GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
RAJYA SABHA
UNSTARRED QUESTION NO. 2111
ANSWERED ON 18/12/2025

ACCURACY OF FORECAST

2111. SMT. RAJANI ASHOKRAO PATIL:

Will the Minister of EARTH SCIENCES be pleased to state:

(a) the accuracy of seasonal monsoon forecasts issued during 2024–25;
(b) the details of mismatch between forecasts and actual rainfall;
(c) the details of impact on agriculture planning;
(d) the details of upgrades proposed for prediction models; and
(e) the steps taken to strengthen IMD's data network?

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

(a)-(b) The IMD's seasonal forecast for the 2024 & 2025 southwest monsoon seasons proved to be highly accurate. The details of IMD seasonal forecast verification for All India Summer Monsoon Rainfall for the period 2024 & 2025 is given below:

Year	All India Summer Monsoon Rainfall Forecast Verification				
	Actual (%)	**First Forecast (%)**	**Second Stage Forecast (%)**	**Rainfall Category**	**Remark**
2024	108	106	106	Above Normal	Accurate
2025	108	105	106	Above Normal	Accurate
*Model error ± 5% of LPA for 1st stage **Model error ± 4% of LPA for 2nd stage					

For the 2024 southwest monsoon season, the first stage forecast for the season (June-September) rainfall over the country as a whole issued in April was 106% of LPA with a model error of ± 5% of LPA, and the update forecast issued in the end of May 2024 was 106% of LPA with a model error of ± 4% of LPA. The actual season rainfall for the country as a whole was 108 % of LPA. Thus, the seasonal rainfall forecast for the country as a whole was correct. Considering the four broad geographical regions of India, the forecasts issued on 27th May 2024 indicated that the southwest monsoon seasonal (June to September 2024) rainfall is most likely to be above-normal over Central India and South Peninsular India (>106% of LPA), normal over Northwest India (92-108% of LPA) and below normal over Northeast India (<94% of LPA). The forecast for the southwest monsoon seasonal rainfall over the monsoon core zone, consisting of most of the rainfed agriculture, was also above Normal (>106% of LPA.

The actual rainfall over Northwest India, Central India, Northeast India, South Peninsula, and Monsoon Core Zone was recorded at 107%, 120%, 86%, 114% and 119% of the LPA, respectively. The seasonal forecast issued for homogeneous regions during the season was within the range of the forecast for all four regions.

The first stage forecast for the 2025 southwest monsoon season (June-September) rainfall over the country as a whole issued in April was 105% of LPA with a model error of ± 5% of LPA, and the update forecast issued at the end of 5th May 2025 was 106% of LPA with a model error of ± 4% of LPA. The actual season rainfall for the country as a whole was 108 % of LPA. Thus, the seasonal rainfall forecast for the country as a whole was correct. Considering the four broad geographical regions of India, the forecasts issued on 27th May, the southwest monsoon seasonal (June to September 2025) rainfall is most likely to be above-normal over Central India and South Peninsular India (>106% of LPA), above normal over Northwest India (>108% of LPA) and below normal over Northeast India (106% of LPA). The actual rainfall over Northwest India, Central India, Northeast India, South Peninsula, and Monsoon Core Zone were 27%, 15%, -20%, 10% and 22% of the LPA, respectively. The seasonal forecast issued for homogeneous regions during the season was within the range of the forecast, except for Northwest India.

The spatial probability forecasts during both years had also indicated, highlighted above-normal rainfall across the country, except in Northeast India. Overall, the forecast aligned well with observed rainfall patterns across much of India, with only a few deviations noted in parts of the Gangetic Plains.

(c) Monsoon rains are critical for the agricultural sector, particularly over the monsoon core zone, consisting of most of the rainfed agriculture areas in the country. However, over most areas of the monsoon core zone received normal to above normal rainfall during both years. In 2024, annual crop production in the country was above normal, and during 2025, the annual crop production is expected to be above normal.

(d) IMD is continuously working on upgrading and improving its seasonal prediction systems through advances in empirical, dynamical, and multi-model ensemble-based approaches. Ongoing enhancements focus on refining model physics, improving data assimilation, increasing model resolution, integrating more robust ensemble techniques, and using AI/ML to deliver more accurate and reliable seasonal forecasts.

(e) Various steps have been taken by the Government to strengthen IMD's data network, and there has been tremendous progress in modernising IMD's observational system with the installation of new Doppler Weather Radars (DWR), lightning alert systems, and automated weather stations across the country. The details of progress till 2024-2025 compared to 2013-2014 (last 10 years) for India, are enclosed in Annexure-1. Currently, 47 radars are in operation across India, with 87% of the country's total area under radar coverage. In the coming years, additional DWRs will be installed as per the requirement so as to bring the entire country under the radar coverage.

Annexure-1

Status of IMD's meteorological observation network and computing infrastructure in the country 2024-2025 Vs 2013-2014

Parameter/System	2013-2014	2024-2025
Automatic Weather Station network	675	1008
Doppler Weather Radar	15	47
Rain Gauge Stations	3500	6700
Runway Visual Range Systems	20	180
Current weather indicating systems	29 Airports	117 airports with 137 Systems
Pressure measuring	Mercury Barometers	Digital Barometers
High Performance Computing (HPC)	1.1 Peta flops Processing speed	28 Peta flops Processing speed
Upper air observations	43 RS/RW Stations 62 Pilot Balloon stations	56 RS/RW Stations. 62 Pilot Balloon stations
High Wind Speed Recorders	19	37 (By 2024)

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