GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 2911
TO BE ANSWERED ON WEDNESDAY, 17TH DECEMBER, 2025

WEATHER FORECASTING TECHNOLOGY AND INFRASTRUCTURE

2911. SHRI AMRINDER SINGH RAJA WARRING:
SHRI BALWANT BASWANT WANKHADE:
DR. DHARAMVIRA GANDHI:

Will the Minister of EARTH SCIENCES be pleased to state:

(a) the details of the weather forecasting technologies currently being used by the Government and its affiliated agencies such as the India Meteorological Department (IMD) including numerical weather prediction models, radar networks, satellites and AI based systems;
(b) the details of new technologies and models being developed or implemented by the Government to predict and manage increasingly unpredictable weather patterns caused by climate change;
(c) the number of farmers registered to the Meghdoot mobile application since 2021 and the steps taken to expand coverage, year-wise;
(d) the current status of the network of Doppler Weather Radars (DWRs) under Mission Mausam including the number and locations installed and operational so far; and
(e) the details of the expansion plan including the exact number of additional DWRs planned, the timeline for their installation and the States/locations earmarked for the new installations?

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

(a) Under the Mission Mausam, the Bharat Forecast System (BharatFS), an advanced computer simulation model, has already been developed, and it has been operational at a very high spatial resolution of 6 km. It has also 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 is being used to generate weather forecasts at the level of a panchayat or cluster of panchayats. To further support the operations of high-resolution model simulations in real-time, the computing facilities (Arunika and Arka) have been substantially increased to integrate voluminous data and run meso-scale, regional, and global models.

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 multi-scale Mithuna-FS suite reduces biases in rainfall, temperature, and fog visibility. Coupled with intelligence and machine learning (AI/ML)-based post-processing, these models provide sharper medium-range forecasts, better nowcasting capability, and more reliable district-scale probabilities for extreme rainfall, heatwaves, fog, air quality, and thunderstorms. The Ministry has established a dedicated virtual centre involving the India Meteorological Department, National Centre for Medium Range Weather Forecasting (NCMRWF), and other institutes to integrate AI/ML systematically into the weather forecasting chain under the Mission Mausam. This virtual centre coordinates the development of AI/ML tools for bias correction, statistical post-processing, downscaling, nowcasting, and multi-source data fusion from radars, satellites, and AWS networks.

NCMRWF also experimentally runs global operational AI models such as Pangu-Weather, FourCastNet, and GraphCast on the Arunika Supercomputer at ~25 km resolution and fine-tunes them for India. These data-driven components run alongside the dynamical NWP systems on the Ministry's HPC resources, enabling the rapid generation of tailored hyperlocal products for sectors such as agriculture, urban management, and disaster risk reduction.

Satellite and radar-based monitoring has increased manifold. Currently, 6 Channels in INSAT 3-D are providing 30-minute gap cloud pictures and water vapour, wind-related products at a very high resolution of up to 1 km. Currently, 47 DWRs are in operation across India, and the details are given in Annexure-1.

(b) The Ministry is continuously working to strengthen observational capabilities and R&D infrastructure to achieve greater accuracy in weather forecasting. The IMD has adopted new techniques and technologies over time to detect, monitor, and provide timely early warnings for disruptive weather patterns caused by climate change. The IMD has expanded its infrastructure for observations, data exchange, monitoring & analysis, forecasting, and warning services in the country.

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. As discussed in (a), the Bharat Forecast System (BharatFS), an advanced weather forecasting model, is also used to generate short and medium-range forecasts.

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 media platforms like mass media, Internet (e-mail), Public Website (mausam.imd.gov.in), mobile applications (Mausam/Meghdoot/DAMINI/RAIN ALARM). 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.

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. 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.

(c) Year-wise statistics and steps taken to expand the Meghdoot coverage are given in Annexure-1.

(d)-(e) Currently, 47 DWRs are in operation across India, and the details are given in Annexure-2. In the coming years, DWRs will be installed as per the requirement to cover the remaining gap areas in the country, provide redundancy, and replacement of old radars in the DWR network under Mission Mausam of MoES.

Annexure-1

Year	Meghdoot registered users
Since the launch to 2021	2,36,188
2022	2,81,561
2023	3,18,560
2024	3,78,540
2025 (Till Date – 28 Nov 2025)	4,16,056

Nationwide Expansion of the Application: The India Meteorological Department (IMD), under the Ministry, has undertaken systematic efforts to expand the Meghdoot mobile application, which provides weather-based agromet advisories to farmers. Initially launched for around 150 districts, the application has now been extended across the country and presently covers nearly 700 agriculturally important districts for the dissemination of agromet advisories under Gramin Krishi Mausam Sewa (GKMS).

Enhanced Spatial Reach at Block Level: To further improve the geographical reach of the services, the application has been upgraded to provide daily weather forecasts for nearly 7,000 blocks and 747 districts of the country. Additionally, real-time weather warnings and nowcasts have been incorporated to assist farmers in responding promptly to adverse or rapidly changing weather conditions. The application includes multilingual support for 12 languages, pictorial representations of advisories, and simplified formats to enhance usability among farmers.

Promotion Through Farmer Awareness Activities: The Meghdoot application has been widely promoted through farmer awareness programmes (FAP) conducted by AMFUs across various states. Multiple communication channels, including SMS, agromet advisories, social media platforms, and local outreach initiatives, have been utilised to inform farmers about the downloads, demos, availability, and benefits of the app.

Linkage with State Government Platforms: To further extend outreach, Meghdoot advisories have been integrated with 21 State Government platforms, including state-level mobile applications and agricultural information portals/websites. This linkage has helped widen access to advisories among farmers using state-specific digital services.

Integration with National Digital Platforms: In addition, the weather-based agromet advisories disseminated through Meghdoot are linked with major national platforms such as UMANG, Mausam, Krishi Decision Support System (DSS), VISTAAR, WINDS of the Ministry of Agriculture, and other digital systems. These integrations ensure uniform dissemination of advisories across multiple access points.

Annexure-2

S. No.	State/Union Territory	DWR Locations
1.	Andhra Pradesh	Machilipatnam (S-Band)
2.	Andhra Pradesh	Visakhapatnam (S-Band)
3.	Andhra Pradesh	Sriharikota, ISRO (S-Band)
4.	Assam	Mohanbari (S-Band)
5.	Bihar	Patna (S-Band)
6.	Chhattisgarh	Raipur
7.	Goa	Goa (S-Band)
8.	Gujarat	Bhuj (S-Band)
9.	Himachal Pradesh	Jot (X-Band)
10.	Himachal Pradesh	Murari Devi (X-Band)
11.	Himachal Pradesh	Kufri (X-Band)
12.	Kerala	Kochi (S-Band)
13.	Kerala	VSSC, ISRO Thiruvananthapuram (C-Band)
14.	Madhya Pradesh	Bhopal (S-Band)
15.	Maharashtra	Mumbai (S-Band)
16.	Maharashtra	Nagpur (S-Band)
17.	Maharashtra	IITM Solapur (C-Band)
18.	Maharashtra	Veravali (C-Band)
19.	Maharashtra	Mumbai, Juhu (X-band)
20.	Maharashtra	Mumbai, Panvel (X-band)
21.	Maharashtra	Mumbai, Kalyan, Dombivli (X-band)
22.	Maharashtra	Mumbai, Vasai, Virar (X-band)
23.	Maharashtra	Mahabaleshwar (X-band)
24.	Meghalaya	Cherrapunji, ISRO (S-Band)
25.	Odisha	Gopalpur (S-Band)
26.	Odisha	Paradip (S-Band)
27.	Punjab	Patiala (S-Band)
28.	Rajasthan	Jaipur (C-Band)
29.	Tamil Nadu	Chennai (S-Band)
30.	Tamil Nadu	Karaikal (S-Band)
31.	Tamil Nadu	NIOT Chennai (X-Band)
32.	Telangana	Hyderabad (S-Band)
33.	Tripura	Agartala (S-Band)
34.	Uttarakhand	Lansdowne (X-Band)
35.	Uttarakhand	Mukteshwar (X-Band)
36.	Uttarakhand	Surkanda Devi (X-Band)
37.	Uttar Pradesh	Lucknow (S-Band)
38.	West Bengal	Kolkata (S-Band)
39.	Jammu & Kashmir	Banihal Top (X-Band)
40.	Jammu & Kashmir	Jammu (X-Band)
41.	Jammu & Kashmir	Srinagar (X-Band)
42.	Delhi	Aya nagar (X-Band)
43.	Delhi	Palam (S-Band)
44.	Delhi	HQ Mausam Bhawan (C-Band)
45.	Ladakh	Leh (X-Band)
46.	Karnataka	Mangaluru (C-Band)
47.	Chhattisgarh	Raipur (C-Band)

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