

**GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
STARRED QUESTION No.*1
TO BE ANSWERED ON WEDNESDAY JULY 18, 2018**

MONSOON PREDICTION

***1. SHRI ASHOK SHANKARRAO CHAVAN:
SHRI SUDHEER GUPTA:**

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether the India Meteorological Department (IMD) has predicted normal monsoon during the current season and if so, the details thereof, region-wise;**
- (b) whether the Government is aware that several foreign agencies including the Japanese Meteorological Department have predicted below normal monsoon during the current season;**
- (c) if so, the details thereof and the reaction of the Government thereto, agency-wise;**
- (d) whether average error in IMD's monsoon forecasts has come down during each of the last three years and if so, the details thereof; and**
- (e) the measures taken/being taken by the Government to update the IMD system as well as to avoid inaccurate predictions by IMD?**

**ANSWER
MINISTER FOR MINISTRY OF SCIENCE AND TECHNOLOGY AND
MINISTRY OF EARTH SCIENCES
(DR. HARSH VARDHAN)**

(a) to (e): A statement is laid on the Table of the House.

STATEMENT REFERRED TO IN REPLY TO PARTS (A) TO (E) OF THE LOK SABHA STARRED QUESTION NO. *1 REGARDING 'MONSOON PREDICTION' FOR ANSWER ON 18TH JULY, 2018.

- (a) Yes Madam. IMD has predicted a normal monsoon during the current season (2018 southwest monsoon season). The summary of the forecast issued on 30th May, 2018 is given below and detailed forecast is attached as Annexure-I.
- Rainfall over the country as a whole for the 2018 southwest monsoon season (June to September) is most likely to be NORMAL (96% to 104% of long period average (LPA)).
 - Quantitatively, monsoon season (June to September) rainfall for the country as a whole is likely to be 97% of the LPA with a model error of $\pm 4\%$.
 - Region wise, the season rainfall is likely to be 100% of LPA over North-West India, 99% of LPA over Central India, 95% of LPA over South Peninsula and 93% of LPA over North-East India all with a model error of $\pm 8\%$.
 - The monthly rainfall over the country as whole is likely to be 101% of its LPA during July and 94% of LPA during August both with a model error of $\pm 9\%$.
- (b) Government is aware that several foreign climate prediction agencies including Japan Meteorological Agency (JMA) prepare and issue forecasts of seasonal rainfall and IMD has access to these forecasts. However, it may be mentioned that in the month of May when IMD issued the Long Range Forecast, most of the model forecasts including that from JMA were indicating normal rainfall during the 2018 southwest monsoon season and not below normal rainfall. The details of the forecasts issued by other agencies are given in the Annexure-II:
- (c) Does not arise.
- (d) Yes madam. The absolute error of the IMD's monsoon forecasts for the seasonal rainfall over the country has shown significant decrease after the implementation of the new statistical ensemble forecasting system in 2007 compared to previous years. The average absolute error (difference between forecast and actual rainfall) of the new statistical forecasting system used for forecasting all India rainfall during the last 11 years (2007 -2017) was 5.9% of long period average (LPA) compared to the average absolute error of 8.5% of LPA during the previous 11 years (1996 -2006). This clearly indicates improvement made in the operational forecast system in the recent period compared to the earlier period. It may be mentioned that IMD was able to correctly predict the deficient monsoon rainfall experienced during 2014 & 2015.

- (e) **Government has taken several measures to upgrade the IMD forecast system to further improve prediction accuracy. Systematic efforts are being made to further improve statistical forecasting system, which was introduced by IMD in 2007. Under the Monsoon Mission, a new dynamical prediction system for long range forecasting of Indian monsoon was implemented by IMD. IMD is working to improve the skill of this dynamical prediction system in collaboration with Indian and foreign academic institutions.**



भारत सरकार
Government of India
पृथ्वी विज्ञान मंत्रालय (एम. ओ. ई. एस.)
Ministry of Earth Sciences (MoES)
भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

**2nd Stage Long Range Forecast for the
2018 Southwest Monsoon Rainfall**

HIGHLIGHTS

- Rainfall over the country as a whole for the 2018 southwest monsoon season (June to September) is most likely to be **NORMAL** (96% to 104% of long period average (LPA)).
- Quantitatively, monsoon season (June to September) rainfall for the country as a whole is likely to be **97%** of the LPA with a model error of **±4%**.
- Region wise, the season rainfall is likely to be **100%** of LPA over North-West India, **99%** of LPA over Central India, **95%** of LPA over South Peninsula and **93%** of LPA over North-East India all with a model error of **± 8 %**.
- The monthly rainfall over the country as whole is likely to be **101%** of its LPA during July and **94%** of LPA during August both with a model error of **± 9 %**.

1. Background

India Meteorological Department (IMD) had issued the first stage operational long range forecasts for the 2018 southwest monsoon season (June-September) rainfall over the country as a whole on 16th April. IMD has now prepared the 2nd Stage Long Range forecast of the seasonal rainfall over the country as a whole, forecasts for the monthly rainfall for July & August over the country as a whole, and forecasts for the seasonal rainfall for the 4 broad geographical regions of India (Northwest India, Northeast India, Central India and South Peninsula). The 2nd stage forecasts for the southwest monsoon season (June-September) rainfall over the country as a whole was prepared using a 6-parameter Statistical Ensemble Forecasting System (SEFS) and the operational Monsoon Mission Climate Forecast System (MMCFS).

2. Sea Surface Temperature Conditions in the Pacific & Indian Oceans

The moderate La Nina conditions developed in the equatorial Pacific in later part of the last year weakened to weak La Nina conditions early this year and currently have turned to neutral ENSO conditions. The MMCFS & other global climate models indicate conditions over the Pacific likely to continue to be Neutral during most part of the monsoon season and turn to weak El Nino conditions after the monsoon season.

At present, the warm neutral Indian Ocean Dipole (IOD) conditions are prevailing over the Indian Ocean. The MMCFS and other global climate models indicate weak negative IOD conditions are likely to develop during the middle of the monsoon season and continue to persist till the early part of the post-monsoon season.

3. Monsoon Mission Coupled Forecasting System (MMCFS)

The latest experimental forecast based on the MMCFS suggests that the monsoon season rainfall during the 2018 monsoon season (June to September) averaged over the country as a whole is likely to be 102% \pm 4% of LPA.

4. The Operational Second Stage Forecasts for the 2018 Southwest Monsoon Rainfall

i) Season (June-September) Rainfall over the country as a whole

Quantitatively, the season rainfall for the country as a whole is likely to be 97% of the long period average (LPA) with a model error of \pm 4%. The LPA rainfall over the country as a whole for the period 1951-2000 is 89 cm.

The 5 category probability forecasts for the Season (June to September) rainfall over the country as a whole is given below.

Category	Rainfall Range (% of LPA)	Forecast Probability (%)	Climatological Probability (%)
Deficient	< 90	13	16
Below Normal	90 - 96	28	17
Normal	96 -104	43	33
Above Normal	104 -110	13	16
Excess	> 110	3	17

ii) Season (June-September) Rainfall over the Broad Geographical Regions

The season rainfall is likely to be 100% of LPA over North-West India, 99% of LPA over Central India, 95% of LPA over South Peninsula, and 93% of LPA over North-East India all with a model error of \pm 8 %.

iii) Monthly (July & August) Rainfall over the country as a whole

The monthly rainfall over the country as a whole is likely to be 101% of its LPA during July and 94% of LPA during August both with a model error of \pm 9 %.

Annexure –II

Inferences derived from seasonal forecasts from various climate prediction agencies for the 2018 southwest monsoon season.

S. No	Forecasting Agency	Inference for 2018
1	European Centre for Medium Range Weather Forecasting (ECMWF), UK	June-August & July to September (Issued: May 2018): Normal to above normal rainfall is likely over parts of North, Central and Northwest India. Normal to below normal rainfall is likely over parts of Northeast and South Peninsular India.
		June to August and July to September (Issued: May 2018): Normal rainfall is most likely over the most parts of the country. However, above normal rainfall is likely over some parts of east central and below normal rainfall is likely over southernmost parts of the country.
2	International Research Institute for Climate and Society, USA	June to August & July to September (Issued: May 2018): Above normal rainfall is likely over some of the north and central parts of India. Below normal rainfall is likely over some parts of south peninsular and north-eastern India. For the rest of the country climatological probabilities are likely.
3	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	June to August (Issued: May 2018): Positive rainfall anomalies are predicted over most parts of north, north east and east central as well as south eastern and west (coastal region) India. Negative rainfall anomalies are predicted over remaining areas with highest magnitudes over northwest India.
4	APEC Climate Center, South Korea	June, July, August & September (Issued: May 2018): Above normal rainfall likely over the parts of the central and eastern India. Below normal rainfall is likely over parts of south and northeast India. Normal to below normal rainfall is likely over parts of northwest India. Climatological probabilities are likely for rest of the Country.
5	Met Office, UK	June to August & July to September (Issued: May 2018): Normal to below normal rainfall is likely over most parts of the country.

6	World Meteorological Organization LRFMME	<p>June to August (Issued: May 2018): Above normal rainfall is likely over east-central parts of the country and north Indian region. Below normal rainfall is likely over northeastern part of the country and peninsular region.</p> <p>June to September (Issued: May 2018): Positive rainfall anomalies are predicted over central Indian region. Negative rainfall anomalies are predicted over parts of northeastern and peninsular region of the country.</p>
7	Japan Meteorological Administration (JMA)	<p>July to September (Issued: June 2018)</p> <p>Normal to above normal rainfall is most likely over most parts of the country.</p>