning is 80 for day 1, 70 for day 2, and 65 for day 3, as compared to 50 for day 1, 48 for day 2, and 37 for day 3 in 2014. There is an increase in the lead period of the forecast by 4 days from 2020 compared to 2016.

There is about 30, 40, and 45% improvement in skill of 24, 48, and 72 hrs lead period, respectively, in the recent 05 years (2020-24) as compared to the previous 5 years (2015-19).

****