



भारत सरकार  
**Government of India**  
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**Ministry of Earth Sciences (MoES)**  
भारत मौसम विज्ञान विभाग  
**INDIA METEOROLOGICAL DEPARTMENT**  
**Climate Research and Services (CRS)**

**Climate Summary for the month of March 2023**

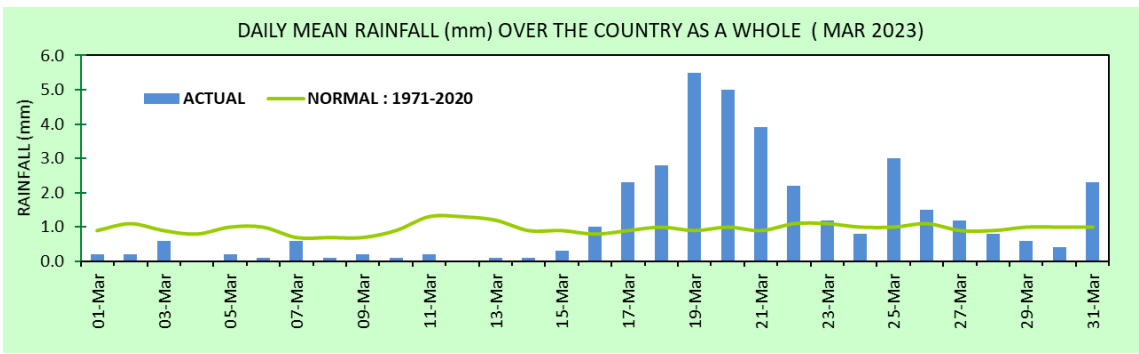
**1. Monthly Rainfall Scenario (01 to 31 March, 2023)**

During March 2023, the country as a whole recorded 37.6 mm rainfall which is 26% more than its Long Period Average (LPA) 29.9 mm. Daily variation of the rainfall over the country as a whole during the month of March 2023 and All India rainfall percentage departure from normal based on 1971-2020 for March during 1901-2023 is shown in the figure 1(a) and 1(b) respectively.

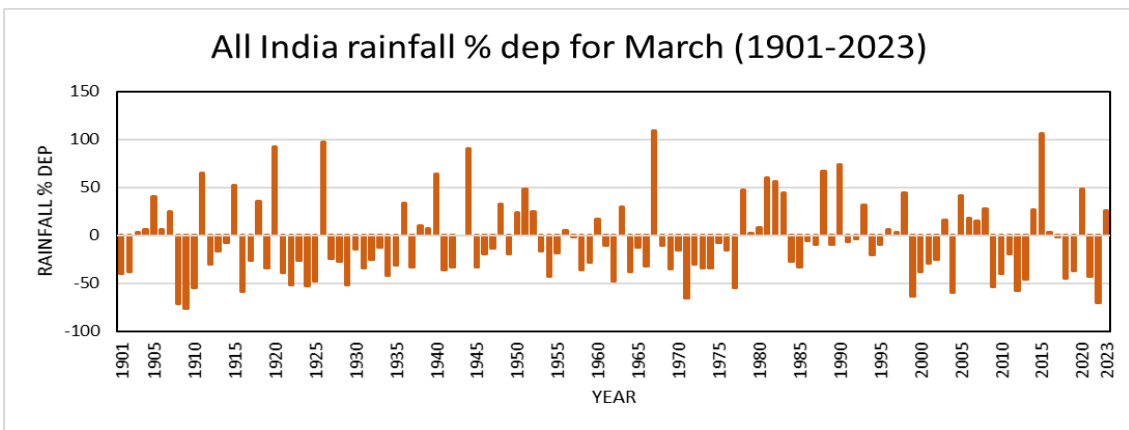
During the month of March 2023, South peninsular India received rainfall of 32.1 mm, which is 7<sup>th</sup> highest record since 1901 after the years 2008 (122.2 mm), 1944 (69.7 mm), 1915(46.9 mm), 1984 (43.3 mm), 2006 (40.9 mm) and 1967 (33.5 mm). Similarly, rainfall over central India (23.9 mm) in March 2023 was 11<sup>th</sup> highest since 1901 after the years 1944 (48.9 mm), 1967 (48.4mm), 1951 (35.8 mm), 1926 (33.6 mm), 1915 (31.8 mm), 2015 (31.8 mm), 2006 (28.7 mm), 1957 (27.7 mm), 2020 (26.3 mm) and 1950 (24.8 mm). The time series of percentage departure of rainfall since 1901 for South Peninsula and Central India are given in Fig. 2(a) and (b) respectively.

During March 2023, there were 24 meteorological sub-divisions which received large excess/ excess rainfall and 5 subdivisions received normal rainfall. However, 4 subdivisions received deficient rainfall and 3 subdivisions received large deficient rainfall. The monthly rainfall for March 2023 is given in the table below:

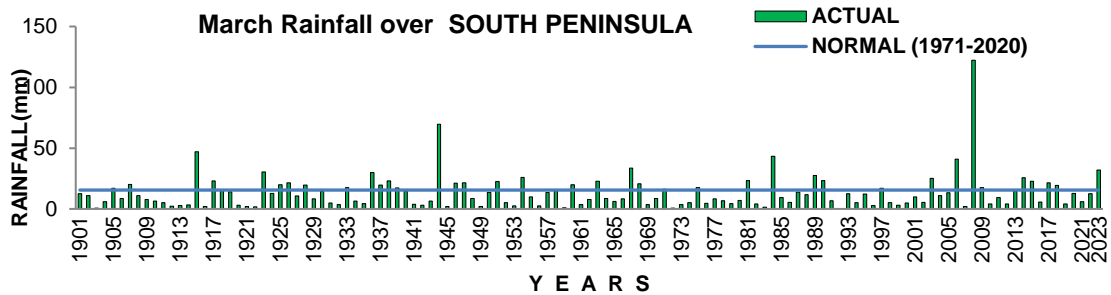
Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	37.6	29.9	26.0
Northwest India	41.1	47.9	-14.0
Central India	23.9	7.8	206.0
South Peninsula	32.1	15.5	107.0
East & northeast India	66.9	59.7	12.0



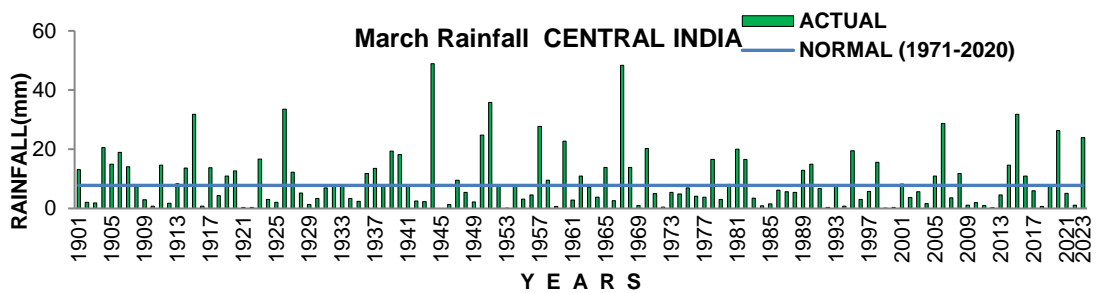
**Fig.1 (a):** Daily variation of rainfall over the country as a whole during March 2023.



**Fig.1 (b):** All India monthly rainfall percentage departure from normal (1971-2020) for March from 1901-2023.

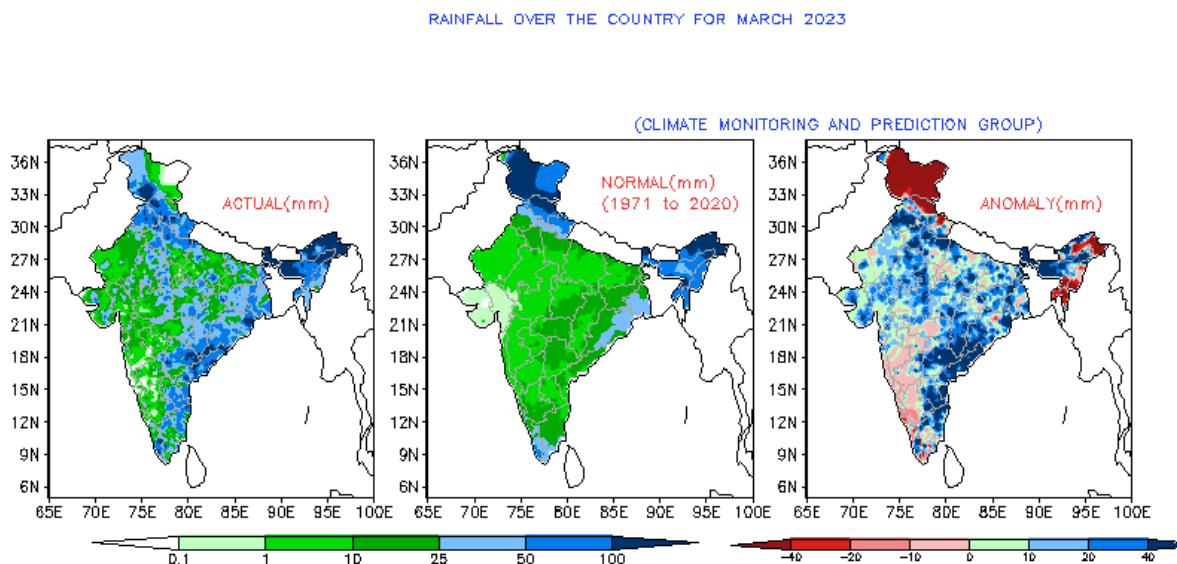


**Fig.2 (a):** Rainfall (March) percentage departure from normal (1971-2020) for South Peninsula from 1901-2023.



**Fig.2 (b):** Rainfall (March) percentage departure from normal (1971-2020) for Central from 1901-2023.

The observed spatial distribution of rainfall of March 2023, normal rainfall based on the period of 1971 to 2020 and departures of rainfall on March 2023 from normal is shown in the figure 3. It shows normal to excess rainfall over most part of the country except southwest India, extreme northwest India and some portion of the northeast India where it was deficient rainfall.



**Fig 3: Observed spatial Rainfall pattern for the month of March 2023 over India and their departure from normal (1971 to 2020 period).**

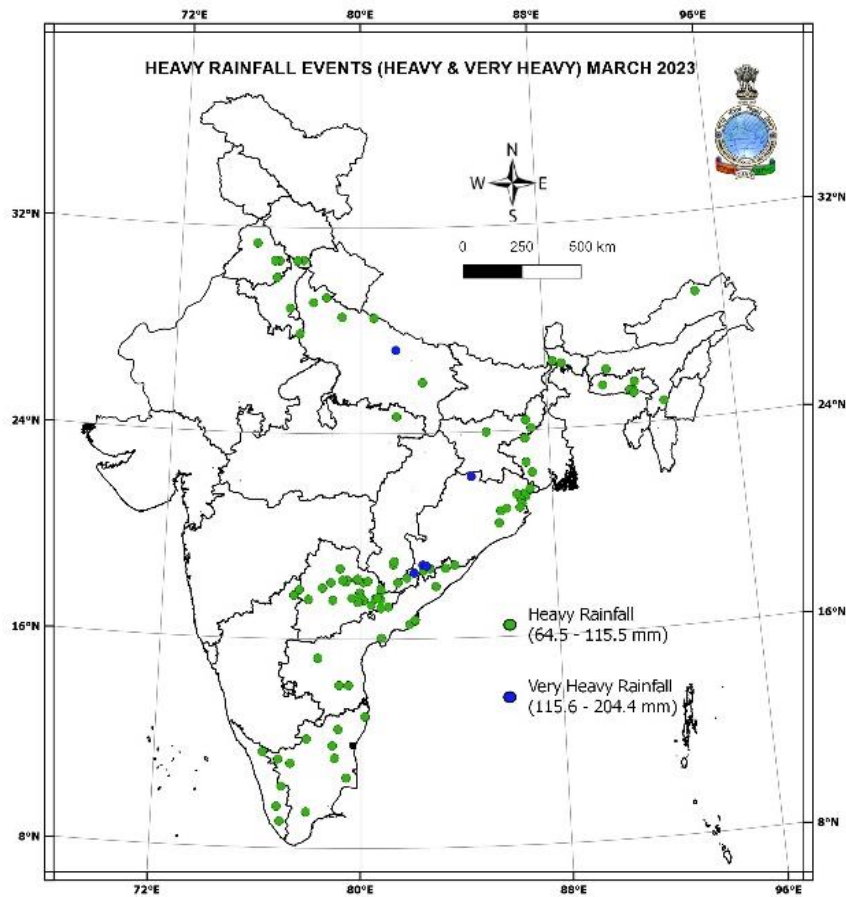
## 2. Frequency of Heavy Rainfall events

The March 2023 heavy rainfall events (64.5 to 115.5 mm of rainfall) witnessed over many regions especially from Telangana, Tamil Nadu, Puducherry & Karaikal, Odisha and Assam & Meghalaya and very heavy rainfall (115.6 to 204.4 mm of rainfall) mainly from Odisha and Uttar Pradesh. The location of occurrences of heavy and very heavy rainfall events is shown in the Figure 4. Out of total 102 events, 5 were very heavy rainfall (115.6 to 204.4mm) and 97 were heavy rainfall (64.5 to 115.5 mm of rainfall) events during this month. |

Some stations received record heavy rainfall (24 hour). The table below shows stations which received 24-hour record rainfall and its previous record.

STATION	24 HOUR RECORD RAINFALL IN March 2023(mm)#	DATE	PREVIOUS RAINFALL RECORD (mm)	DATE	STATE
GOALPARA	81	20	68	19-03-2011	Arunachal Pradesh
JALPAIGURI	75	21	68.6	07-03-1926	West Bengal
KORAPUT	122	19	47	12-03-2006	Odisha

# based on real time available data

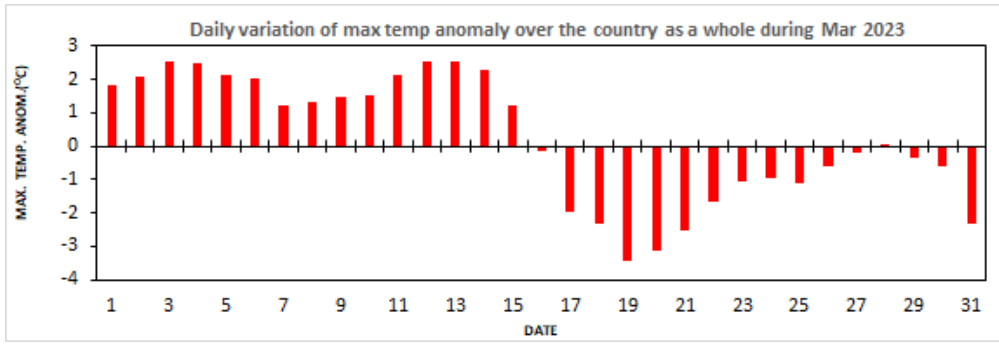


(Only highest category of rainfall event considered for a station)

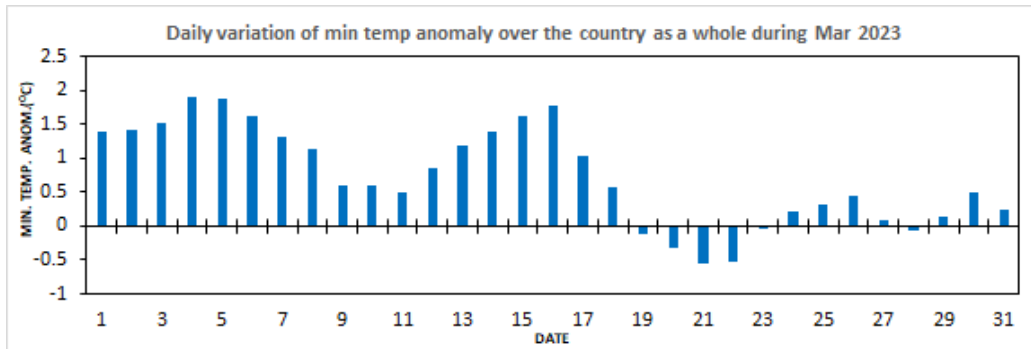
**Fig 4: The location of occurrences of heavy rainfall events in the month March 2023.**

#### **4. Characteristics of Temperatures for the month of March 2023**

The average maximum, average minimum and mean temperature for the country as a whole during March 2023 are 31.37 °C, 19.46 °C and 25.41 °C respectively, against the normal of 31.24 °C, 18.87 °C and 25.06 °C based on period 1981-2010. Thus, the average maximum temperature is normal by 0.13 °C while the average minimum temperature and mean temperature are above normal by 0.59 °C and 0.36 °C respectively for the country as a whole. The climatological data based on the period of 1981 to 2010 are used to calculate the normal and hence the anomaly (Actual average temperature in 2022 - normal temperature based on data of 1981-2010). The daily variation of maximum and minimum temperature anomaly over the country as a whole for March 2023 is shown in the figure 5(a) and (b). It can be notice that temperature departures were below normal since March 17 because of thunderstorm activity over many parts of the country and minimum temperature remained near normal during the same period.

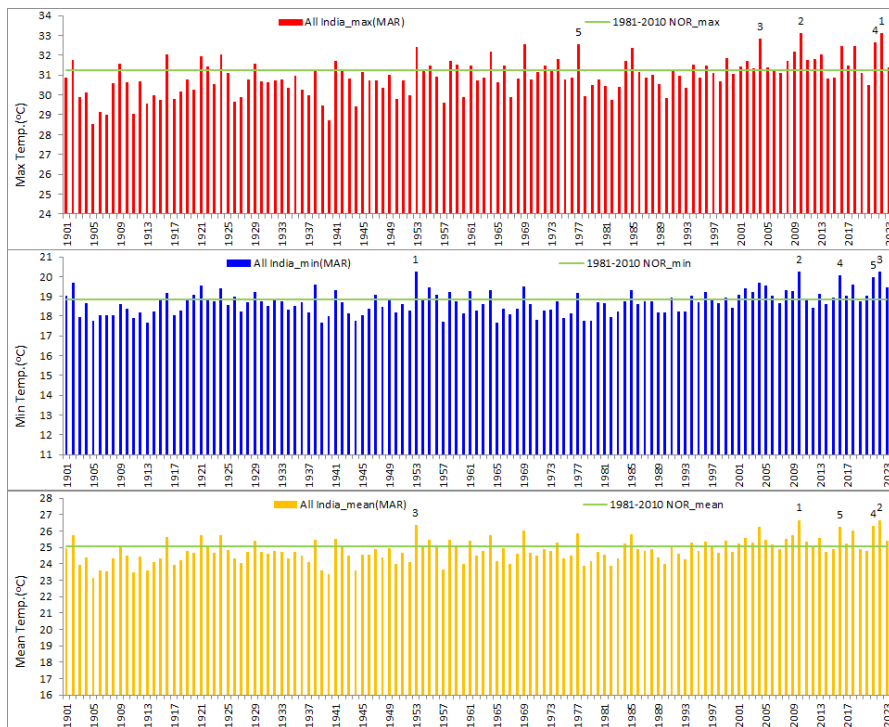


**Fig. 5(a): Daily variation of maximum temperature anomaly over the country as a whole for March 2023.**



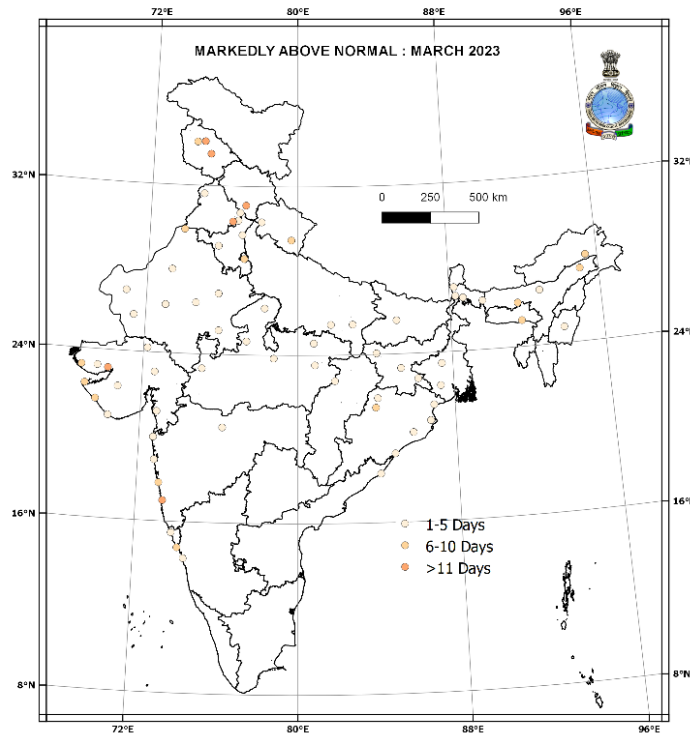
**Fig. 5(b): Daily variation of minimum temperature anomaly over the country as a whole for March 2023.**

Figure 6 shows time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of March 1901-2023.



**Fig 6: Time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of March 1901-2023**

Maximum temperature was markedly above normal mainly over most parts of Central India, Northwest India and East & Northeast India (Fig. 7). Figure 7 shows the stations with number of days, which were markedly above normal (>4.4°C) maximum temperatures.



**Fig. 7: Number of days with Maximum temperature being markedly above normal (>4.4°C) over the country for March 2023**

The Temperatures during March 2023 for all India and homogeneous regions with its ranks during 1901-2023 are given below;

MAR 2023		Max Temp (°C)	Min Temp (°C)	Mean Ten (°C)
ALL INDIA	ACTUAL	31.37	19.46	25.41
	NORMAL	31.24	18.87	25.06
	ANOMALY	0.13	0.59	0.36
	Rank from Top	39	14	25
NORTHWEST INDIA	ACTUAL	27.36	14.07	20.71
	NORMAL	26.82	12.73	19.77
	ANOMALY	0.54	1.34	0.94
	Rank from Top	37	9	22
EAST & NORTHEAST INDIA	ACTUAL	30.16	17.47	23.81
	NORMAL	30.21	16.58	23.39
	ANOMALY	-0.05	0.89	0.42
	Rank from Top	73	10	35
CENTRAL INDIA	ACTUAL	33.21	20.12	26.67
	NORMAL	33.58	19.62	26.60
	ANOMALY	-0.37	0.50	0.07
	Rank from Top	63	19	44
SOUTH PENNINSULAR INDIA	ACTUAL	33.29	23.34	28.32
	NORMAL	33.08	23.34	28.21
	ANOMALY	0.21	0.004	0.11
	Rank from Top	22	56	31

**Note: Values are rounded off to nearest two decimal**

## 5. Chief synoptic/weather features observed during March 2023:

During March month there were seven Western Disturbances (WD) formed during (1-3, 5-11, 13-16, 15-20, 19-22, 22-28 and 28-31 March). All these moved across north central India. East-west trough ran at lower levels from Rajasthan to eastern India during 17-21 and then during 28-31 March. Persistence of trough/wind discontinuity from southern parts of the Peninsular India to east central India was also observed in many days during 2<sup>nd</sup> half of the month.

The Weather during 14-22 March was most severe mainly because of the following reasons.

- Five active WDs moved across north and central India.
- Associated strong westerly jet stream (with wind speed exceeding 120 kmph to 200 kmph sometimes at the height of about 12 km) which provided upper level divergence and hence lower level convergence of air mass and uplifting of air leading to formation of deep clouds,
- Occurrence of lower level cyclonic circulations leading to development of thunderstorm clouds
- Feeding of moisture from Bay of Bengal and Arabian Sea in association with the anti-cyclonic circulation over the north Bay of Bengal and central Arabian Sea Lowering of freezing level in atmosphere helping in formation of hail

## 5. Significant Weather Events for the month March 2023:

During March, total 68 persons reportedly died, 70 persons got injured & more than 550 livestock perished due to various weather events. The details of casualties are given below, which are based on real time media reports.

Fig. 8 shows significant weather events and associated death during March 2023 based on real time media reports.

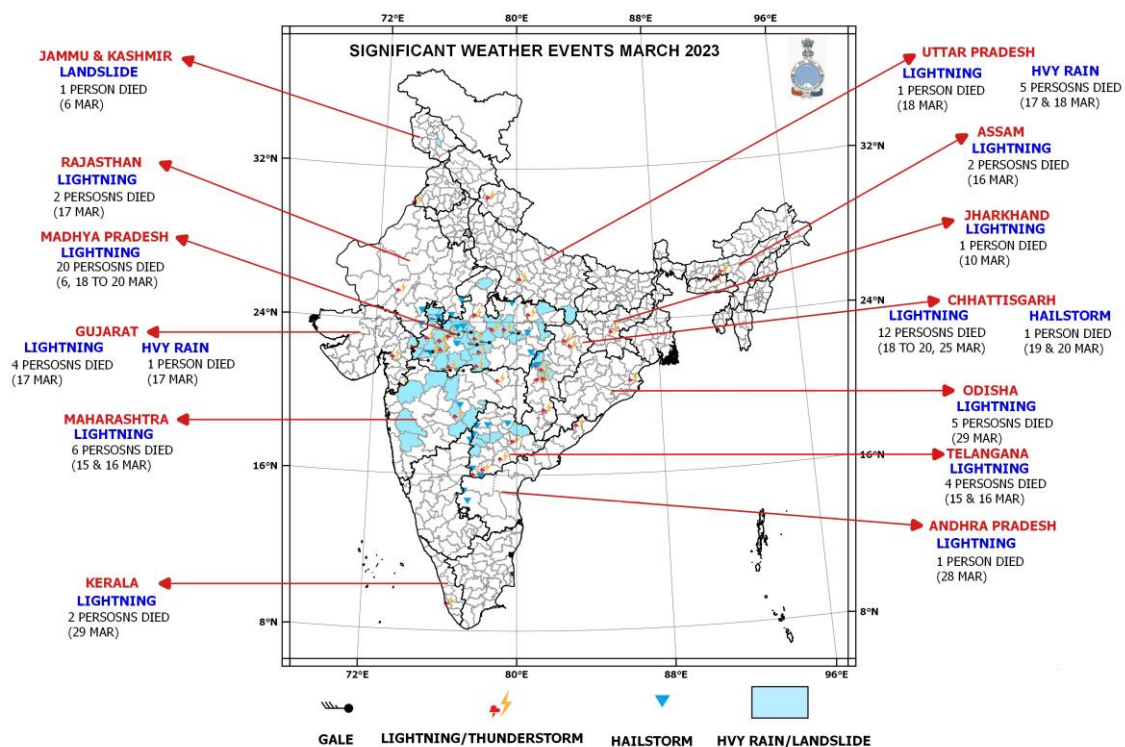


Fig. 8: Significant weather events during March 2023 (Based on real-time media report)