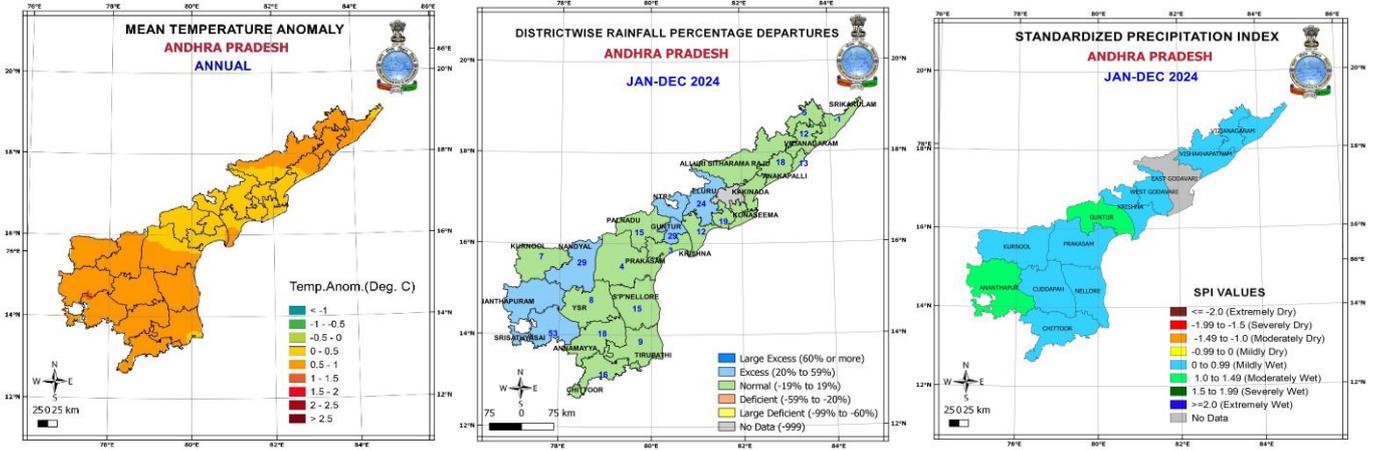




भारत सरकार
Government of India
पृथ्वी विज्ञान मंत्रालय(एम. ओ. ई. एस.)
Ministry of Earth Sciences (MoES)
भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT
जलवायु अनुसंधान एवं सेवाएँ
CLIMATE RESEARCH AND SERVICES



आंध्र प्रदेश राज्य के लिए जलवायु पर वक्तव्य: २०२४

STATEMENT ON CLIMATE FOR THE STATE OF ANDHRA PRADESH: 2024

द्वारा जारी/ ISSUED BY

जलवायु निगरानी और प्रागुक्ति समूह / Climate Monitoring and Prediction Group
जलवायु अनुसंधान एवं सेवाएँ का कार्यालय/ Office of Climate Research and Services

भारत मौसम विज्ञान विभाग / India Meteorological Department

पुणे 411005 / Pune 411005

आंध्र प्रदेश राज्य के लिए जलवायु पर वक्तव्य: २०२४
Statement on Climate for the state of Andhra Pradesh: 2024

जलवायु अनुसंधान एवं सेवाएँ का कार्यालय
O/o Climate Research and Services,
India Meteorological Department,
Pune 411 005

Preamble:

It gives me immense pleasure to share this scientific document titled, "Statement on Climate for the state of Andhra Pradesh for 2024" jointly prepared by office of Climate Research and Services, India Meteorological Department, Pune (Ministry of Earth sciences) and the Government of Andhra Pradesh. The statement of climate is attempting to capture the regional climate variability of the state especially with reference to weather parameters like; temperature and rainfall which has huge impact on various sectors like Agriculture, Health, Power, Water Management and many other critical domains. The information on severe weather analysis is also presented in this along with statistics which could be, one of the important inputs for state for its Planning Purpose, Disaster managements issues and over all the economic sustainability and growth. With the continuous projections of climate scientists globally, indicating the possibility of increase in the severe weather events along with its severity, both at global and regional level, this Annual Update will be very useful to all concerned. The data used in this analysis is from 1901 to 2024 (124 years). I am sure this yearly update with climatological perspectives, will create more awareness among all the stake holders, users in the state about the climate of the state and would enable to move parallely with relevant global and regional scientific directives or advisories in the coming time.

This statement on climate of 2024 also includes the inputs like loss and damage data due to severe weather and other weather-related factors from the Government of Andhra Pradesh. I wish that such joint ventures and integrated approach will yield more benefits to the society, state and in turn to our Nation.

Looking forward for your feedback and will work together.

*K. C. Sai Krishnan,
Head, Climate Research and Services,
India Meteorological Department,
Pune.*

July 2025

HIGHLIGHTS

The Andhra Pradesh State averaged annual mean land surface air temperature (28.52°C) during 2024 was +0.62°C warmer than its Long Period Average (LPA) for the period 1991-2020 thus making it the warmest year on record for the state since 1901.

In 2024, the above-normal annual mean temperature was mainly driven by higher-than-average minimum temperatures during the winter (+1.6°C anomaly, 2nd warmest since 1901) and post-monsoon (+1.6°C anomaly, warmest since 1901) seasons. The minimum temperature anomaly (+0.95°C) was notably higher than the maximum temperature anomaly (+0.29°C), making it the warmest minimum temperature since 1901, while the maximum temperature was the 9th warmest on record.

Out of 26 districts of the state, 6 received excess rainfall (+20% to +59% of its 1971-2020 period LPA) and 19 received normal rainfall (-19% to +19% of its LPA). Data of one district remains unavailable.

Objective

The objective of this brief report is to provide the analysis of state's temperature, rainfall and extreme weather events that occurred during 2024. This report will be useful for various stakeholders and general public who are interested on the latest weather and climate conditions and its impact in 2024.

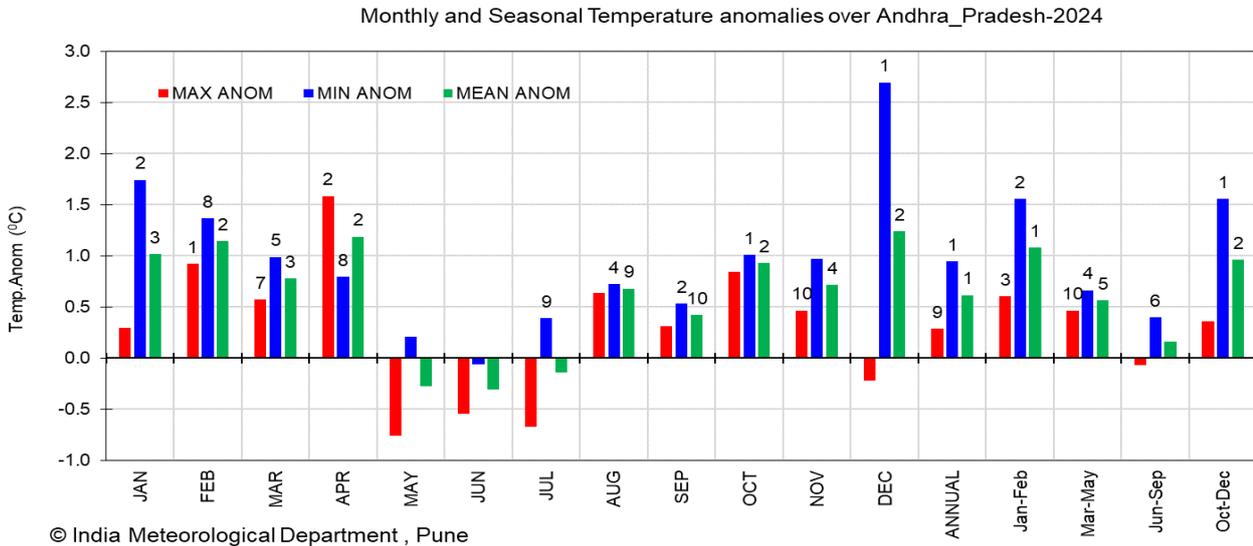
Introduction

India Meteorological Department (IMD) is the official agency responsible for providing operational weather and climate services required for the country in various sectors. IMD provides climate services through its office of the Climate Research and Services (CRS) situated in Pune. As a part of its climate monitoring activities, the CRS office, in coordination with IMD's state Meteorological Centers and state governments has decided to issue the statement of annual climate every year since 2021 for each individual state in line with the annual statement of climate issued for the country. This statement provides important information about the monthly, seasonal and annual state averaged temperature, rainfall and Standardized Precipitation Index (SPI) for the year 2024, along with long term trends for some parameters. Additionally, it includes state-specific information related to various extreme weather and climate events experienced during 2024.

Temperature

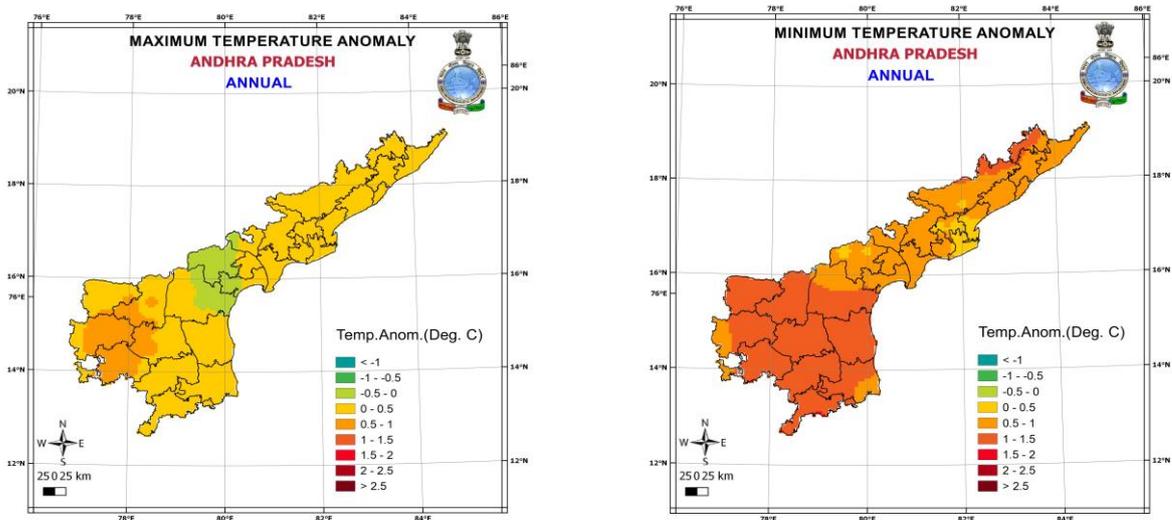
The monthly, seasonal and annual maximum, minimum and mean temperature anomalies averaged over the state of Andhra Pradesh for the year 2024 is given in the **Fig.1**. The anomalies were computed based on the LPA for the period 1991-2020. Top 10 warmest/coolest months/seasons are marked on the graph. The higher minimum temperatures observed during both the winter (+1.6°C anomaly, the second warmest since 1901) and post-monsoon (+1.6°C anomaly, the warmest since 1901) seasons were the primary contributors to the overall warming trend in 2024. The state's annual average maximum temperature was +0.29°C above the long-term mean, ranking as the ninth warmest

since 1901, while the annual minimum temperature was +0.95°C higher, making it the warmest on record. Consequently, the state's mean temperature for 2024 was 0.62°C above average, marking the year as the warmest on record since 1901. The highest anomaly in maximum temperature, 1.6°C, was recorded in April (2nd warmest since 1901), while the highest anomaly in minimum temperature, 2.7°C, occurred in December (warmest since 1901).



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 Fig. 1: Monthly and Seasonal Maximum, Minimum and Mean Temperature anomalies averaged over Andhra Pradesh during 2024. The anomalies were computed from the LPA base period of 1991-2020. The numbers above/below the bar indicate top 10 warmest/coolest ranking since 1901

The spatial pattern of annual maximum, minimum and mean temperature anomalies over Andhra Pradesh during 2024 is given in Fig 2. The temperature anomalies were within ±1°C over most parts of the state. However, southern parts of Andhra Pradesh were warmer by +1 to +1.5°C in terms of minimum temperature.



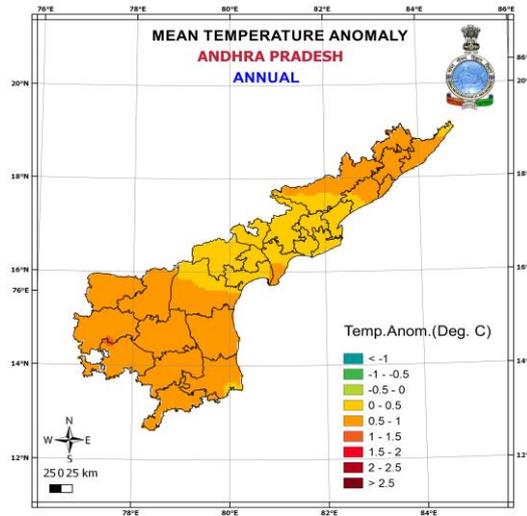


Fig. 2: Spatial pattern of Annual Maximum, Minimum, and Mean Temperature anomalies over Andhra Pradesh during 2024. The anomalies were computed from LPA for the base period of 1991-2020

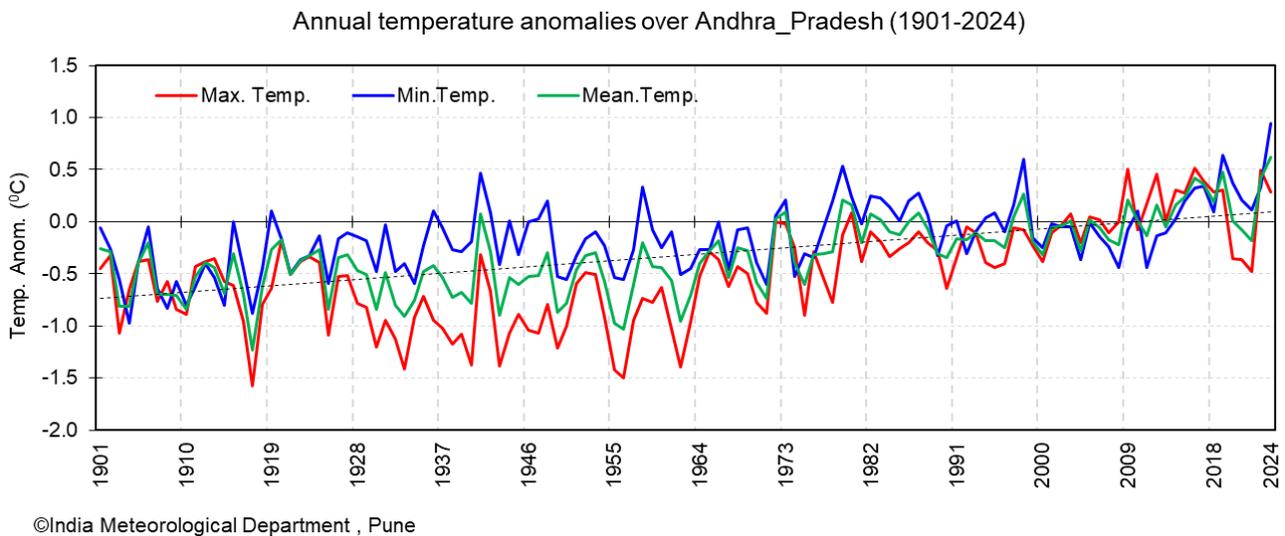


Fig. 3: Annual maximum, minimum and mean land surface air temperature anomalies averaged over the State of Andhra Pradesh for the period 1901-2024. The anomalies were computed with respect to the base period of 1991-2020. [The dotted blackline indicates the linear trend in the annual mean temperature time series]

The time series of variation of annual maximum, minimum and mean land surface air temperature anomalies averaged over the state for the period 1901-2024 is given in **Fig 3**. A significant increasing trend of $+0.68^{\circ}\text{C}/100$ years is observed in the state-averaged annual mean temperature for the period 1901-2024. This trend is more pronounced in terms of maximum temperature ($+0.83^{\circ}\text{C}/100$ years) compared to minimum temperature ($+0.52^{\circ}\text{C}/100$ years). The five warmest years on record for Andhra Pradesh, in order, are 2024(anomaly $+0.616^{\circ}\text{C}$), 2019($+0.473^{\circ}\text{C}$), 2023($+0.416^{\circ}\text{C}$), 2016($+0.415^{\circ}\text{C}$) and 2017($+0.365^{\circ}\text{C}$).

Fig.4(a and b) shows daily variation of minimum and maximum temperature anomalies during the year, respectively. The anomalies were computed with respect to the base period of 1991-2020. The

state experienced unusually higher maximum and minimum temperatures from January to April, and again during October and November. December, with minimum temperature anomaly of 2.7 °C, was the warmest since 1901. In contrast, the maximum temperatures were lower between May and July.

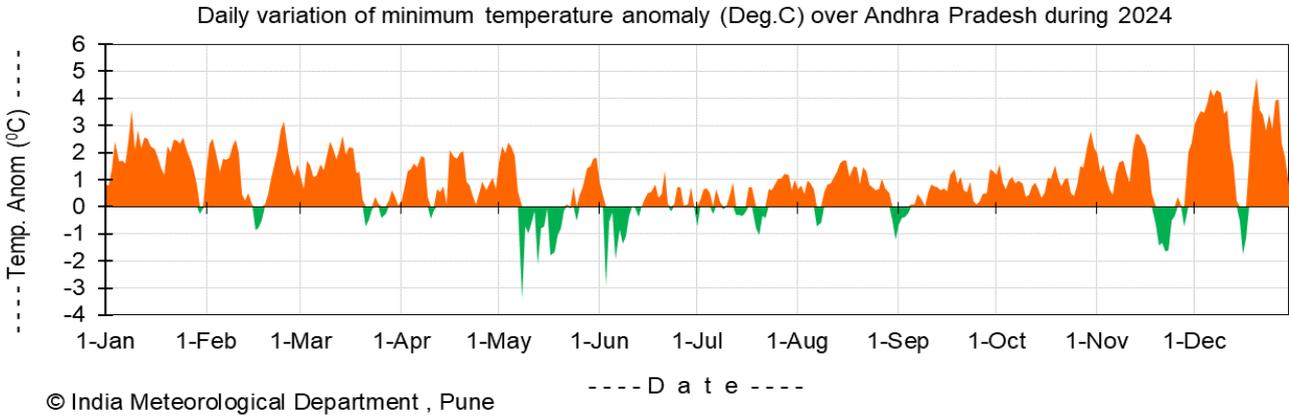


Fig. 4(a): Daily variation of minimum temperature anomaly (°C) over Andhra Pradesh during 2024

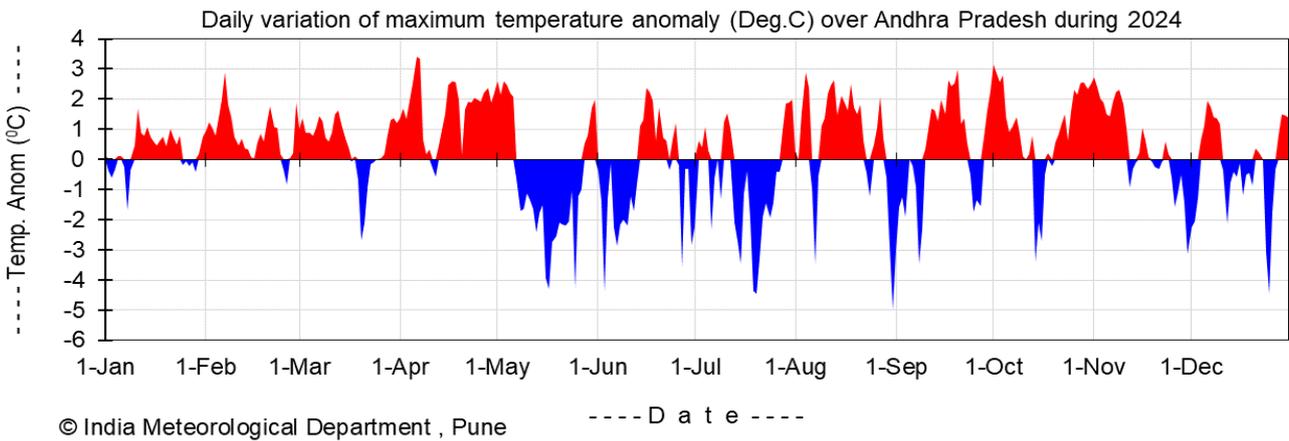


Fig. 4(b): Daily variation of maximum temperature anomaly (°C) over Andhra Pradesh during 2024

Rainfall

Based on 1971-2020 climatology, Andhra Pradesh state as a whole receives 1.83 % of its annual rainfall during the winter season (Jan-Feb), 9.8% during the pre-monsoon season (Mar-May), 57.0% during the southwest monsoon season (Jun-Sept) and 31.4 % during the post-monsoon season (Oct-Dec). Although the southwest monsoon season is the primary rainy season for the state, it receives more than 40% of its total rainfall during the pre-monsoon and post-monsoon seasons combined .**Fig.5** shows the annual percentage departure of rainfall over different districts of Andhra Pradesh during 2024. The anomalies were computed based on the 50-year LPA for the period 1971-2020. Out of 27 districts of the state, 6 received excess rainfall (+20% to +59% of its 1971-2020 period LPA) and 19 received normal rainfall (-19% to +19% of its LPA)). Data of one district remains unavailable.

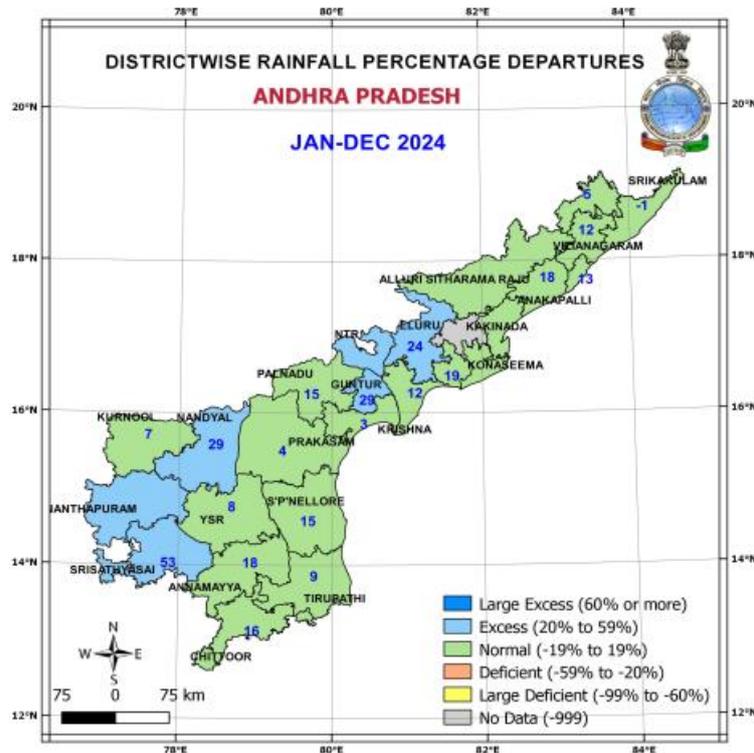


Fig. 5: District-wise annual rainfall percentage departures

The daily variation of rainfall (mm) during the year for the state is shown in **Fig. 6(a)**. During the monsoon season, the state experienced above or near-normal rainfall on most days, with the exception of a few consecutive days in September. In the post-monsoon months, the state received above-normal rainfall for several consecutive days during the second half of October. However, rainfall was predominantly below normal on many days until early December.

Daily variation of rainfall (mm) over Andhra Pradesh during 2024

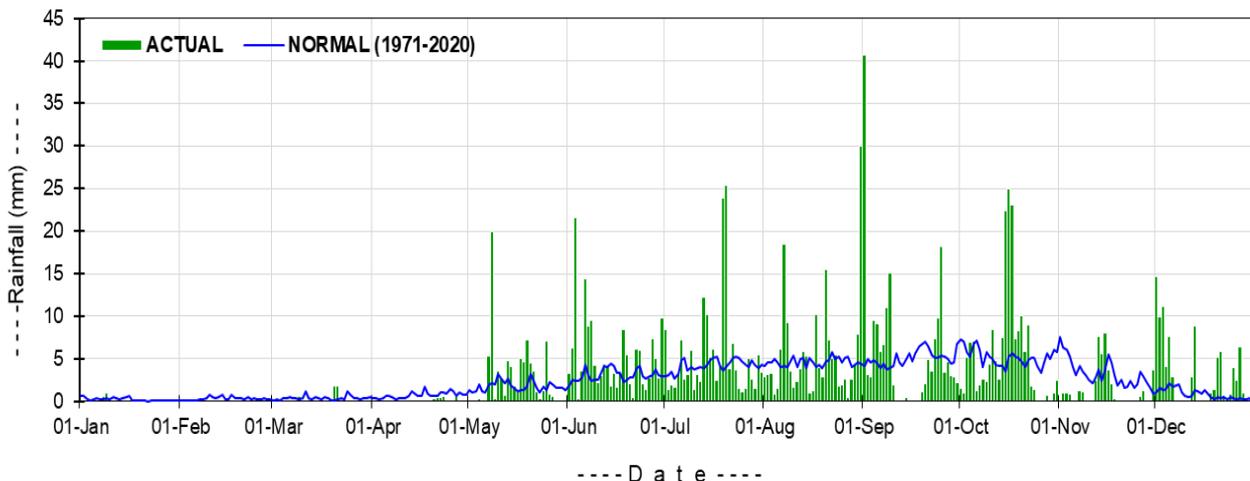


Fig. 6(a): Daily variation of rainfall (mm) averaged over Andhra Pradesh during the year

The time series of variation of % departure of seasonal and annual rainfall for the state for the period 1901-2024 is shown in **Fig. 6(b), 6(c)** and **6(d)** respectively. The departures are calculated with respect to the LPA base period of 1971-2020. During the southwest monsoon season, northeast monsoon season and the year 2024 as a whole, the state received 127%, 108 % and 116 % of its LPA rainfall respectively.

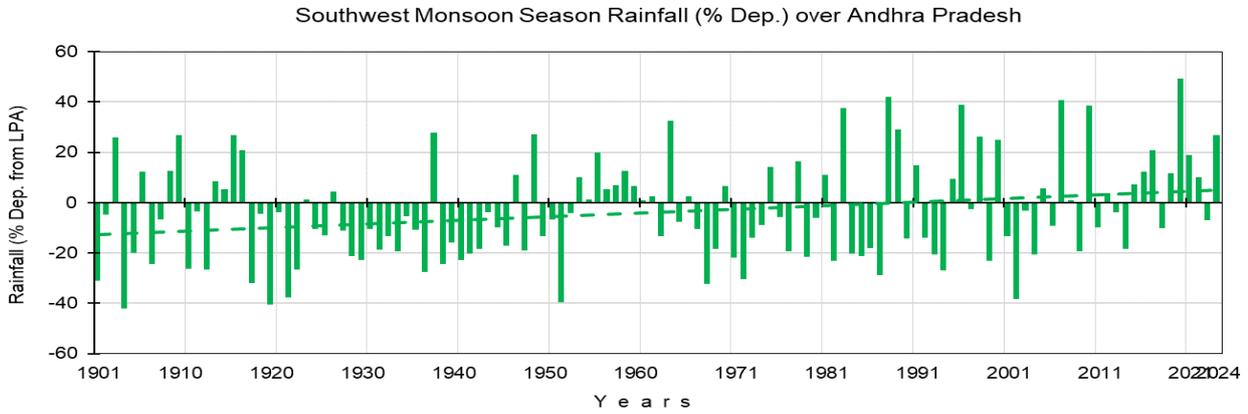


Fig. 6(b): Time series of % departure of southwest monsoon rainfall averaged over Andhra Pradesh (1901-2024)

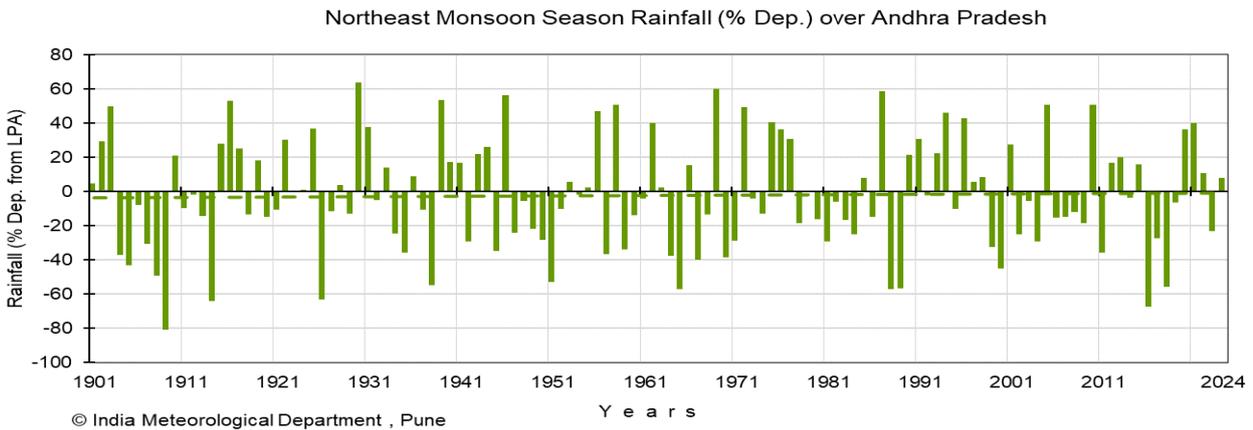


Fig. 6(c): Time series of % departure of northeast monsoon rainfall averaged over Andhra Pradesh (1901-2024)

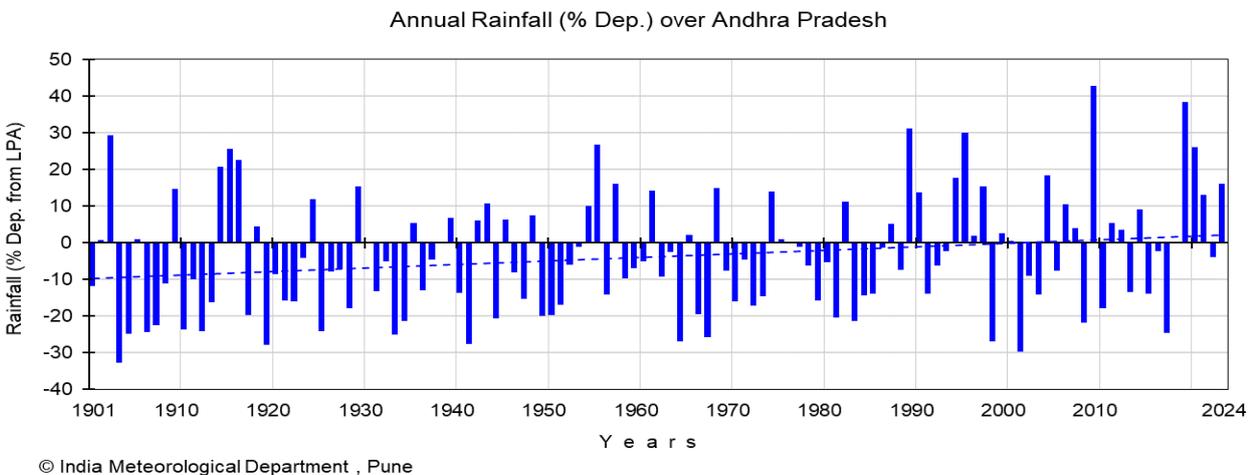


Fig. 6(d): Time series of % departure of annual rainfall averaged over Andhra Pradesh (1901-2024)

Table 1 shows the monthly, seasonal and annual rainfall statistics for the state for the year 2024. The state experienced excess rainfall during the crucial monsoon season and normal rainfall during the equally important pre-monsoon and post-monsoon seasons. In contrast, during the winter season which is typically characterized by minimum rainfall, it received large deficient rainfall. Due to these seasonal variations, the rainfall remained in the normal range at the end of the year.

TABLE 1

MONTH / SEASON	ACTUAL (mm)	NORMAL (mm)	% DEP.	CATEGORY
JANUARY	1.9	7.3	-73.8	LD
FEBRUARY	0.1	9.4	-98.7	LD
WINTER SEASON	2.0	16.7	-87.8	LD
MARCH	4.4	12.2	-64.0	LD
APRIL	3.1	21.9	-85.8	LD
MAY	81.3	55.3	46.9	E
PRE-MONSOON SEASON	88.8	89.4	-0.7	N
JUNE	154.1	94.1	63.8	LE
JULY	167.5	131.1	27.7	E
AUGUST	172.4	144.3	19.5	N
SEPTEMBER	169.0	152.1	11.1	N
MONSOON SEASON	663.0	521.6	27.1	E
OCTOBER	175.2	161.5	8.5	N
NOVEMBER	41.5	98.8	-58.0	D
DECEMBER	91.2	26.9	239.0	LE
POST-MONSOON SEASON	309.7	287.2	7.8	N
ANNUAL	1059.4	914.9	15.8	N

CATEGORY	LARGE EXCESS [LE]	+60 % OR MORE
	EXCESS [E]	+20 % TO +59 %
	NORMAL [N]	-19 % TO +19 %
	DEFICIENT [D]	-59 % TO -20%
	LARGE DEFICIENT [LD]	-99 % TO -60 %
NO RAIN [NR]	-100%	

ANDHRA PRADESH

The district-wise trend in annual rainfall for the period 1951-2022 is given in **Fig 7**. Overall, there is a noticeable increasing trend in rainfall across the state, with the southernmost districts of Ananthapur and Chittoor showing a significant upward trend. In contrast, a slight but non-significant decreasing trend in rainfall is observed only in the northern district of Vizianagaram.

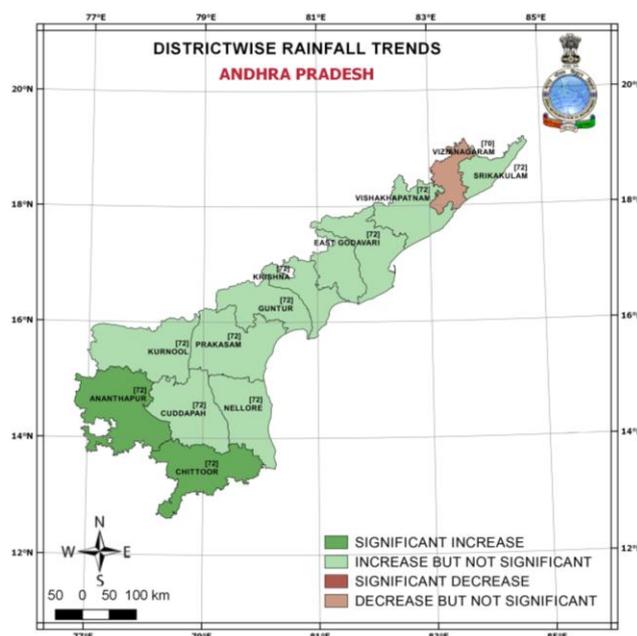


Fig. 7: District-wise annual rainfall Trend for Andhra Pradesh
 [Numbers in the bracket for each district indicates the number of years up to 2022 used to calculate the trend]

Standardized Precipitation Index (SPI)

The district-wise annual SPI Map for the state for the year 2024 is shown in **Fig. 8**. The SPI is based on precipitation and serves as a measure of drought. This index yields negative values for drought and positive values for wet conditions. As the wet and dry conditions become severe, the index becomes more positive or negative. Mildly wet to moderately wet conditions were observed across the state. Data of one district is not available.

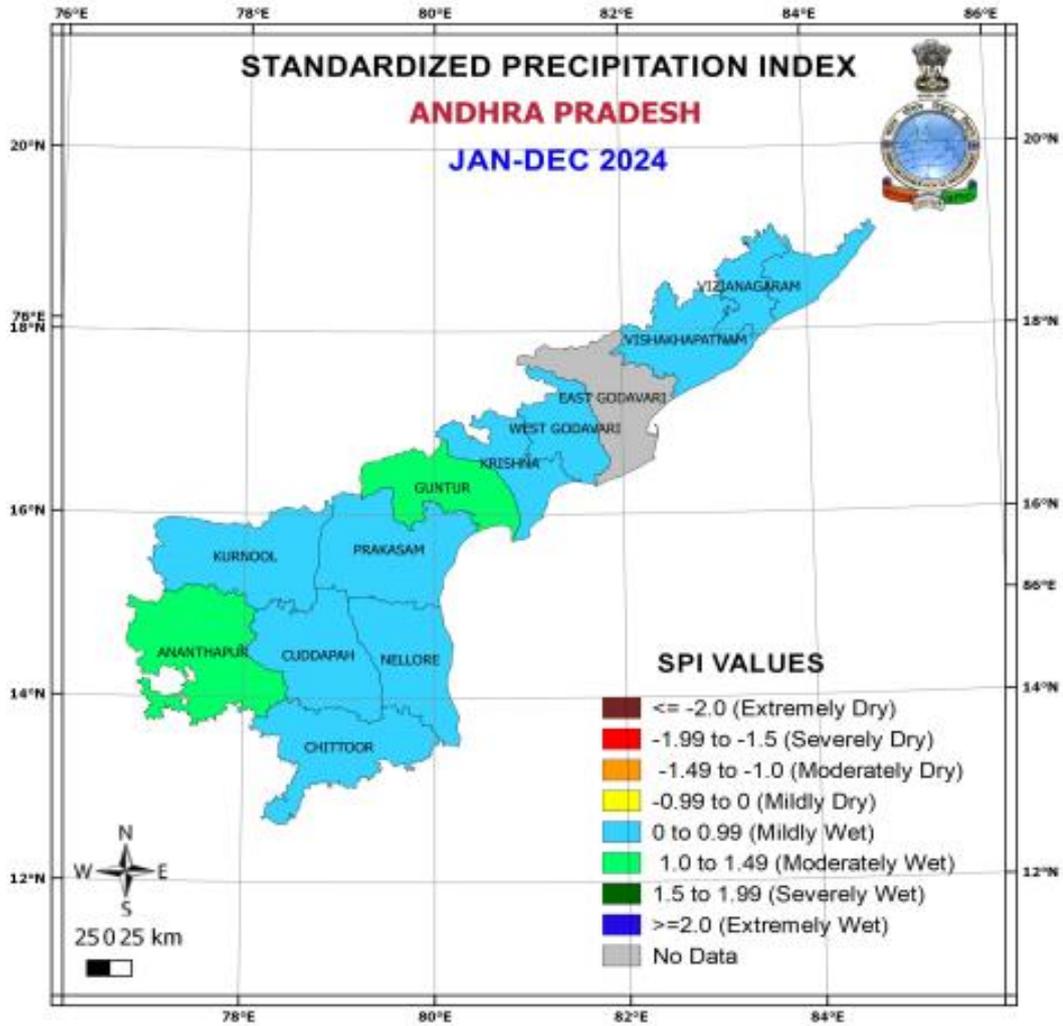


Fig. 8: District wise Annual SPI Map for Andhra Pradesh for the year 2024

Extreme Weather Events

Heavy (rainfall between 64.5-115.5mm), very heavy (115.6-204.4 mm) and extremely heavy (≥ 204.5 mm) rainfall events were recorded over some stations of Andhra Pradesh. **Fig.9** shows the location and frequency of occurrence of such events during the year. **Table 2** shows the very heavy and extremely heavy rainfall values with the date of its occurrence and the locations.

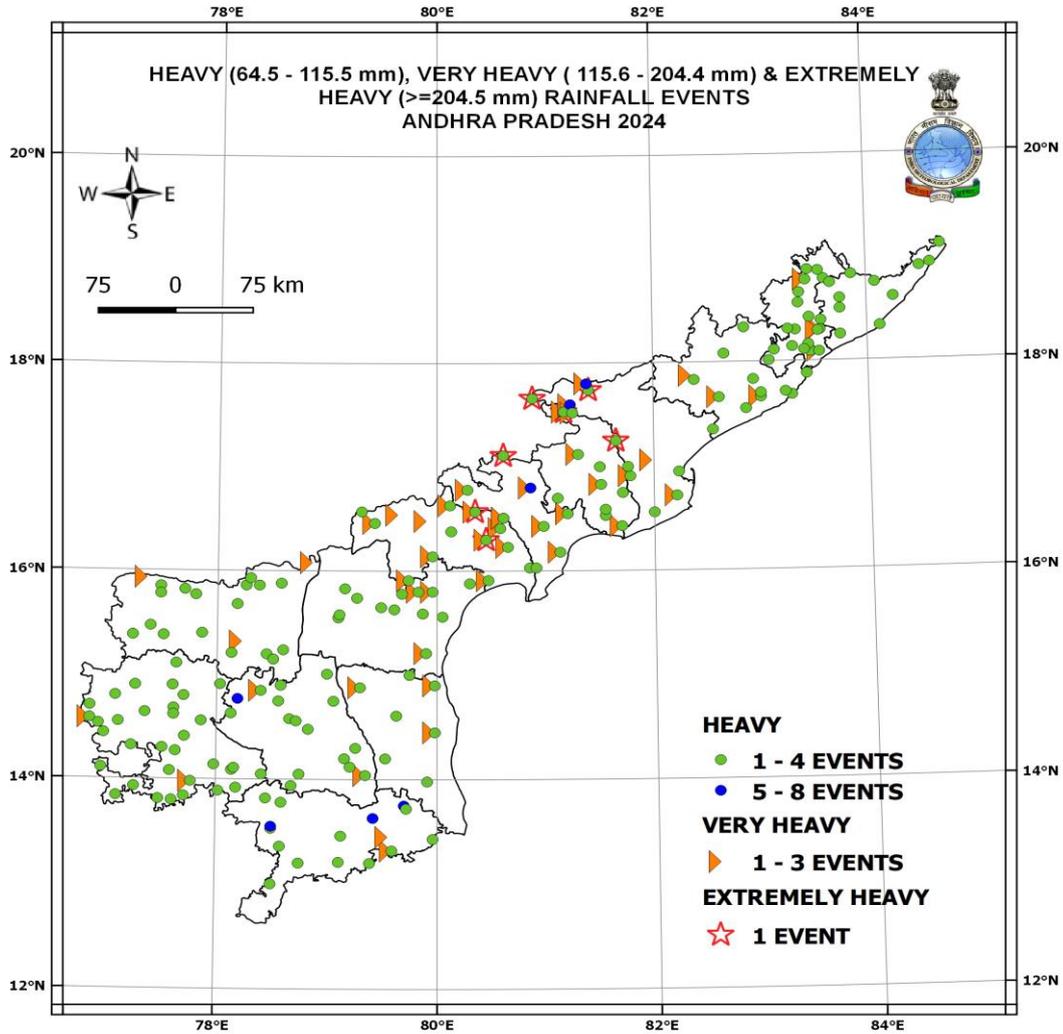


Fig. 9: Location and frequency of heavy , very heavy and extremely heavy rainfall events reported over stations of Andhra Pradesh during the period January to December 2024

Table 2

Very heavy (115.6–204.4 mm) and extremely heavy (>204.4 mm) rainfall # events recorded over stations in Andhra Pradesh during January–December 2024

DATE	STATION NAME	RAINFALL (mm)
20-MAR	CHEEPURUPALLE	136.8
	GARIVIDI	131.2
14-MAY	UDAYAGIRI	122.2
3-JUN	NARSIPATNAM	120.4
	BANAGANAPALLE	178.8
	SRISAILAM	126.2
13-JUL	GUNTUR	142.2
	TENALI	123.4
	MASULIPATNAM CDR	150.9
19-JUL	DOWLESHWARAM	116.0
	PUSAPATIREGA	156.8
	CHINTALAPUDI	178.8
	KOYYALAGUDEM	120.6
	KUKUNOOR	269.0
	POLAVARAM	268.8
20-JUL	TADEPALLIGUDEM	133.0
	CHINTUR	207.0
12-AUG	ANAKAPALLE	132.6
	NAGARI	142.6
14-AUG	GUMMAGATTA	129.2
17-AUG	PUTTUR	138.8
20-AUG	JAMMALAMADUGU	120.4
	MANTHRALAYAM	200.4
21-AUG	SRISAILAM	142.0
31-AUG	AMARAVATI	131.0
	GUDIVADA	169.4
	KAIKALUR	149.6
	MASULIPATNAM CDR	184.3
	PRAKASAM BARRAGE	177.2
	VIJAYAWADA A.P.	122.7
	NARSAPURAM	140.7

DATE	STATION NAME	RAINFALL (mm)
1-SEP	KUNAVARAM	136.4
	VARARAMACHANDRAPUR	116.8
	AMARAVATI	261.4
	ATCHAMPET	190.0
	BAPATLA	133.8
	GUNTUR	225.4
	JANGAMAHESWARAPURAM	134.2
	MACHERLA	164.6
	MANGALAGIRI	173.2
	PIDUGURALLA	171.8
	TENALI	178.2
	NANDIGAMA	172.6
	NUZVID	142.2
	PRAKASAM BARRAGE	119.4
	TIRUVURU	257.8
	MUNDLAMURU	138.0
	SANTHAMAGULURU	122.6
KUKUNOOR	200.8	
VELAIRPAD	158.0	
SRISAILAM	118.0	
9-SEP	CHINTAPALLE	131.2
25-SEP	YANAM	119.2
15-OCT	KAVALI	148.5
	ADDANKI	136.4
16-OCT	KANDUKUR	121.2
	KAVALI	182.1
17-OCT	NELLORE	125.2
	KODUR	144.0
28-OCT	PARVATHIPURAM	116.8
1-DEC	NAGARI	132.4
	KODUR	123.8
4-DEC	GORANTLA	136.4

(#: Rainfall figures are for past 24 Hrs. ending on 8:30 Hrs. IST of the date)

The locations affected by major extreme weather events in Andhra Pradesh during 2024 are shown in **Fig. 10**. The state experienced lightning, floods/heavy rain and cyclonic storm related events during the year. The details are provided in Table 3.

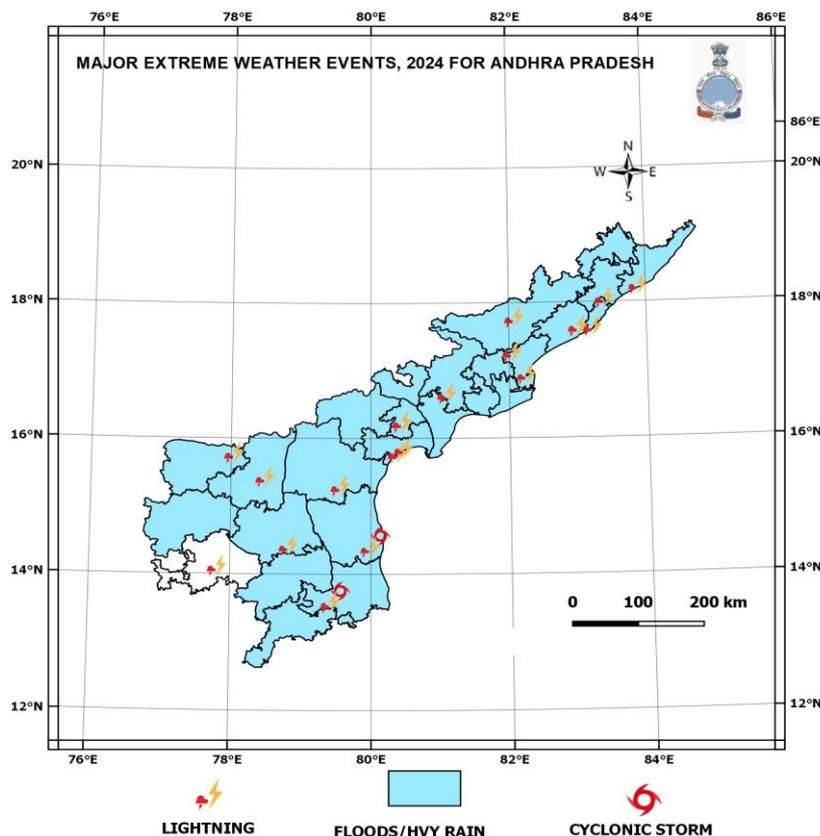


Fig. 10: Locations impacted by major extreme weather events in 2024 (details provided in the Table 3)

Table 3

Major extreme weather events during 2024 which caused loss of human lives* in Andhra Pradesh

Event	Number of casualties and Date	Season	Affected districts
Floods and Heavy Rains	85 (19 to 20 Jul.; 31 Aug.; 1 to 10 Sep.)	Monsoon (June to September)	Alluri Sitharama Raju, Anakapalli, East Godavari, Eluru, Guntur, Kakinada, Konaseema, Krishna, Ntr, Palnadu, Srikakulam
Lightning	48 (20 Mar.; 8, 19 Apr.; 7, 18, 19, May; 2, 7, 14, 15, 16, 24, 26 Jun.; 19, 20, 28 Aug.; 26, 29 Sep.; 3, 18, 30 Oct.; 11 Nov.; 3 Dec.)	Pre-Monsoon (March to May), Monsoon (June to September), Post-Monsoon (October to December)	Alluri Sitharama Raju, Anakapalli, Bapatia, Cuddapah, East Godavari, Eluru, Kakinada, Kurmool, Nandyal, Nellore, Ntr, Palnadu, Prakasam, Srikakulam, Sri Sathya Sai, Tirupathi, Vishakhapatnam, Vizianagaram

(*: Based on the media reports and the reports from Disaster Management Authorities of the government)

A Cyclonic Storm "FENGAL," developed during the post-monsoon season between Nov. 25 to Dec. 2 over the Bay of Bengal and made a landfall near Puducherry (Tamil Nadu) on Nov. 30 as a Cyclonic Storm. This system particularly affected the southern districts of Nellore and Chittoor in Andhra Pradesh. It caused damage to both public and private property. This included the destruction of 6,330.76 hectares of agricultural crops and 76.76 hectares of horticultural crops, as well as the disruption of irrigation sources, roads, electric poles etc. In addition, 18 livestock lost their lives. **Fig.11** shows the track of this cyclonic storm.

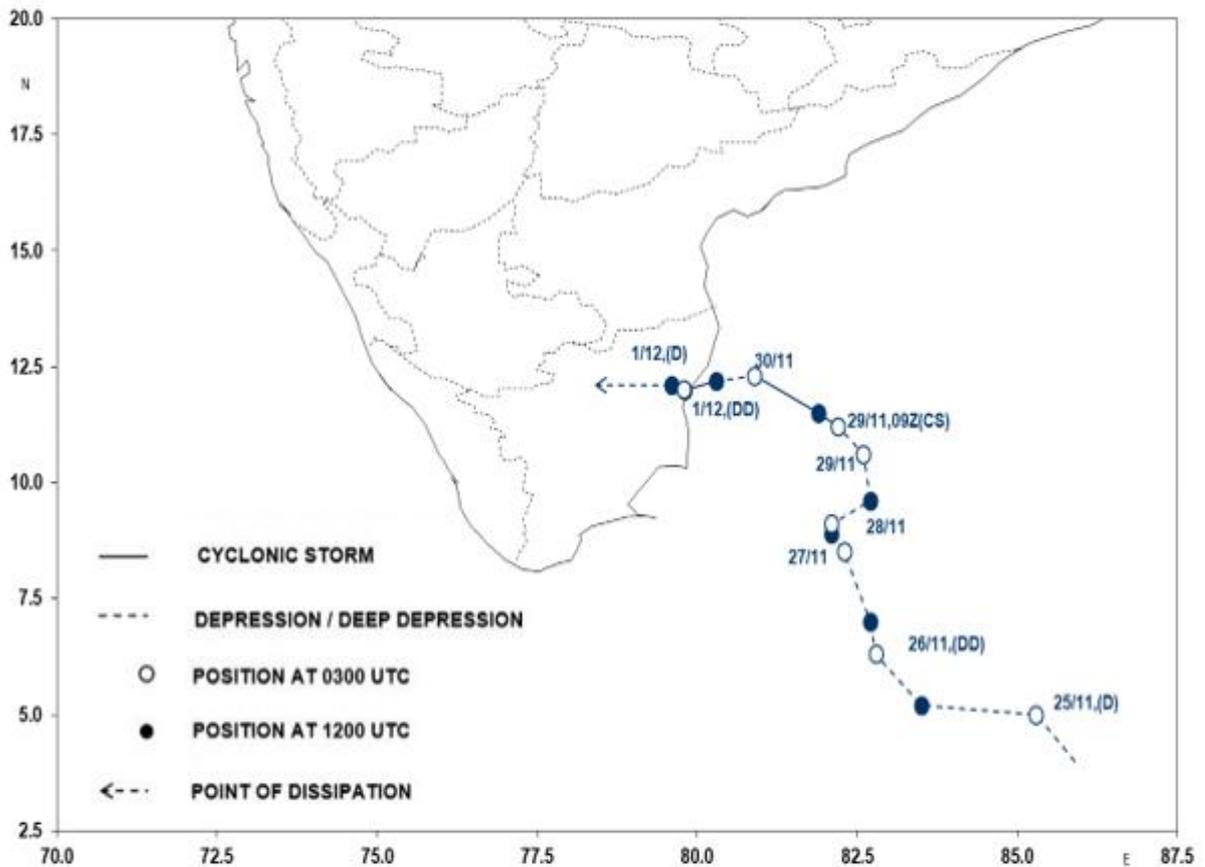


Fig. 11 Track of cyclonic storm "FENGAL" (25 Nov-2 Dec)

Summary

The Statement on Climate for the state of Andhra Pradesh for 2024 is prepared based on the real-time meteorological observation across the state at the district/block level in different seasons and taking reference of more than 100 years of past climate data for the state. So, the observation made in this report are very important for different sectors like agriculture, health, power, disaster management and water, etc. This joint report is prepared by the India Meteorological Department with the crucial inputs from the state government, which we expect in future as well. It is suggested that with the demanding need at global and regional level related to the climate change for sustainable development, this type of joint reports/ventures would be a path breaking for the society. By saying so, following are the submitted:

- (i) The report may please be circulated to all the concerned ministries/departments of the state government and other relevant stakeholders in the state.
- (ii) Based on the feedback, further course of actions in different climate sectors can be planned, like holding workshops, pilot studies, and any other joint ventures.

Apart from this annual climate statement, India Meteorological Department, Pune comes out regularly with climate updates which are shared on the public domain for the users' benefit. It is suggested to check for these updates regularly on the India Meteorological Department (IMD), Pune website: : <https://www.imdpune.gov.in/>.

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