



# Telangana State Southwest Monsoon (SWM) Report 2024

Telangana Development Planning Society Planning Department, Government of Telangana

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#### Salient Features of Monsoon 2024

- Rainfall over the State during Southwest Monsoon season (June- September) 2024 was as a whole has excess 30% (962.6mm) compared to the normal rainfall (738.6 mm) of the season.
- The SWM arrived over Kerala on 30<sup>th</sup> June, 2 days before the normal date of 1<sup>st</sup> June and covered entire country by 2<sup>nd</sup> July, 6 days ahead of normal date 8<sup>th</sup> July. The SWM arrived over Telangana State on 8<sup>th</sup> June, 3 days after its normal date of arrival of 5<sup>th</sup> June. Further advancement over the entire State is covered by 12<sup>th</sup> June.
- The monthly rainfall variation over the state as whole was 23%, 29%, -3% and 84% of rainfall deviation during June, July, August and September respectively. In June, July and September months the rainfall is in excess where as in the August month it is normal.
- Out of 33 Districts, 5 Districts received Large Excess (≥+60% deviation from normal), 20 received Excess (+20% to +59%) and 8 received Normal (+19% to 19%). Out of 612 Mandals, 100 Mandals received Large Excess, 291 received Excess, 216 received Normal and 5 received Deficit (-20% to -59%).
- The area weighted rainfall percentage departure shows, 18% area received large excess, 46% excess, 35% normal and 1% of area received deficit rainfall during the season.
- In June, only one low-pressure System developed over the Bay of Bengal and Monsoon onset was delayed over many places in the State.
- In July, the state as whole received excess rainfall due to many favorable conditions for the monsoon. It is mainly due to the formation of three back to back Low Pressure Systems (15-17, 18-23 and 26-28 July) over Bay of Bengal. Out of these, one system intensified into Depression during 19 to 20 July over Bay of Bengal off south Odisha-north Andhra Pradesh coasts and gradual west-northwestwards movement along north Telangana through Odisha, Chhattisgarh enhanced rainfall activity with heavy to very heavy rainfall over north and eastern districts of the State during the month.
- The rainfall over the state as a whole for the month of July 2024 was 294.8 mm, which is 29% excess from its normal rainfall 229.1 mm.
- During August, monsoon appeared resulting in below normal rainfall over the State (-3%). The one well marked low pressure systems (3- 5 August) and one two Deep Depression (one land Deep depression during 2 - 5 August and depression during 29 August – 2 September) formed over Bay of Bengal and also one Cyclonic Strom "ASNA", which are moved northern parts of the country. Due

to this, weak monsoon conditions are prevailed during 9th to 19th August and 26th to 29th August over the State.

- During September, State received good amount of rainfall due to Depression over Bay of Bengal during 31 August to 02 September which moved from central and adjoining north Bay of Bengal to Vidarbha during 29th August to till 2 September and one Low pressure system during 21-24 September over Bay of Bengal off north Andhra - south Odisha coasts which moved over to south Chhattisgarh & neighborhood across Odisha.
- During this month, Extreme Heavy rainfall of 521.9 mm in 24 hours was recorded over Kakavai station, Tirumalapalam mandal, Khammam district, on 1<sup>st</sup> September 2024 which surpassed the earlier record of 440.6 mm on 19-09-2006 at Chigurumamidi, Karimnagar district. Also State 24 hour average highest rainfall of 98.2 mm recorded on 1<sup>st</sup> September, which is 60% of monthly normal rainfall of 162.7 mm.
- The highest rainfall with more than 10 cm/hr was recorded over Kakarvai (Khammam) stations on 1st September, which is similar to cloud burst (CB) events with rainfall >10 cm/hr. It was 105.0 mm in one hour, in 3 hours it is 239.6 mm and in 6 hours it is 362.4 mm over the same Station. The Stations recorded Exceptionally Heavy Rainfall in 24 hours are Kakarvai (Khammam) 52 cm, Nellikudur (Mahabubabad) 46, Inugurthy, Chinnagudur (Mahabubabad) & Redlawada (Warangal) 45, Mukundapuram (Suryapet) 44, Nellikudur (Mahabubabad) 43, Peddanagaram (Mahabubabad) 41 and Narsimhulapet & Kommulavancha (Mahabubabad) 40 cm on 1st September, 2024.
- During last 5 years rainfall shows, an increase in rainfall in July, September and decrease in August. During Monsoon-2024, Very Heavy rainfall was observed at many places over northwest and east districts in July and September and Extreme rainfall were observed only in September.

The spatial distribution of monthly and seasonal rainfall over different districts is shown in Fig. 1 to 5, State area weighted rainfall departure (%) in Fig.6 and district wise week by week rainfall departure (%) is shown in Fig. 7.

#### Monthly and district wise seasonal rainfall of during Monsoon-2024



Figure 1: District wise Rainfall deviation in June 2024



Figure 2: District wise Rainfall deviation in July 2024



Figure 3: District wise Rainfall deviation in August 2024



Figure 4: District wise Rainfall deviation in September 2024



Figure 5: District wise Rainfall deviation in Southwest Monsoon season – 2024

S.No	Month	Normal Rainfall (mm)	Actual Rainfall (mm)	Dev (%)
1	June	129.4	159.0	23
2	July	229.1	294.8	29
3	August	217.4	209.9	-3
4	September	162.7	298.9	84
Sc N	outh West Aonsoon	738.6	962.6	30

Table 1: Month wise Rainfall Status of Southwest Monsoon 2024

Area weighted Rainfall % departure for Southwest Monsoon





District wise Week by Week Rainfall Departure (%)																			
		-		F	rogr	ess o	f Mo	nsoo	n - 2	024		_			_	_			
S.No	District	1-5 Jun	12-Jun	19-Jun	26-Jun	3-Jul	10-Jul	17-Jul	24-Jul	31-Jul	7-Aug	14-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep	25-Sep	26-30 Sep
1	Adilabad	-5	-49	-13	55	45	35	-8	45	21	-38	-72	-33	-11	234	-68	-99	-39	35
2	Kumuram Bheem	31	-29	-42	-15	68	36	-36	141	29	-30	-63	-24	30	109	7	-98	11	24
3	Mancherial	14	-81	-84	-4	93	-26	-19	139	20	-52	-63	-36	25	136	28	-94	-22	56
4	Nirmal	-25	-41	-39	144	36	5	-3	82	-9	6	-76	-26	72	268	1	-99	16	6
5	Nizamabad	-3	-17	-57	58	22	-12	48	108	-2	-4	-47	-17	41	333	13	-96	14	-61
6	Jagtial	41	-58	-52	93	111	1	-28	121	2	-30	-60	18	16	267	-22	-99	-56	2
7	Peddapalli	33	-55	-65	110	94	-21	13	133	49	-22	-47	-41	18	240	-43	-99	-60	-66
8	Jayashankar	83	-25	-58	142	-39	-6	37	192	52	-9	-66	-31	47	108	36	-99	17	-35
9	Bhadradri Kothagudem	72	-9	-52	89	71	66	20	114	4	19	-18	-66	-73	314	115	-95	-44	-59
10	Mahabubabad	95	54	10	-3	6	3	-9	29	-28	58	23	-72	-79	649	170	-99	-35	-7
11	Warangal	265	-43	-33	29	51	-10	-21	77	-18	-15	-66	-55	-18	418	63	-99	-2	-37
12	Hanumakonda	177	-61	-33	124	24	-32	4	124	-15	-2	-63	-28	-39	215	16	-99	18	-80
13	Karimnagar		-59	-22	169	128	-48	10	105	-2	-6	-43	29	34	392	-43	-99	-24	-82
14	Rajanna Sircilla	-23	-19	-22	28	91	-12	-1	55	-2	-19	-47	36	16	354	11	-97	-23	-69
15	Kamareddy	88	-44	-33	-23	6	-34	-35	92	15	-55	-66	-24	-12	416	19	-98	-26	-50
16	Sangareddy	66	104	-3	-48	-3	-65	-11	66	-39	-81	-22	63	-25	367	133	-100	18	1
17	Medak	89	56	-45	-11	-30	-67	-37	65	-32	-39	-28	106	-19	560	-8	-99	2	-61
18	Siddipet	87	12	-33	130	9	-49	-32	88	-29	-15	-50	154	-5	662	-13	-100	-20	-84
19	Jangaon	14	17	1	-4	83	-18	-13	24	-60	-55	-44	16	-48	423	-21	-98	-17	-70
20	Yadadri Bhuvanagiri	23	49	-1	-42	11	-80	-2	36	-46	-88	13	97	-53	446	-35	-100	71	-67
21	Medchal-Malkajgiri	70	103	-53	-42	-8	-65	37	22	-56	-86	-21	178	-55	410	-7	-96	75	-68
22	Hyderabad	108	116	-1	36	-3	-63	17	7	-63	-97	82	196	-82	238	107	-99	210	-81
23	Rangareddy	69	11	-23	-32	43	1	-13	24	-50	-84	-2	83	-37	341	205	-100	114	-22
24	Vikarabad	124	135	-39	-73	83	42	78	39	-47	-72	-42	28	-2	334	111	-100	102	44
25	Mahabubnagar	167	100	-78	-51	89	83	78	91	-49	121	-37	37	147	580	120	-100	129	4
26	Jogulamba Gadwal	532	140	121	-75	-8	-7	88	53	-89	246	-15	147	69	290	133	-100	105	-72
27	Wanaparthy	248	228	-29	-90	78	38	122	76	-68	156	-45	76	123	613	135	-99	92	-50
28	Nagarkurnool	213	207	-32	-83	69	-14	16	72	-26	94	-6	91	41	535	68	-100	80	-19
29	Nalgonda	506	144	-28	-14	-8	-64	-35	66	-48	29	-47	18	-56	337	60	-100	71	-48
30	Suryapet	319	22	-4	5	55	-20	-10	29	-62	49	-24	-44	-45	596	102	-100	19	-61
31	Khammam	173	8	-19	72	76	43	14	54	-49	65	-25	-45	-27	489	135	-99	-24	-66
32	Mulugu	130	-20	-64	73	51	52	24	159	43	60	-55	-51	72	253	88	-99	-12	27
33	Narayanpet	490	130	-45	-54	42	70	95	69	-74	192	3	122	104	539	175	-100	103	-43
	State	134	25	-37	29	46	1	6	90	6	0	-40	2	75	325	56	-99	16	-32

Figure 7: District wise week by week monsoon rainfall departure (%)



Figure 7a: Week by week progress and cumulative rainfall (% departure from normal) over Telangana State

Fig.7 shows, the rainfall was above normal in most of the weeks in the season while, it is below normal i.e, -37% with large deficit in third week (13-19) of June, 40% in second week (8-14) of August and 99% in 3<sup>rd</sup> week (12-18) and 32% in 5<sup>th</sup> week of September and all other weeks are above normal.

Week by week progress and cumulative rainfall (% departure from normal) over Telangana State is given in Figure 7a. Out of the 18 week, there are 14 positive rainfall anomaly weeks, 3 in June, 5 in July, 3 in August and 3 weeks in September. In every month there is a negative rainfall week except September month with two negative rainfall weeks. The highest negative weekly rainfall anomaly was recorded during week ending 12-18 September with -99%, and the other negative rainfall weeks are recorded week ending on 13-19 June, 8-14 August and 26-30 September with -37%, -40% and -32% respectively. The highest positive rainfall anomalies were recorded during the week ending on 4<sup>th</sup> September with 325%, 5<sup>th</sup> June with 134% and 24<sup>th</sup> July with 90%.

#### Intra seasonal variation during the 2024 Southwest Monsoon season

The intra-seasonal variation of rainfall during the 2024 monsoon season is depicted in Fig.8, which shows the time series of daily rainfall anomaly over the State. It can be observed that from 22<sup>nd</sup> June to 1<sup>th</sup> July monsoon was near normal and from 18<sup>th</sup> July to 28<sup>th</sup> July it is very active and also from 30 August to 03<sup>rd</sup> September monsoon was vigorous over the State. The daily average highest rainfall recorded was 98.2 mm on 1<sup>st</sup> September and 44.5 mm on 2<sup>nd</sup> September. A prolonged weak monsoon situation was observed during 29 July to 28 August, however, the monsoon again became active after 30<sup>th</sup> August. Overall, most days of the August received less rainfall, which resulted in a below normal monthly rainfall (-3%) in August 2024. Again from 10 to 21 September, it is weak monsoon conditions prevailed.



Figure 8: State daily average rainfall with respective to its normal rainfall during the Monsoon season.



Figure 9. State Cumulative rainfall with respective to its normal rainfall during the Monsoon season.

These intra-seasonal variation of rainfall features are associated with the Madden Julian Oscillation (MJO), which is an oceanic-atmospheric phenomenon which affects weather activities across the globe. It brings major fluctuation in tropical weather on weekly to monthly timescales and has a significant influence on the intra-seasonal variability of the monsoon. Phase 3,4,5 and 6 – Enhanced convection (rainfall) moves slowly eastwards over Africa, the Indian Ocean and parts of the Indian subcontinent and suppressed phases 7, 8, 1, and 2 over the this region where Enhanced rainfall moves further eastward over the western Pacific, eventually dying out in the central Pacific. The next MJO cycle begins. In June 2024, the MJO index is in Phase 5 with a weaker amplitude less than 1 during the 1st week of June and very slow and loopy movement within phase 7 then phase 8 during most of the month. Thus MJO phase and amplitude are not favourable for enhancement of convective activity and cyclogenesis over the North Indian Ocean region which the Monsoon was stagnated about 3 week without any progress till 19th June over rest of India. During July, MJO index is located in phase 3 to 5 with amplitude more than 1 during first 3 weeks of the month. Thus, MIO phase and amplitude is favourable for enhancement of convective activity over the north Bay of Bengal (BoB) during August. In September 1st week, MJO index situating in phase 4 which given Extreme heavy rainfall during 1st week of September over the State.

#### Highest One Day Rainfall Departure (%) from monthly Normal

The year wise from 2004 to 2024 State one day highest rainfall observed departure (%) from monthly normal along with trend lines is given in Fig.10. It shown increasing trend in single day Extreme rainfall events which during Southwest monsoon season. State average 24 hours highest rainfall of 98.2 mm recorded on 1<sup>st</sup> September, which is 60% of monthly normal 162.8 mm, 109.6 mm on 5<sup>th</sup> August, 2006 which is 50% departure and 97.6 mm on 27<sup>th</sup> July 2023, with 43% departure.



Figure 10: Year wise State one day average highest rainfall Departure (%) from Monthly Normal

Table 2. Last 21 years (2004 to 2024) State highest signal day rainfall recorded and its % Departure with month normal.

Date	Day highest Rainfall	Monthly Normal	% Dep from Normal
2004-Jul-14	20.4	229.1	9
2005-Aug-21	81.2	217.4	37
2006-Aug-05	109.6	217.4	50
2007-Aug-17	30.4	217.4	14
2008-Aug-10	68.1	217.4	31
2009-Sep-30	35.8	162.8	22
2010-Jul-30	47.4	229.1	21
2011-Jul-14	44.6	229.1	19
2012-Sep-03	30.9	162.8	19
2013-Jul-19	54.3	229.1	24
2014-Sep-07	32.7	162.8	20
2015-Jun-21	47.8	129.4	37
2016-Sep-23	51.5	162.8	32
2017-Aug-20	31.2	217.4	14
2018-Aug-12	66.3	217.4	30
2019-Aug-02	35.3	217.4	16
2020-Aug-15	43.8	217.4	20
2021-Sep-07	60.0	162.8	37
2022-Jul-13	63.3	229.1	28
2023-Jul-27	97.6	229.1	43
2024-Sep-01	98.2	162.8	60



Figure 11: Month wise rainfall deviation (%) during the last five years.

In last Five years the SWM seasonal rainfall deviation is normal or excess and was highest in 2022 is with 52% and then in 2020 with 49% and in 2021 with 40%. When compared with the months, July has the highest rainfall deviation with 121% in July 2022 and 114% in July 2023, 77% in August 2020 the deviation with 116%, 92%, 84% and 74% in September 2021, 2020, 2024. 2022 respectively. It seems there is an increase in rainfall in July, September and decrease in August during last 5 years.

Month		2020			2021			2022			2023			2024	
	Ex. H	νн	н	Ex. H	νн	н	Ex. H	VН	н	Ex. H	νн	н	Ex. H	νн	н
Jun	1	13	123	0	12	235	0	8	163	0	0	4	0	0	0
Jul	0	12	239	8	108	515	48	313	703	62	248	713	0	20	204
Aug	6	112	462	0	20	158	0	11	141	0	1	58	0	7	172
Sep	2	34	335	17	141	366	1	46	307	0	28	314	44	135	528
SWM	9	171	1159	25	281	1274	49	378	1314	62	277	1089	44	162	904

Table 3: Number of heavy rainfall events over the State during the last five years (from 2020 to 2024)

<u>Note</u>: Ex.H = Extremely Heavy Rainfall (>204.4mm), V H = Very Heavy Rainfall (115.6 – 204.4mm), H = Heavy Rainfall (64.5 - 115.5mm)



Figure 12: Year wise & Month wise, Southwest monsoon Heavy + Very Heavy and Extreme Rainfall events in last five years.

From last five years (2020 to 2024) monthly (June, July, August & September) and Southwest monsoon season rainfall events for Heavy & Very Heavy and Extreme rainfall events are plotted in Fig.12. The Extremely Heavy rainfall events in the July month is increasing from 2020 to 2023, where as in 2024 the number have slightly decreased. In September month is another month with highest number of events after July and in June and August months have very less events of Extreme rainfall events.



# Figure 13: Cumulative Rain (y-axis left) and Number of Heavy Rainfall (>64.5 mm) (y-axis right) days during Southwest monsoon season.

The above Fig. 13 shows an increasing trend in heavy rainfall events during the last five years.





during monsoon-2024.



Figure 15: District location and Month wise Very Heavy rainfall recorded during monsoon-2024



Figure 16: District location and Month wise Extremely Heavy rainfall recorded during monsoon-2024

District location and month wise Heavy, Very Heavy and Extreme Heavy rainfall observed during Monsoon given in Figs. 14-16. It shows, Heavy rainfall was observed at many places over most of the districts in August and September, Very Heavy rainfall was observed at many places over northwest and east districts in July and September and Extreme rainfall was observed at many places over Mahabubabad, Khammam and Suryapet districts and isolated places over Kamareddy, Mulugu, Bhadradri Kothagudem, Siddipet and Jangaon districts in September. Top 20 highest rainfall recorded on 1<sup>st</sup> September is given in the table 4.

Heavy Rainfall (64.5 –				Very Heavy	Extremely Heavy rainfall						
	1	15.5)		20	(greater than 204.4mm)						
All	over	the	districts	Adilabad, N	irmal,	Nizamabad,	Maha	bubab	ad,	Khamı	mam
exc	ept	Jo	gulamba	Kamareddy,	Medak	k, Siddipet,	and	Sury	apet	dist	ricts,
Gad	dwal di	istrict		Bhadradri	k	Kothagudem,	isolat	ed	man	dals	in
				Khammam,		Suryapet,	Kama	ıreddy,		Mu	lugu,
				Nagarkurnool,	Bhadradri Kothagudem,						
				isolated mand	Wara	ngal	and	Jang	gaon		
				Bheem, Manch	distric	:ts.					
				Peddapalli, Ro	ijanna S	Sircilla,					
				Jagtial, Jangad	Jagtial, Jangaon, Mahabubabad,						
				Jayashankar, I							
				Bhuvanagiri, \							
				Rangareddy, N							
				Nalgonda, Jog	ulambo	ı Gadwal,					
				Narayanpet, S	Sangare	ddy districts.					

### Table 4: Districts where Heavy Rainfall recorded during the season.

## Table 4: State Highest Rainfall (mm) on $1^{st}$ September, 2024

S.No	District	Mandal	Location	Date	Rainfall (mm)
1	Khammam	Tirumalayapalem	Kakarvai	01-Sep-24	521.9
2	Mahabubabad	Nellikudur	Nellikudur	01-Sep-24	469.6
3	Mahabubabad	Inugurthy	Inugurthy	01-Sep-24	456.5
4	Warangal	Nekkonda	Redlawada	01-Sep-24	454.0
5	Mahabubabad	Chinnagudur	Chinnagudur	01-Sep-24	452.5
6	Suryapet	Maddirala	Mukundapuram	01-Sep-24	443.0
7	Mahabubabad	Nellikudur	Nellikudur	01-Sep-24	435.8
8	Mahabubabad	Narsimhulapet	Peddanagaram	01-Sep-24	411.0
9	Mahabubabad	Narsimhulapet	Narsimhulapet	01-Sep-24	405.8
10	Mahabubabad	Narsimhulapet	Kommulavancha	01-Sep-24	400.8
11	Mahabubabad	Nellikudur	Nellikudur	01-Sep-24	383.5
12	Mahabubabad	Mahabubabad	Mahabubabad	01-Sep-24	374.8
13	Mahabubabad	Mahabubabad	Malyala (ARS)	01-Sep-24	371.0
14	Mahabubabad	Danthalapalle	Danthalapalle	01-Sep-24	354.2
15	Mahabubabad	Maripeda	Maripeda	01-Sep-24	352.4
16	Suryapeta	Maddirala	Maddirala	01-Sep-24	341.3
17	Mahabubabad	Kesamudram	Kesamudram	01-Sep-24	377.2
18	Mahabubabad	Kuravi	Kuravi	01-Sep-24	354.2
19	Suryapeta	Kodad	Kodad	01-Sep-24	344.8
20	Khammam	Tirumalayapalem	Bachodu	01-Sep-24	336.0



Figure 17: Heavy rainfall event on 1<sup>st</sup> September, 2024.

Mandal wise Exceptionally Heavy Rainfall reported in 24 hours on 1<sup>st</sup> September 2024 given in Fig.17 and some of the Stations recorded Exceptionally Heavy Rainfall (in cm) are Kakarvai (Khammam) 52 cm, Nellikudur (Mahabubabad) 46, Inugurthy, Chinnagudur (Mahabubabad) & Redlawada (Warangal) 45, Mukundapuram (Suryapet) 44, Nellikudur (Mahabubabad) 43, Peddanagaram (Mahabubabad) 41 and Narsimhulapet & Kommulavancha (Mahabubabad) 40 cm on 1<sup>st</sup> September, 2024.

Continuous rainfall recorded in one, two and three hours in association of heavy rainfall event is given in Fig.18. The extreme rainfall event was in association with the Depression over Bay of Bengal during 31 August to 02 September. The highest rainfall was recorded on 1<sup>st</sup> September in one hour is 105.0 mm recorded over Kakarvi (Khammam), 87.8 mm over Nillikudur and 84.5 mm over Chinnagudur (Mahabubabad) during the season also in 3 hours it is 239.6 mm over Kakarvai (Khammam), 212.8 mm over Chinnagudur (Mahabubabad), 189.0 mm over Inugurthy (Mahabubabad) and 6 hours it is 362.4 mm over Kakarvai (Khammam), 311.0 mm over Chinnagudur (Mahabubabad), 296.8 mm over Inugurthy (Mahabubabad). The hourly rainfall gives the intensity of rainfall which leads to flooding over the region. It will also give the information of on the strength of the weather system and continues thunder storm activity at a place.



#### Withdrawal of Southwest Monsoon 2024

The withdrawal from extreme north-western parts of the country of the Southwest monsoon is started from west Rajasthan and Saurashtra & Kutch on 23<sup>rd</sup> September, whereas the withdrawal of the southwest monsoon from northwest India usually begins from 17<sup>th</sup> September. Southwest monsoon has withdrawn from the entire country including Telangana State on 15<sup>th</sup> October 2024, which is the normal date of withdrawal for the State and entire country.