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INDIA METEOROLOGICAL DEPARTMENT
Climate Research and Services (CRS)

Climate Summary for the month of November 2023

1. Monthly Rainfall Scenario (01 to 30 November, 2023)

Rainfall over the country as a whole for the month of November 2023 shows that it has recorded 34.6 mm rainfall, which is 16% more than its Long Period Average (LPA) 29.7 mm.

Daily variation of the rainfall over the country as a whole during the month of November 2023 with normal (1971-2020) and All India rainfall percentage departure from normal for November during 1901-2023 is shown in the figure 1(a) and 1(b) respectively.

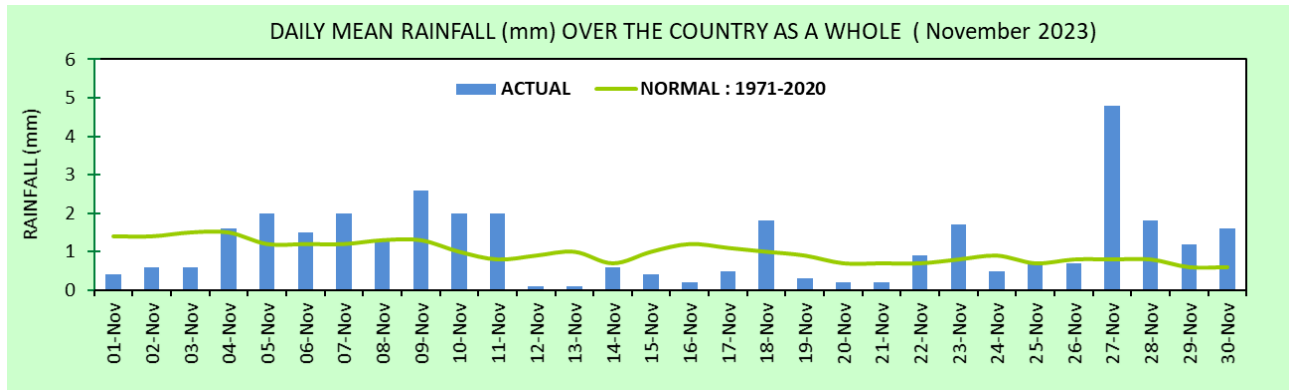


Fig.1 (a): Daily variation of rainfall over the country as a whole during November 2023.

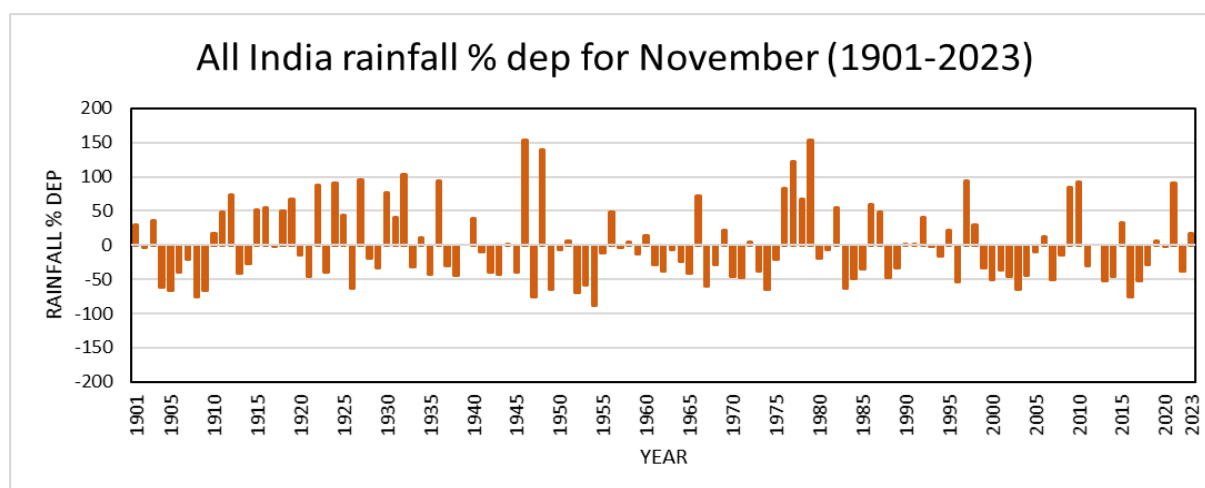


Fig 1(b). All India monthly rainfall percentage departure from normal (1971-2020) for November from 1901-2023.

The time series of actual rainfall since 1901 for All India is given in Fig. 2.

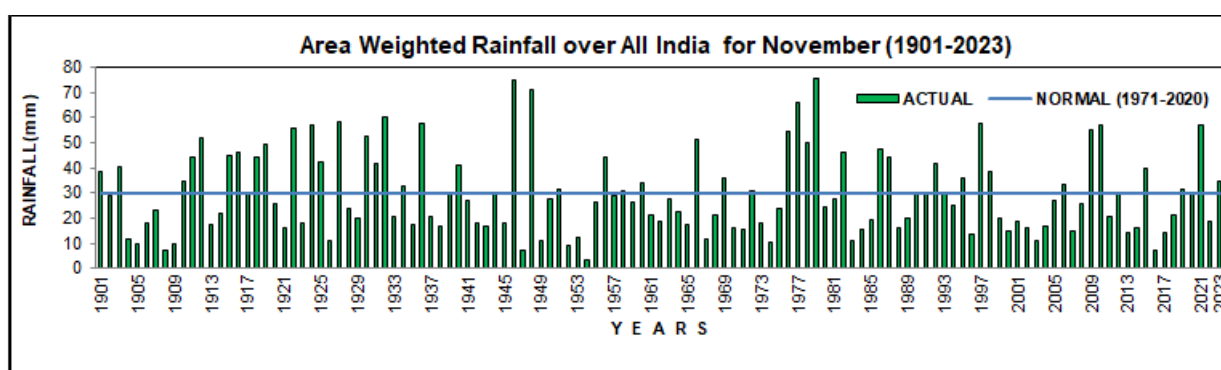


Fig.2: Time series of area weighted rainfall over All India for November (1901 - 2023).

The monthly rainfall for November 2023 is given in the table below:

Regions	Actual Rainfall (mm)	Normal Rainfall (mm)	% Departure from LPA
Country as a whole	34.6	29.7	16.0
Northwest India	14.2	12.1	17.0
Central India	21.6	14.0	54.0
South Peninsula	105.3	89.8	17.0
East & northeast India	14.2	22.6	-37.0

During this month, 7 sub division received large excess, 13 received excess, 4 normal, 6 received deficient, 6 received large deficient rainfall. The rainfall distribution expressed in percentage departure is given in Fig. 3.

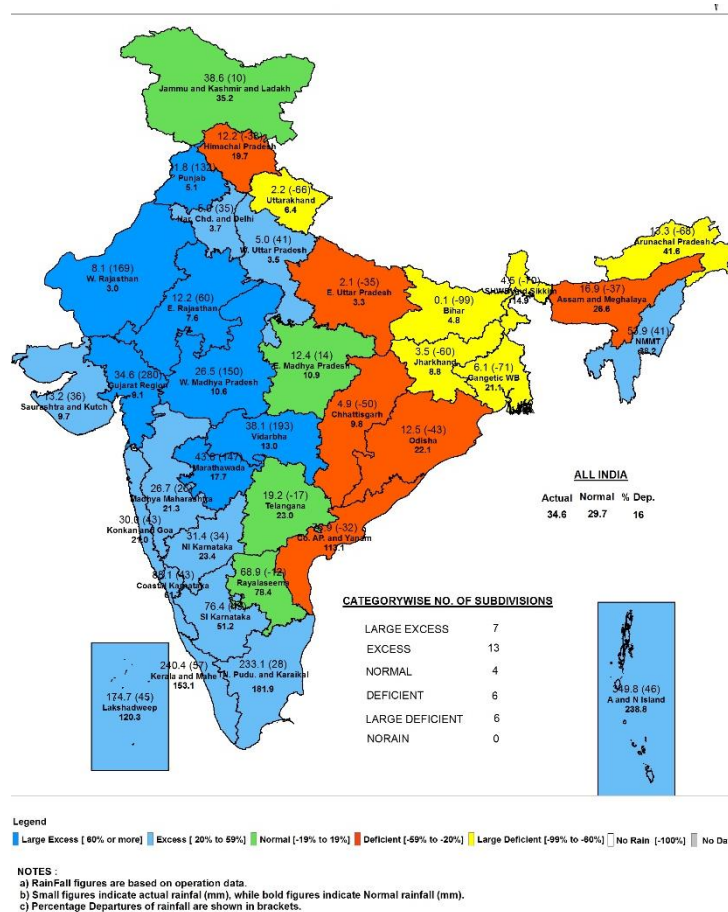


Fig 3: Subdivision-wise rainfall distribution for November 2023.

The observed spatial rainfall, normal rainfall for the period 1971 to 2020 and its departures from normal for the month of November 2023 are given in Fig. 4.

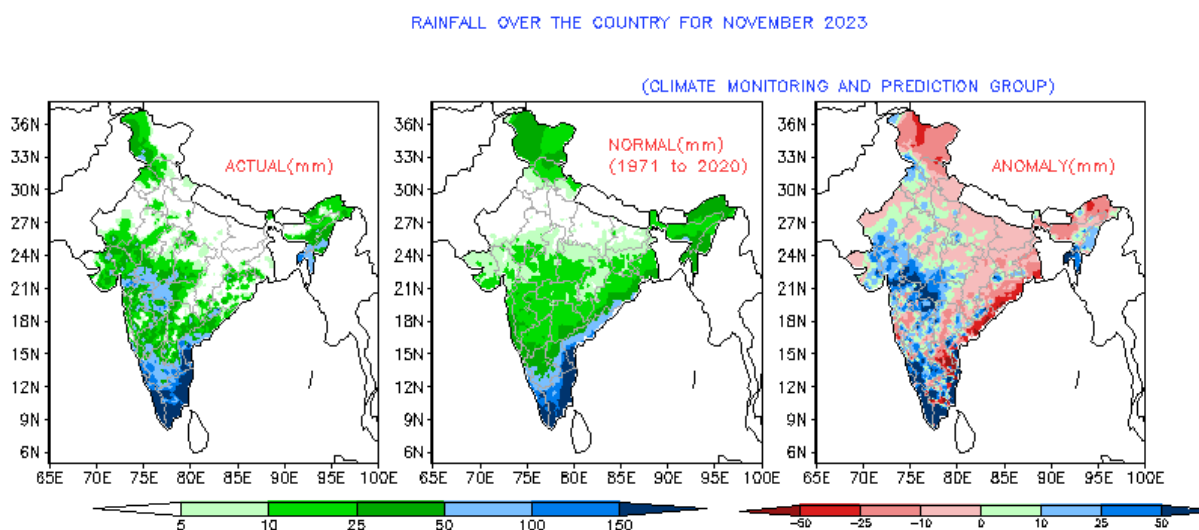
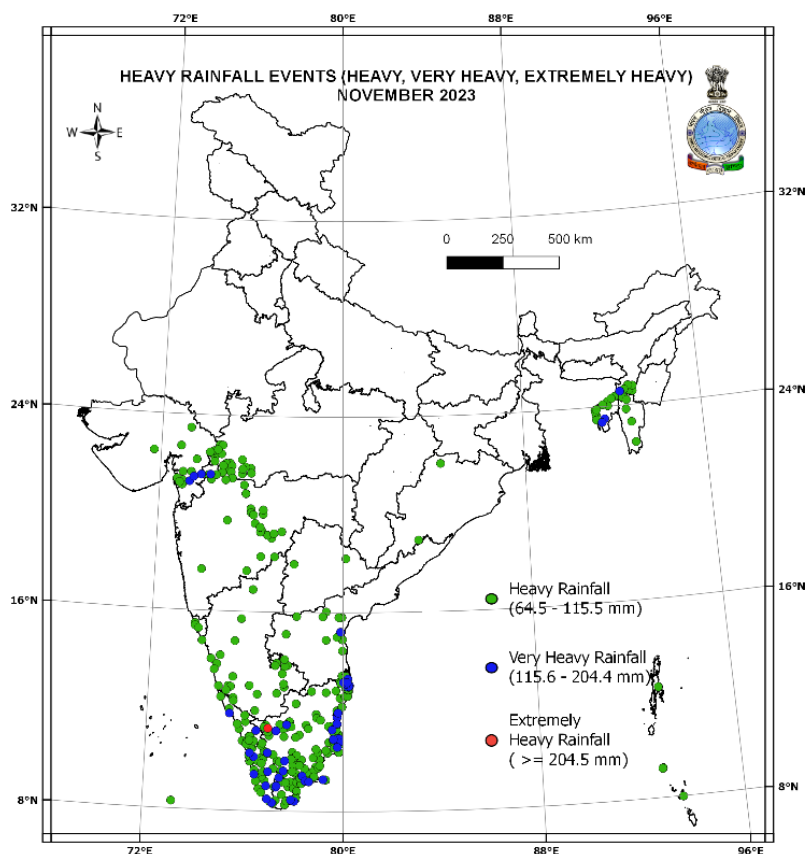


Fig 4: Observed spatial Rainfall pattern for the month of November 2023 over India and their departure from normal (1971 to 2020 period).

2. Frequency of Heavy Rainfall events

The November 2023 witnessed extremely heavy rainfall event (> 204.4 mm of rainfall) mainly over one station of Tamilnadu, very heavy rainfall events were observed mainly over Tamilnadu, Puducherry & Karaikal and Kerala & Mahe.

Out of total 323 stations, 1 station(Mettupalayam) from Tamilnadu, Puducherry & Karaikal reported extremely heavy rainfall (> 204.4 mm) of 373 mm, 47 station reported very heavy rainfall (115.6 to 204.4 mm) and 275 stations reported heavy rainfall (64.5 to 115.5 mm of rainfall) during this month. The location of occurrences of heavy and very heavy rainfall events is shown in the Figure 5.



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

Fig 5: The location of occurrences of heavy rainfall events in the month November 2023.

During November 2023, some stations received record 24 hours accumulated rainfall. The table below shows stations received 24-hour record rainfall and its previous record.

STATION	24 HOUR RECORD RAINFALL IN November 2023(mm)#	DATE	PREVIOUS RAINFALL RECORD(mm)	DATE	STATE
KHARGONE	84	27	57.6	1-11-1981	Madhya Pradesh
MANDVI	116	27	103.6	2-11-1981	Gujarat
GANDHINAGAR	22	27	13	18-11-2010	Gujarat
NANDED	64.2	27	47.5	19-11-1987	Maharashtra
UDGIR	45	9	35.6	22-11-2010	Maharashtra
WASHIM	55.8	27	46	14-11-2010	Maharashtra
VALPARAI	83.8	5	81.4	8-11-2009	Tamil Nadu
HAMIRPUR	57.0	30	21	19-11-2010	Uttar Pradesh

based on real time available data

Chief Synoptic weather features observed during November 2023.

During November 2023, three Low pressure system(LPS) formed over Indian region (1 over Arabian Sea and 2 over Bay of Bengal).. A low Pressure System formed over SE Arabian Sea moved towards SW Arabian Sea during 8-12 Nov. Out of two system formed over Bay of Bengal one system intensified in to Cyclonic Storm “Midhili” over Bay of Bengal during 14-19 Nov 2023, and crossed Bangladesh coast near Khepupara during 1430-1530 hours IST of 17th.November 2023. Another Low Pressure Area formed over south Andaman Sea & adjoining Malacca Strait on 27th and became Depression over SE Bay of Bengal on 1 December.

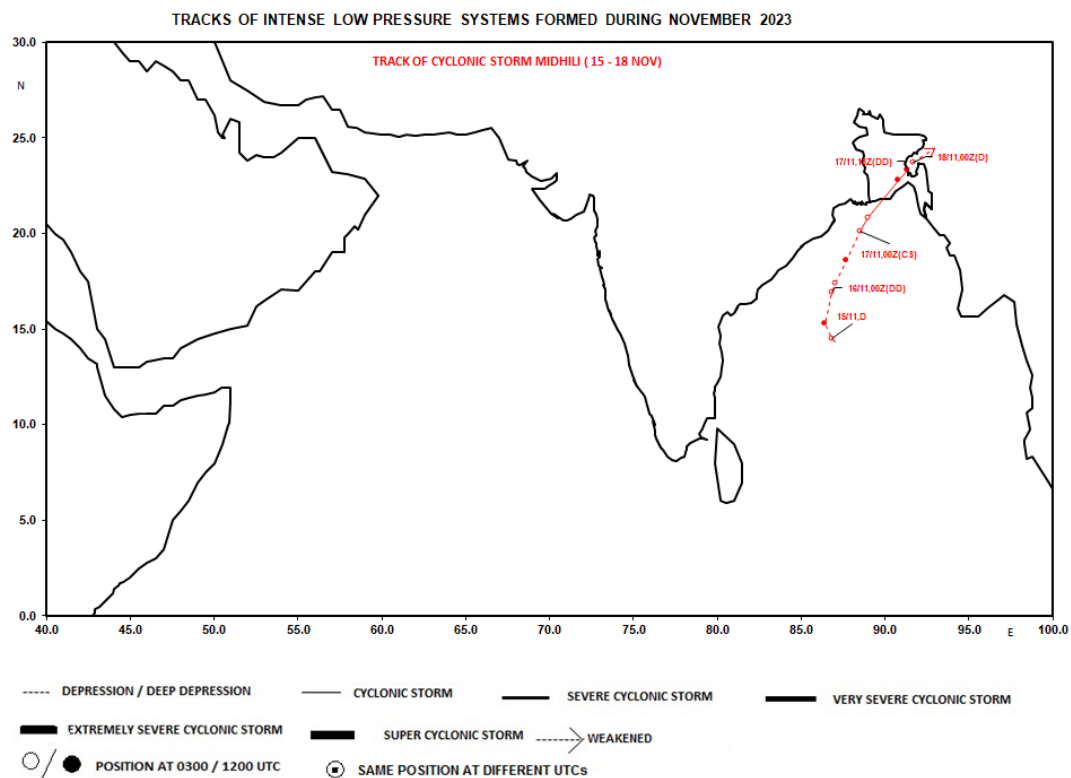


Fig 6: Track of intense low-pressure system formed during November 2023

In addition to 5 Western Disturbance (WD) are formed during November 2023 (6-9 Nov, 9-13, 18-22, 20-24 Oct, 29-30 Nov 2023) moved across north India but three moved north of 30° N. Two WDs during 9-13, 25-28 November caused severe weather. Strong interaction of active Western Disturbance (WD) with trough in easterly along with high moisture feed from Arabian Sea, caused fairly widespread to widespread rainfall with isolated heavy to heavy rainfall along with thunderstorm & hailstorm activity over Gujarat, south Rajasthan, West Madhya Pradesh and north Maharashtra during 25-27 Nov. With their further east-ward movement during later dates, it also caused cloudy conditions and isolated light to moderate rain and thunderstorms accompanied with lightning over other parts of northwest India and Uttar Pradesh including Delhi on 28 and 29 Nov.

3. Characteristics of Temperatures for the month of November 2023

The average maximum, average minimum and mean temperature for the country as a whole during November 2023 were 29.64°C, 18.89°C and 24.27°C respectively, against the normal of 29.03°C, 17.40°C and 23.22°C based on period of 1981-2010. Thus, the average maximum temperature, average minimum temperature and mean

temperature were above normal by 0.61°C , 1.48°C and 1.05°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 2023 - normal temperature based on data of 1981-2010). The daily variation of maximum and minimum temperature anomaly over the country as a whole for November 2023 is shown in the figure 7(a) and (b).

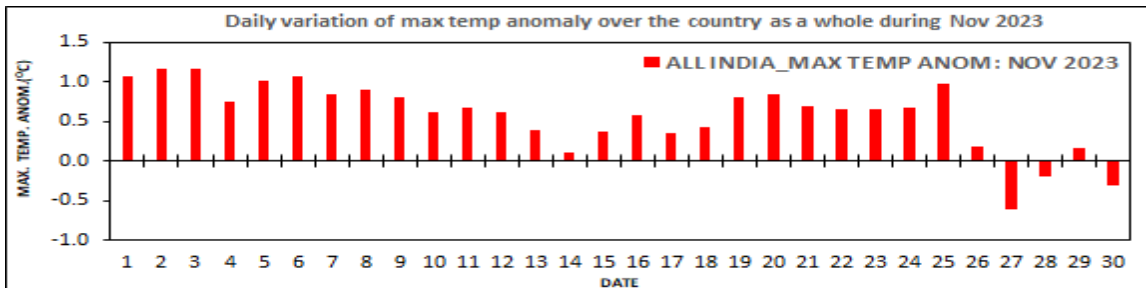


Fig 7 (a): Daily variation of maximum temperature anomaly over the country as a whole for November 2023.

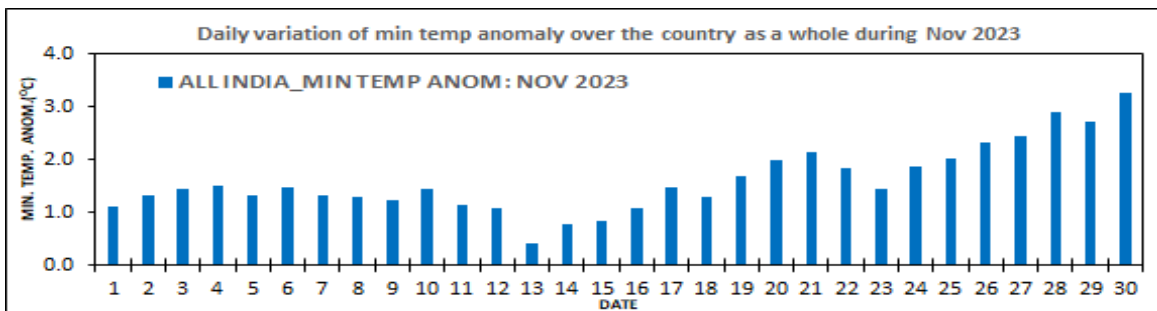


Fig 7(b): Daily variation of minimum temperature anomaly over the country as a whole for November 2023.

Figure 8 shows time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of November 1901-2023. Over the country during November, the average maximum temperature was 3rd highest (29.64°C with an anomaly of 0.61°C) after the years 2016(29.96°C), 2011(29.76°C) since 1901. The average minimum temperature was also 3rd highest (18.89°C with an anomaly of 1.48°C) after the years 1979(19.05°C), 2019(18.90°C) since 1901. The mean temperature was highest at 24.27°C since 1901 against the earlier record of 24.09°C in 2015.

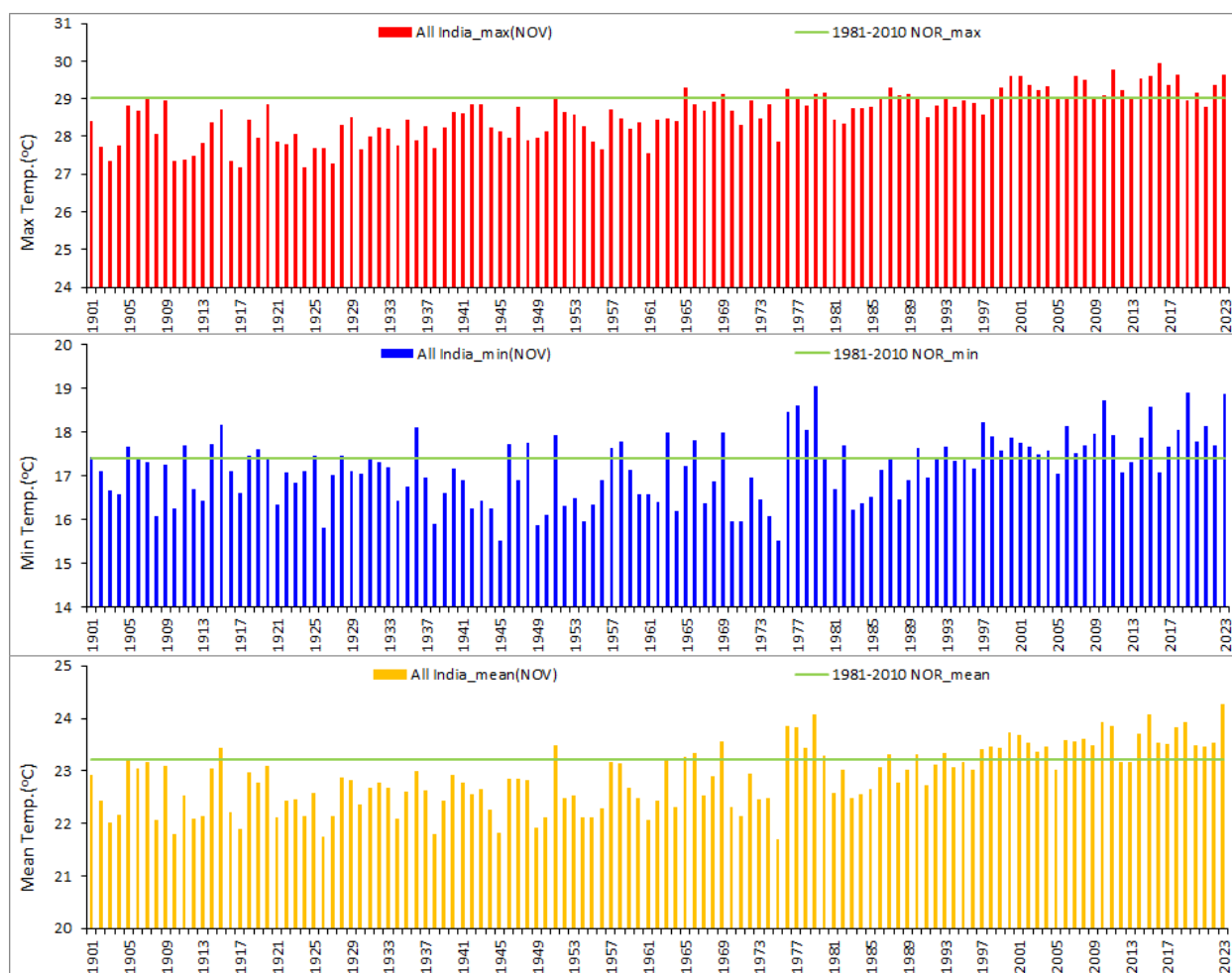


Fig 8: Time series of monthly average maximum, average minimum and mean temperature over the country as a whole for the month of November 1901-2023.

Figure 9 shows time series of monthly average maximum, average minimum and mean temperature over the South Peninsular India for the month of November 1901-2023. Over South Peninsular India during November, the average maximum temperature was 5th highest (31.18°C with an anomaly of 0.81°C) after the years 2016(31.47°C), 2011(31.33°C), 2019(31.32°C), 2018(31.27°C) since 1901. The average minimum temperature was highest at 23.74°C since 1901 against the earlier record of 23.62°C in 2021. The mean temperature was highest at 27.46°C since 1901 against the earlier record of 27.40°C in 2019.

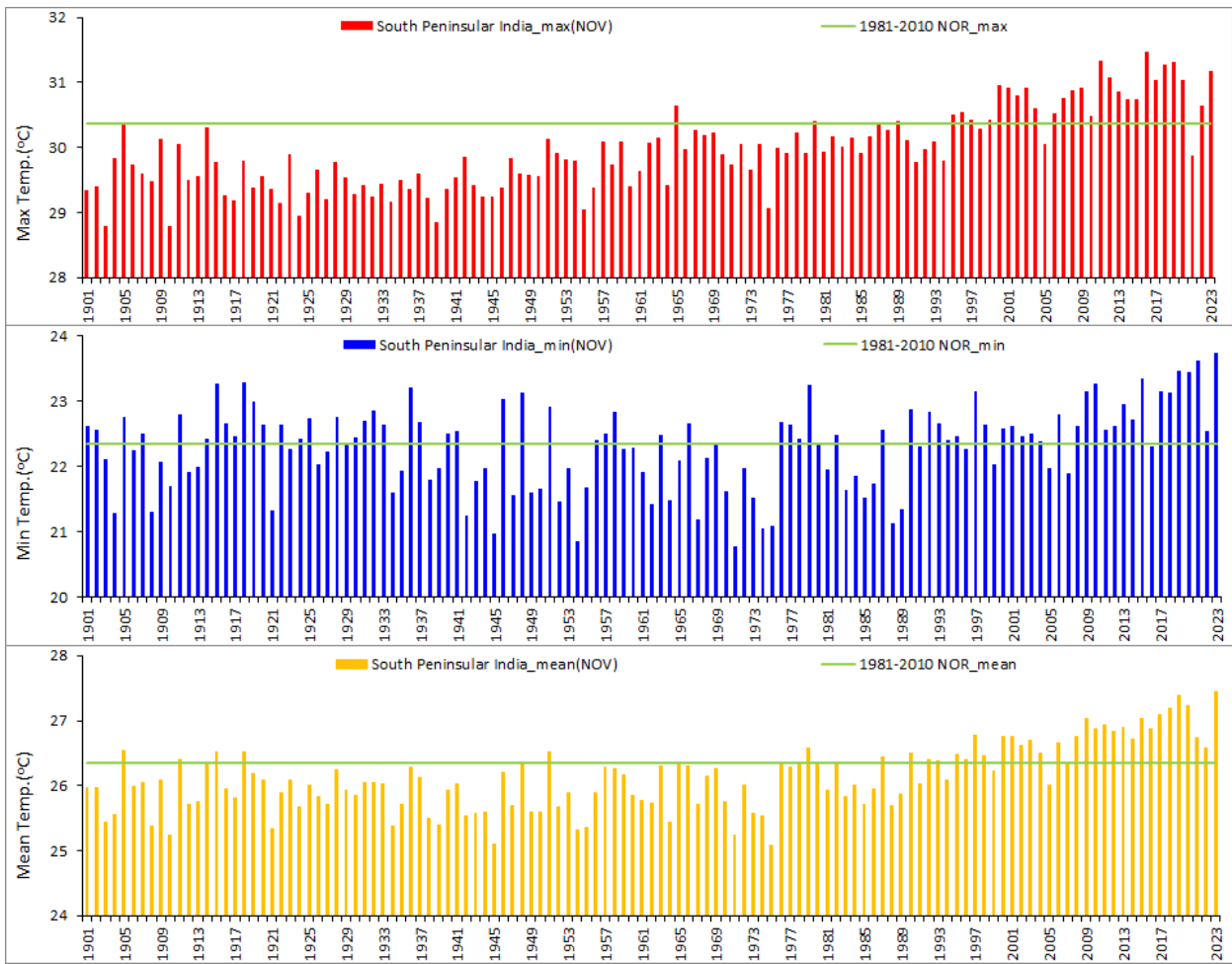


Fig 9: Time series of monthly average maximum, average minimum and mean temperature over South Peninsular India for the month of November 1901-2023.

Figure10 shows time series of monthly average maximum, average minimum and mean temperature over the East & Northeast India for the month of November 1901-2023. Over East & Northeast India during November, the average maximum temperature was highest at 29.48°C since 1901 against the earlier record of 29.06°C in 2022. The average minimum temperature was 6th highest (16.69°C with an anomaly of 1.11°C) since 1901. The mean temperature was 2nd highest (23.09°C with an anomaly of 1.40°C) after the year 1979(23.36°C) since 1901.

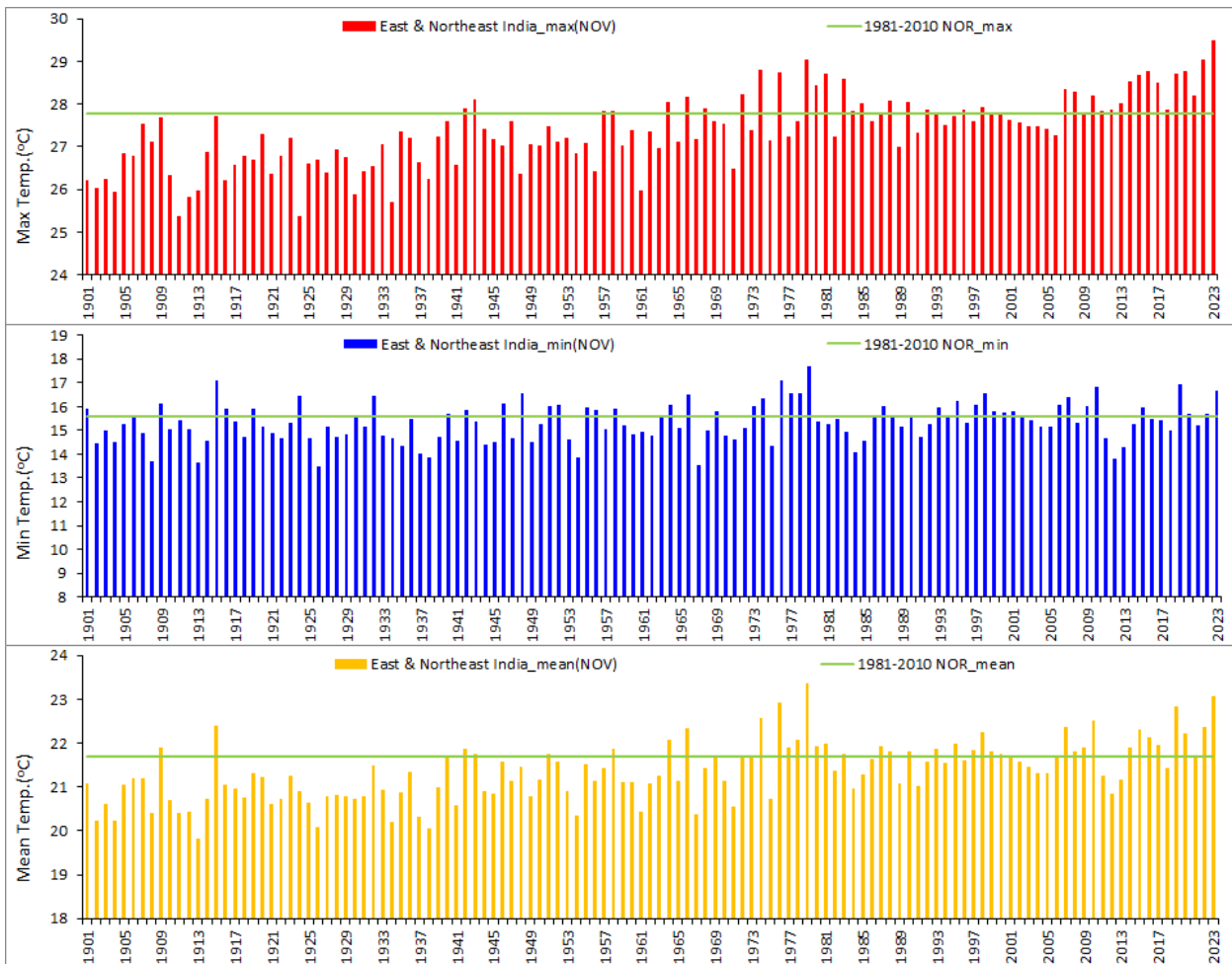


Fig 10: Time series of monthly average maximum, average minimum and mean temperature over East & Northeast India for the month of November 1901-2023.

Figure 11 shows time series of monthly average minimum temperature over the Northwest India for the month of November 1901-2023. Over Northwest India during November, the average minimum temperature was 3rd highest (12.41°C with an anomaly of 1.66°C) after the years 2019(12.68 °C), 2011(12.53°C) since 1901.

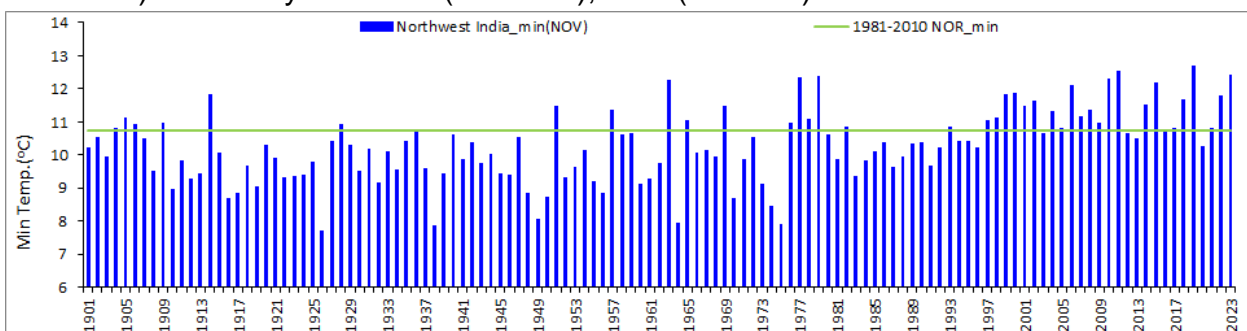


Fig 11: Time series of monthly average minimum temperature over Northwest India for the month of November 1901-2023.

The Temperatures during November 2023 for all India and homogeneous regions with its top ranks since 1901 are given below;

NOV 2023		Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)
ALL INDIA	ACTUAL	29.64	18.89	24.27
	NORMAL	29.03	17.40	23.22
	ANOMALY	0.61	1.48	1.05
	Top Rank since 1901	3	3	1
NORTHWEST INDIA	ACTUAL	25.29	12.41	18.85
	NORMAL	25.74	10.75	18.24
	ANOMALY	-0.45	1.66	0.61
	Top Rank since 1901	66	3	11
EAST & NORTHEAST INDIA	ACTUAL	29.48	16.69	23.09
	NORMAL	27.79	15.58	21.68
	ANOMALY	1.70	1.11	1.40
	Top Rank since 1901	1	6	2
CENTRAL INDIA	ACTUAL	31.68	19.27	25.48
	NORMAL	31.14	17.60	24.37
	ANOMALY	0.55	1.67	1.11
	Top Rank since 1901	12	8	6
SOUTH PENNINSULAR INDIA	ACTUAL	31.18	23.74	27.46
	NORMAL	30.37	22.34	26.36
	ANOMALY	0.81	1.398	1.11
	Top Rank since 1901	5	1	1

Note: Values are rounded off to nearest two decimal

The five highest temperature records with corresponding ranks since 1901 along with year of occurrence for All India, South Peninsular India (TMax,TMin,TMean), East & Northeast India (TMax, TMean) and Northwest India (TMin) are given in the table below;

All India (November 2023)					South Peninsular India (November 2023)					East & Northeast India (November 2023)				
Year	TMax	Normal	Anomaly	Rank	Year	TMax	Normal	Anomaly	Rank	Year	TMax	Normal	Anomaly	Rank
2016	29.96	29.03	0.93	1	2016	31.47	30.37	1.10	1	2023	29.48	27.79	1.70	1
2011	29.76		0.73	2	2011	31.33		0.96	2	2022	29.06		1.27	2
2023	29.64		0.61	3	2019	31.32		0.95	3	1979	29.04		1.25	3
2018	29.63		0.60	4	2018	31.27		0.90	4	1974	28.81		1.02	4
2007	29.61		0.58	5	2023	31.18		0.81	5	2020	28.77		0.98	5

All India (November 2023)					South Peninsular India (November 2023)					East & Northeast India (November 2023)				
Year	TMin	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank
1979	19.05	17.40	1.64	1	2023	23.74	22.34	1.40	1	1979	23.36	21.68	1.67	1
2019	18.90		1.50	2	2021	23.62		1.28	2	2023	23.09		1.40	2
2023	18.89		1.48	3	2019	23.47		1.13	3	1976	22.93		1.25	3
2010	18.74		1.34	4	2020	23.45		1.11	4	2019	22.83		1.14	4
1977	18.60		1.20	5	2015	23.35		1.01	5	1974	22.57		0.89	5

All India (November 2023)					South Peninsular India (November 2023)					Northwest India (November 2023)				
Year	TMean	Normal	Anomaly	Rank	Year	TMean	Normal	Anomaly	Rank	Year	TMin	Normal	Anomaly	Rank
2023	24.27	23.22	1.05	1	2023	27.46	26.36	1.11	1	2019	12.68	10.75	1.94	1
2015	24.09		0.87	2	2019	27.40		1.04	2	2011	12.53		1.79	2
1979	24.08		0.87	3	2020	27.24		0.89	3	2023	12.41		1.66	3
2019	23.93		0.72	4	2018	27.20		0.85	4	1979	12.38		1.64	4
2010	23.92		0.70	5	2017	27.10		0.74	5	1977	12.35		1.60	5

The observed spatial temperature pattern of monthly average maximum, average minimum and mean temperature over India and their departures from normal (1981 to 2010 period) for the month of November 2023 is given in Figure 12.

TEMPERATURE & ITS ANOMOLY FOR THE MONTH NOVEMBER 2023

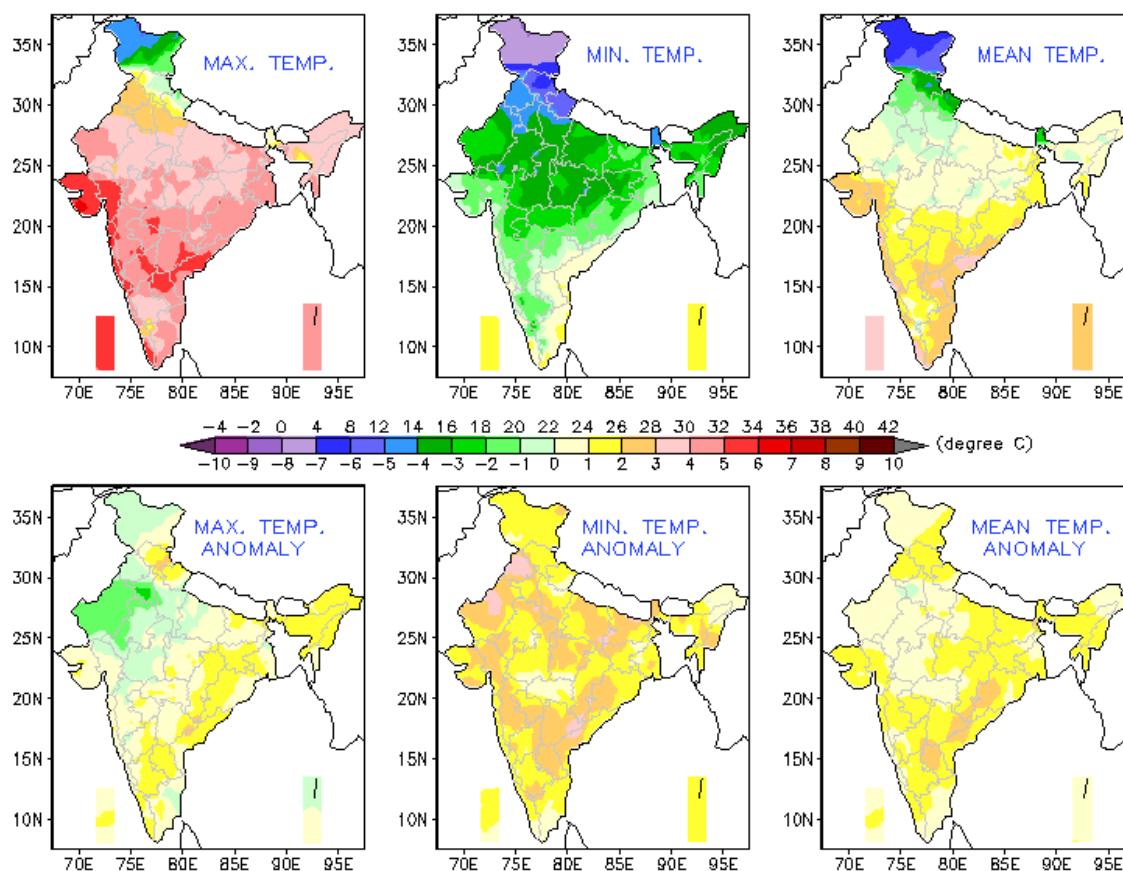


Fig 12: Observed spatial temperature pattern of monthly average maximum, average minimum, and mean temperature over India (top three from left to right) and their departure from normal (1981 to 2010 period) for November 2023 (lower three from left to right).

4. Significant Weather Events for November 2023:

During November, total 39 persons reportedly claimed dead, 44 persons injured & 79 livestock perished.. Fig. 13 shows significant weather events during November 2023. (Based on real time media reports and other state government agencies.)

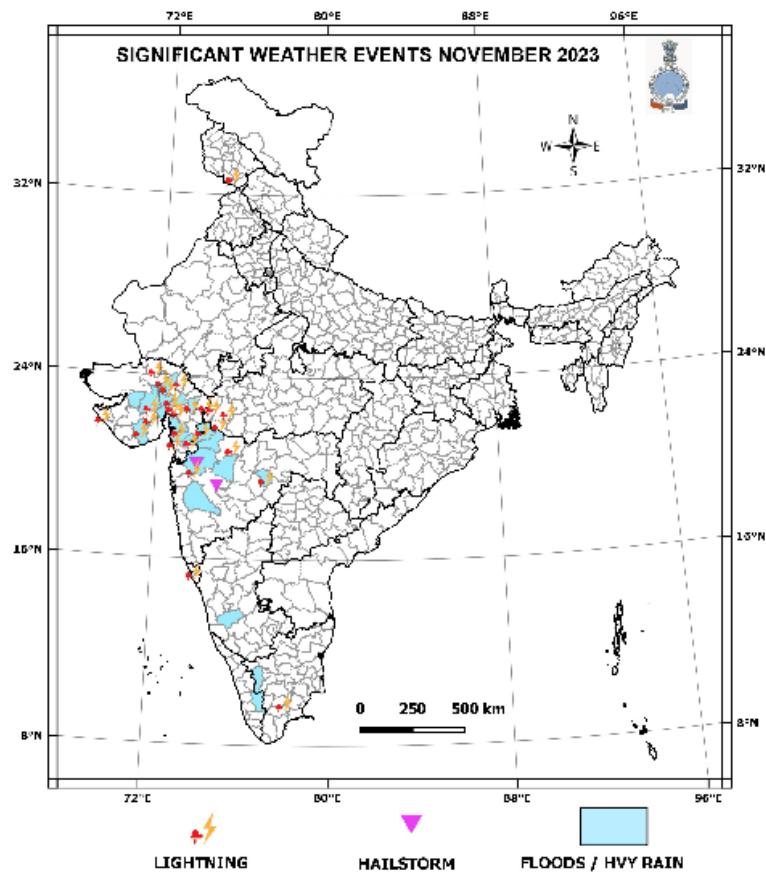


Fig. 13: Significant weather events during November 2023 (Based on real-time media report) which affected population.