GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
RAJYA SABHA
UNSTARRED QUESTION No. 2106
ANSWERED ON 04/08/2022

RAINFALL DEFICIT IN THE COUNTRY

2106. # SHRI RAM NATH THAKUR:

Will the Minister of EARTH SCIENCES be pleased to state:

(a) the rainfall deficit in the country this year
(b) the effect of climate change on monsoon in the form of rainfall deficit and whether the India Meteorological Department (IMD) is providing accurate data in public interest; and
(c) the drought and flood affected areas where such situation occurred due to rainfall deficit and excess rainfall during this monsoon ?

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

(a) This year the monsoon onset over Kerala was on 29th May, 2022 against the normal date of 01st June (3 days ahead of normal date) and it has covered the entire country on 2nd July 2022, against the normal date of 8th July i.e. six days ahead of the normal date for monsoon coverage for the entire country. The map related to Advance of Southwest monsoon 2022 is given in **Annexure-I**.

The monsoon rainfall had been normal [92% of the Long Period Average (LPA)] during June 2022, for the country as a whole; the LPA of the rainfall for the month of June being 165.4 mm based on the data of 1971-2020. The rainfall in June is said to be normal if it is within 92% to 108% of LPA.

Rainfall statistics for the month of June 2022 for the country as a whole and four homogeneous regions are given in the table below:

Region	**Rainfall during 1-30 June 2022**		
	Actual	**Normal**	**% Departure**
EAST & NORTHEAST INDIA	400.9	328.4	22%
NORTHWEST INDIA	68.6	78.1	-12%
CENTRAL INDIA	118.9	170.3	-30%
SOUTH PENINSULA INDIA	139	161	-14%
COUNTRY AS A WHOLE	152.3	165.3	-8%

From the above table it is found that there was excess rainfall over East & Northeast India and deficient rainfall over Central India.

Monsoon remained active in July due to formation and movement of low pressure systems across Central India and the monsoon trough lying to the south of its normal position. The details of seasonal rainfall for the country as a whole and for four homogeneous regions till 28th July are given below:

Region	**Rainfall during 1 June to 28 July 2022**		
	Actual	**Normal**	**% Departure**
EAST & NORTHEAST INDIA	605.1	716.1	-15%
NORTHWEST INDIA	273.4	266.2	+3%
CENTRAL INDIA	565.8	460.0	+23%
SOUTH PENINSULA INDIA	448.7	346.3	+30%
COUNTRY AS A WHOLE	459.1	418.9	+10%

It is clear from the above table that except for the east and northeast India all other parts of the country received normal to above normal monsoon rainfall.

(b) Ministry of Earth Sciences (MoES) is continuously undertaking research to conduct a detailed analysis to find out effect of climate change on monsoon.

The Ministry of Earth Sciences (MoES), has recently published a Climate Change report entitled "Assessment of Climate Change over the Indian Region" (http://cccr.tropmet.res.in/home/docs/cccr/2020_Book_AssessmentOfClimateChangeOverT.pdf). A salient feature of this report is the inclusion of introductory results based on the CMIP Phase 6 (CMIP6) projections of the Indian Institute of Tropical Meteorology (IITM) Earth System Model (IITM-ESM)—the first climate model from India — developed at the Centre for Climate Change Research-IITM, which is contributing to the Sixth IPCC Assessment Report (IPCC AR6). With continued global warming and anticipated reductions in anthropogenic aerosol emissions in the future, CMIP5 models project an increase in the mean and variabilityof monsoon precipitation by the end of the twenty-first century, together with substantial increases in daily precipitation extremes.

IMD also brought out web based online “Climate Hazard & Vulnerability Atlas of India” prepared for the thirteen most hazardous meteorological events, which cause extensive damages, economic, human, and animal losses. The same can be accessed at https://imdpune.gov.in/hazardatlas/abouthazard.html. IMD has studied and investigated the observed changes of rainfall patterns and its extremes in the recent 30 years in different states and districts. 29 Reports of states and UTs on "Observed Rainfall Variability and Changes” have been published by IMD in January 2020. The reports are also available to the public on the IMD Pune website https://imdpune.gov.in/hydrology/rainfall%20variability%20page/rainfall%20trend.html)

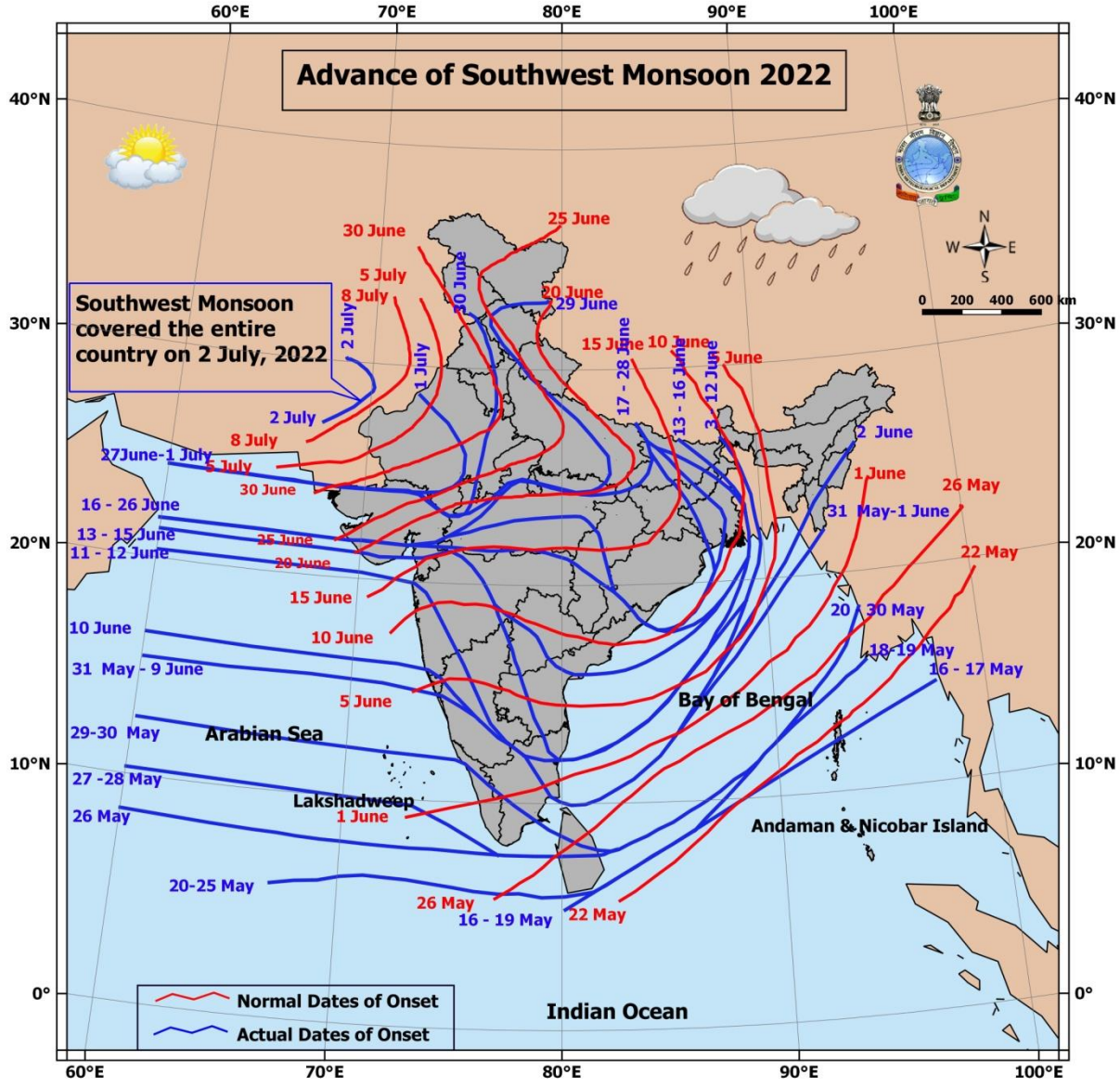
The **highlights of the report** are given below:

- Five states viz., Uttar Pradesh, Bihar, West Bengal, Meghalaya and Nagaland have shown significant decreasing trends in southwest monsoon rainfall during the recent 30 years period (1989-2018).
- The annual rainfall over these five states along with the states of Arunachal Pradesh and Himachal Pradesh also show significant decreasing trends.
- Other states do not show any significant changes in southwest monsoon rainfall during the same period.
- Considering district-wise rainfall, there are many districts in the country, which show significant changes in southwest monsoon and annual rainfall during the recent 30 years period (1989-2018). With regard to the frequency of heavy rainfall days, significant increasing trend is observed over Saurashtra& Kutch, Southeastern parts of Rajasthan, Northern parts of Tamil Nadu, Northern parts of Andhra Pradesh and adjoining areas of Southwest Odisha, many parts of Chhattisgarh, Southwest Madhya Pradesh, West Bengal, Manipur & Mizoram, Konkan& Goa and Uttarakhand.

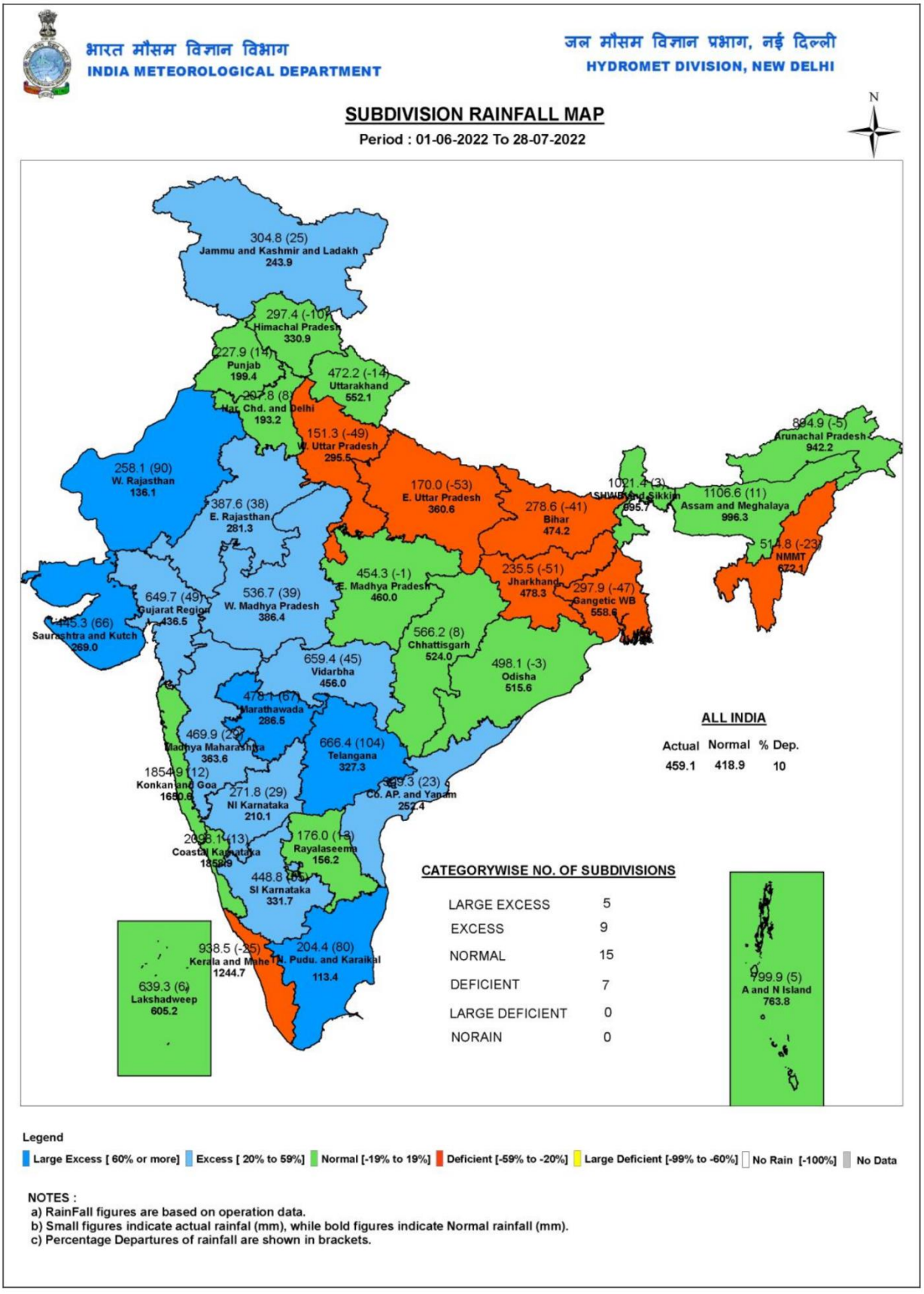
IMD is dedicated to monitoring, detecting, and forecasting weather and climate, including early warning for severe weather events. IMD issue forecast/outlook for rainfall in different spatial and time scales during different season, which will help to take appropriate/anticipatory action to overcome the weather and climate risks.

(c) Sub-division wise observed rainfall from 1 June to 28 July 2022 is provided as graph in Annexure II and the amount of rainfall and the rainfall statistics are provided in table in Annexure III. Following sub-divisions report deficitrainfall : West Uttar Pradesh, East Uttar Pradesh, Bihar Jharkhand, Gangetic West Bengal, Nagaland, Manipur, Meghalaya and Tripura and Kerala and Mahe. All other sub-divisional rainfall activity has been either normal or excess category.

Annexure-I


Advance of Southwest Monsoon 2022
Southwest Monsoon covered the entire country on 2 July, 2022
60°E
70°E
80°E
90°E
100°E
40°N
30°N
20°N
10°N
0°
N
W
E
S
0 200 400 600 km
30 June
25 June
5 July
8 July
30 June
20 June
29 June
2 July
1 July
15 June
10 June
12 June
2 June
1 June
26 May
31 May-1 June
22 May
20 - 30 May
18-19 May
16 - 17 May
2 July
8 July
27June-1 July
5 July
30 June
16 - 26 June
13 - 15 June
11 - 12 June
25 June
20 June
15 June
10 June
10 June
31 May - 9 June
5 June
29-30 May
27 -28 May
26 May
Lakshadweep
1 June
20-25 May
26 May
16 - 19 May
22 May
Arabian Sea
Bay of Bengal
Andaman & Nicobar Island
Indian Ocean
Normal Dates of Onset
Actual Dates of Onset

Annexure-II



NOTES :
a) RainFall figures are based on operation data.
b) Small figures indicate actual rainfal (mm), while bold figures indicate Normal rainfall (mm).
c) Percentage Departures of rainfall are shown in brackets.

Annexure-III

SUBDIVISION-WISE RAINFALL (MM) DISTRIBUTION

S.No.	METEOROLOGICAL SUBDIVISIONS	Period:01-06-2022 To 28-07-2022			
		ACTUAL	NORMAL	% DEPARTURE	CATEGORY
	EAST & NORTH EAST INDIA	605.1	716.1	-15%	N
1	ARUNACHAL PRADESH	894.9	942.2	-5%	N
2	ASSAM & MEGHALAYA	1106.6	996.3	11%	N
3	N M M T	514.8	672.1	-23%	D
4	SHWB & SIKKIM	1021.4	995.7	3%	N
5	GANGETIC WEST BENGAL	297.9	558.6	-47%	D
6	JHARKHAND	235.5	478.3	-51%	D
7	BIHAR	278.6	474.2	-41%	D
	NORTH WEST INDIA	273.4	266.2	3%	N
1	EAST U.P.	170.0	360.6	-53%	D
2	WEST U.P.	151.3	295.5	-49%	D
3	UTTARAKHAND	472.2	552.1	-14%	N
4	HAR. CHD & DELHI	207.8	193.2	8%	N
5	PUNJAB	227.9	199.4	14%	N
6	HIMACHAL PRADESH	297.4	330.9	-10%	N
7	J & K AND LADAKH	304.8	243.9	25%	E
8	WEST RAJASTHAN	258.1	136.1	90%	LE
9	EAST RAJASTHAN	387.6	281.3	38%	E
	CENTRAL INDIA	565.8	460.0	23%	E
1	ODISHA	498.1	515.6	-3%	N
2	WEST MADHYA PRADESH	536.7	386.4	39%	E
3	EAST MADHYA PRADESH	454.3	460.0	-1%	N
4	GUJARAT REGION	649.7	436.5	49%	E
5	SAURASHTRA & KUTCH	445.3	269.0	66%	LE
6	KONKAN & GOA	1854.9	1650.6	12%	N
7	MADHYA MAHARASHTRA	469.9	363.6	29%	E
8	MARATHWADA	478.1	286.5	67%	LE
9	VIDARBHA	659.4	456.0	45%	E
10	CHHATTISGARH	566.2	524.0	8%	N
	SOUTH PENINSULAR INDIA	448.7	346.3	30%	E
1	A & N ISLAND	799.9	763.8	5%	N
2	COASTAL A. P.& YANAM	309.3	252.4	23%	E
3	TELANGANA	666.4	327.3	104%	LE
4	RAYALASEEMA	176.0	156.2	13%	N
5	TAMIL., PUDU. & KARAIKAL	204.4	113.4	80%	LE
6	COASTAL KARNATAKA	2098.1	1858.9	13%	N
7	N. I. KARNATAKA	271.8	210.1	29%	E
8	S. I. KARNATAKA	448.8	331.7	35%	E
9	KERALA & MAHE	938.5	1244.7	-25%	D
10	LAKSHADWEEP	639.3	605.2	6%	N
	COUNTRY: INDIA	459.1	418.9	10%	N

CATEGORY	
LE (LARGE EXCESS) (60% more than LPA or more)	D (DEFICIENT) (20% to 59% less than LPA)
E (EXCESS) (20% to 59% more than LPA)	LD (LARGE DEFICIENT) (60% to 99% less than LPA)
N (NORMAL) (19% more to 19% less than LPA)	NR (NO RAIN) (-100%)
LPA Long Period Average	

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