

Report on Extreme Weather Events during June-December 2018

1. Introduction

The rainfall over the country as a whole during the monsoon season (June–September) was 91% of its Long Period Average (LPA) thus this season was categorized as a normal monsoon. Seasonal rainfall over Central India (93% of LPA) Northwest India (98% of LPA) and South Peninsula (98% of LPA) regions were normal while East and Northeast Region remained deficient at 75% of LPA and rainfall over this was deficient throughout the monsoon months. The seasonal rainfall in 2018 over East and Northeast India remained the second lowest ever received by the region with its lowest value in 2013 (73% of LPA). Southwest monsoon reached parts of southeast Bay of Bengal, south Andaman Sea and Nicobar Islands on 25th May (5 days later than its normal date). It advanced over Kerala on 29th May, 3 days ahead of the normal schedule and covered the entire country by 29th June (a fortnight earlier than the normal date). Monsoon withdrawal was delayed and commenced from parts of northwest India on 29th September (with a delay of nearly a month). The monsoon season during June to September generally witness heavy rainfall over many parts of India associated with active monsoon trough, offshore vortex, west-coast trough, mid-tropospheric cyclone etc. This season is also characterized by the formation of low pressure system over the north Indian Ocean and their intensification into depressions, which give rise to heavy rainfall over many parts of the country. The post-monsoon season during October-December witnessed intense tropical cyclone over the north Indian Ocean. The other synoptic systems that affect the post-monsoon season are easterly wave in the south, western disturbance, cold wave and fog in the northern part of the

country. In this report, an attempt is made to bring out details and impact of the extreme weather phenomena during the monsoon (June to September) and post-monsoon (October to December) seasons of 2018.

2. Cyclonic Circulations

2.1 Monsoon season (June to September 2018)

During the monsoon season, eleven low pressure systems (1 cyclonic storm, 1 Deep Depression, 4 Depressions, 1 well marked low pressure area & 4 low pressure areas) were formed. The tracks of 6 depressions and cyclonic storms formed during the monsoon season from June to September 2018 are shown in Figure 1. All these systems were formed over the Bay of Bengal and moved westward across central India. A brief discussion about the intense systems (Depressions, Deep Depression and Cyclone) shown in Figure 1 are presented below.

The first intense system of the season was a Depression (10th-11th June) over northeast Bay of Bengal and adjoining Bangladesh coast. The second depression of the season was formed in July as a low pressure area over northwest Bay of Bengal and adjoining Gangetic West Bengal and Odisha on 19th July which concentrated into a Depression on 21st July morning and intensified into a Deep Depression in the afternoon of 21st July. It crossed north Odisha and West Bengal coasts in the evening of 21st July close to the south of Digha and moved west northwest-wards across the central parts of the country. Under the influence of the system, widespread and intense rainfall activity occurred over Odisha, Gangetic West Bengal,

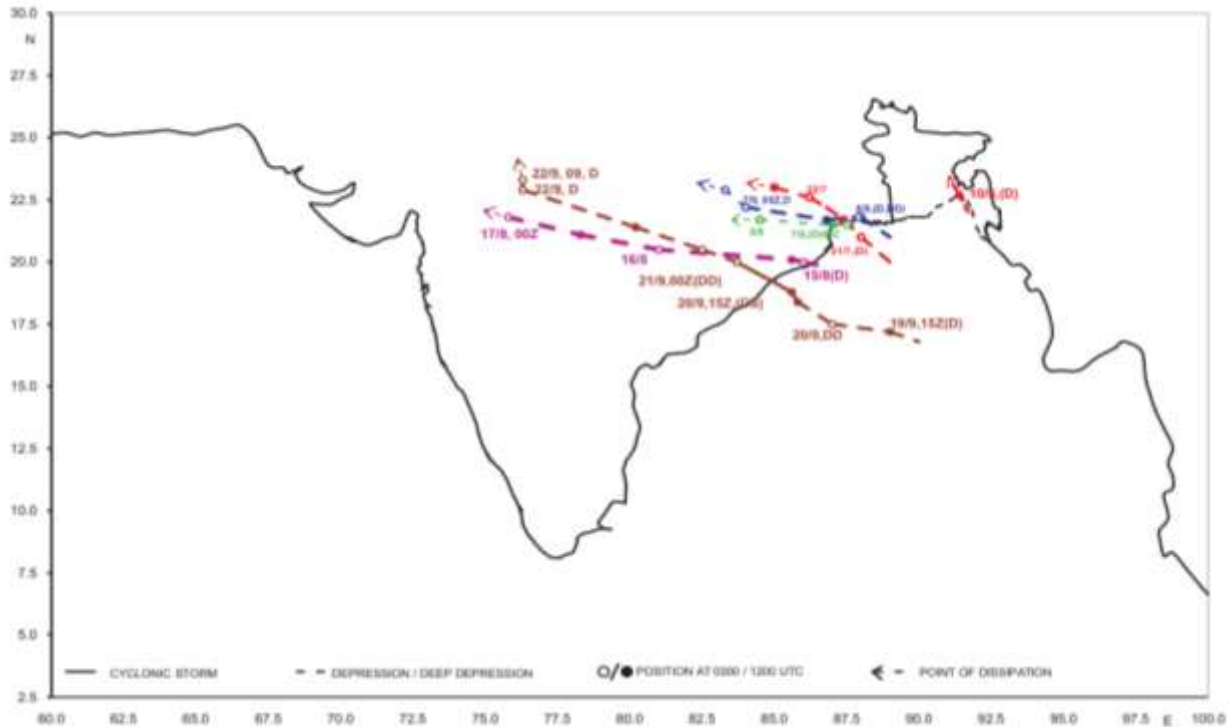


Figure 1: Six Depressions and Cyclones formed during monsoon season 2018

Chhattisgarh, Jharkhand and Madhya Pradesh. Exceptionally heavy rainfall was recorded over Burla ARG (62 cm), Sambalpur (57 cm) and Birmaharajpur ARG (43 cm) in Odisha. While moving west northwest-wards it weakened and its remnant lay over northwest Uttar Pradesh and neighbourhood as a low pressure area on 28th July. Its persistence over West Uttar Pradesh and neighbourhood for nearly three days caused fairly widespread to widespread rainfall activity with heavy to very heavy and extremely heavy falls over Western Himalayan Region and adjoining plains of northwest India during 26th to 28th July.

The first system of August was formed as a Low Pressure Area over Northwest Bay of Bengal and neighbourhood on 6th August. It subsequently concentrated into a Depression and crossed north Odisha, West Bengal coasts and moved west northwest-wards and weakened into Well Marked Low Pressure Area over Chhattisgarh and neighbourhood and finally lay as a low pressure area over north Madhya Pradesh and

neighbourhood on 9th August. It caused fairly widespread to widespread rainfall activity with heavy to very heavy and extremely heavy falls over eastern parts of Central India. The second system in August formed as a low pressure area over Northwest Bay of Bengal and adjoining Coastal areas of West Bengal and Odisha on 13th August. It subsequently concentrated into a Depression and lay over Coastal Odisha and neighbourhood on 15th August, moving west-northwestwards, it weakened gradually and lay as a low pressure area over southwest Madhya Pradesh and neighborhood on 17th August. Under its influence, fairly widespread to widespread rainfall activity with heavy to very heavy falls had been reported from parts of east and adjoining central India. Strengthening of the monsoon flow due to the formation of the low pressure system had caused widespread intense rainfall activity over south peninsular India. During the above mentioned active phase, vigorous monsoon conditions occurred on 5-6 days over Kerala and southern parts of Karnataka. There had been a few instances of

extremely heavy rainfall events over these regions as well as over the Ghat sections of Tamil Nadu.

The first system during September was formed as a Low pressure area over northwest Bay of Bengal & neighborhoods in the morning of 5th September and became a Well Marked Low Pressure area by the evening of the same day. It concentrated into a Depression and further intensified into a Deep Depression on 6th September. It crossed West Bengal coast and moved north-westwards and weakened gradually. Under the influence of the system, widespread and very intense rainfall activity occurred over Odisha. The system also caused widespread and intense rainfall activity over Chhattisgarh, Madhya Pradesh and East Rajasthan. During 6th to 12th September, the monsoon trough lay to the north of its normal position and its eastern end extended across northeastern states on 10th and 11th. Also a north-south trough in the lower tropospheric levels lay extending from eastern parts of Bihar to West Central Bay of Bengal, causing moisture incursion into northeast and adjoining east India. Widespread intense rainfall activity occurred over northeastern states and Sub-Himalayan West Bengal & Sikkim during this period.

The last system formed as a Low Pressure Area over East Central Bay of Bengal and adjoining Myanmar coast on 18th September evening. It concentrated into a Depression over east central Bay of Bengal and neighborhood during the night of 19th. It then intensified further into Cyclonic Storm 'DAYE' over northwest Bay of Bengal on 20th September and crossed south Odisha and adjoining north Andhra Pradesh coasts close to Gopalpur during mid-night of 21st September, gradually weakened into a Depression and moved across central India upto western parts of Madhya Pradesh on 21st and 22nd September. During the traverse, it started

interacting with a Western Disturbance and thus the system, after weakening into a well- marked low pressure area, started re-curving northwards. This constructive interaction between the monsoon low pressure system and the Western Disturbance caused a revival of the active to vigorous monsoon conditions over central and northwest India during 21st to 25th September.

2.2 Post-monsoon season (October to December 2018)

The post-monsoon season of 2018 was very active with three cyclones formed over the Bay of Bengal and one over the Arabian Sea. The tracks and the details about their genesis and movement are shown in Figure 2 and Table 1 respectively.

3. Significant Weather Events

3.1 Monsoon season (June to September 2018)

During the monsoon season of 2018, heavy rain, lightning and thunderstorm related incidents were the most high impact weather events of the season which reportedly claimed over 792 lives mostly from northern, eastern/north-eastern, central and north peninsular parts of the country

Thunderstorm: Thunderstorm activities reportedly claimed 76 lives during the season mostly from different parts of the country. Of these, 75 deaths were reported from Jharkhand during the month of June and July and one reportedly claimed died in Rajasthan.

Lightning: As per reports in local newspaper 114 people were struck & killed by lightning from different parts of the country during the season. Out of 114 persons 39 were from districts of Uttar Pradesh, 22 persons from

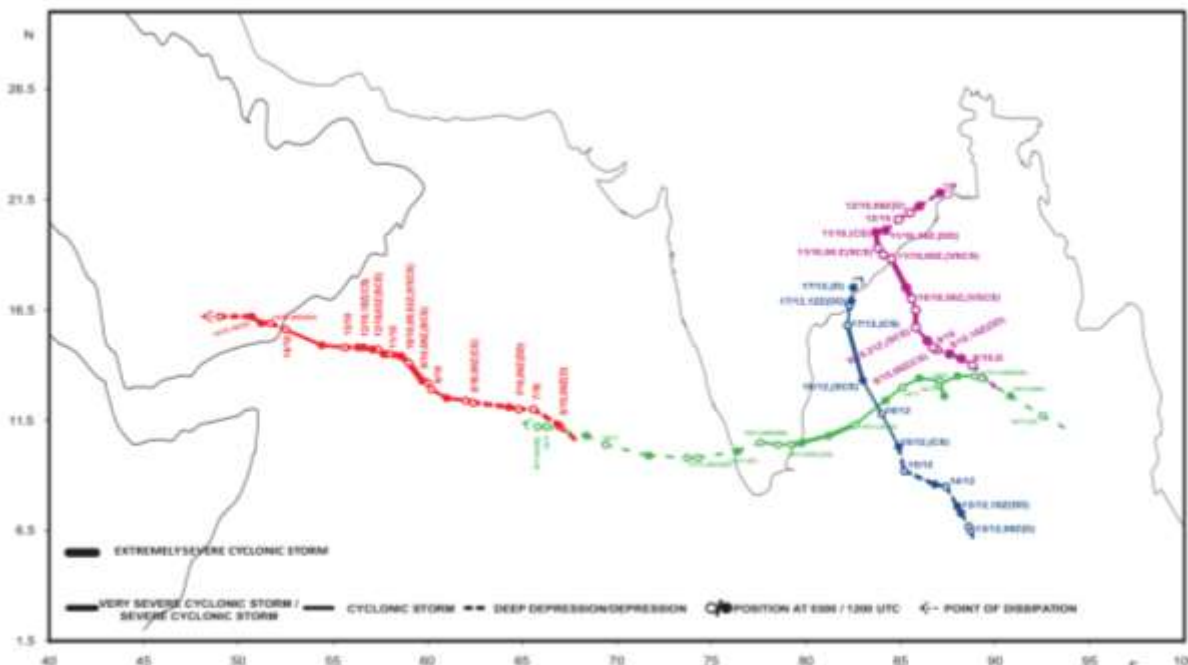


Figure 2: Cyclonic Disturbances (Cyclones during post-monsoon season 2018)

Table 1. Genesis and movement of Tropical Cyclones over north Indian Ocean during post-monsoon season from October to December, 2018

S. No.	System	Period	Genesis location and movement
1	Very Severe Cyclonic Storm, 'LUBAN'	6-15 October	Crossed Yemen and adjoining Oman coasts near 15.8°N and 52.2°E during 0530 to 0600 UTC of 14 th Oct. Weakened into a well-marked low pressure area over Yemen and adjoining Saudi Arabia at 0300 UTC of 15 th .
2	Very Severe Cyclonic Storm "TITLI"	8-13 October	crossed north Andhra Pradesh-south Odisha coasts, near Lat.18.8°N / Long. 84.5°E, during 2300 UTC of 10 th and 0000 UTC of 11 th Oct. Weakened into a well marked low pressure area over Gangetic West Bengal and neighbourhood at 0000 UTC of 13 th Oct.
3	Very Severe Cyclonic Storm "GAJA"	10-19 November	Crossed Tamil Nadu and Puducherry coasts between Nagapattinam and Vedaranniyam near 10.45°N and 79.8°E during 1900 to 2100 UTC on 15 th NOV. Weakened into a well marked low pressure area over southwest and adjoining southeast Arabian Sea on 1800 UTC of 19 th Nov.
4	Severe Cyclonic Storm "PHETHAI"	13-18 December	crossed Andhra Pradesh coast near Lat. 16.5°N / Long. 82.3°E between 0800 & 0900 UTC of 17 th Dec. weakened into a well marked low pressure area over northwest and adjoining westcentral Bay of Bengal and Odisha at 0000 UTC of 18 th Dec.

Odisha, 11 each from Maharashtra and Rajasthan, 4 each from Andhra Pradesh and Bihar, 5 from west Bengal and 6 from Uttarakhand state. 12 persons were reportedly claimed during September.

Heavy Rain: During the season heavy rain & flood related incidents reportedly claimed at least 536 lives from different parts of the country. Deaths of 246 people were reported from Kerala of which 223 were during the period 8-23 August and 9 in the month of June and 14 in the month of July. 158 persons were reported dead in Uttar Pradesh during the season (of which 64 in the month of July and 66 in month of Sep.), 34 from Assam, 26 from Maharashtra, 17 from Himachal Pradesh, 18 from Rajasthan, 7 from Manipur, 6 from Jammu and Kashmir, 5 from Gujarat, 4 each from Arunachal Pradesh and Odisha, 3 each from Punjab, West Bengal and Andhra Pradesh and 2 from Tamilnadu state.

3.2 Post-monsoon season (October to December 2018)

The cyclonic storms during the post-monsoon months have taken many lives. In addition, the rain, low-visibility/fog also caused some casualties during this season.

Cyclonic Storm: Due to very severe cyclonic storm Titli Total 77 people were reportedly

claimed dead from different districts (Gajapati, Ganjam, Khurda, Puri, Jagatsinghpur, Kendrapara, Bhadrak, Balasore) of Odisha during 08-14 October and 12 people were reportedly claimed dead from different districts of Odisha and Andhra Pradesh (Srikakulam and Vizianagaram) during 10-11 October. Due to Cyclone Gaja, 45 people were reportedly claimed dead in different districts of Tamil Nadu during 10-17 November.

Rain: Due to heavy rains 05 people were reportedly claimed died in Villupuram and Thanjavur districts of Tamil Nadu during 23-25 November.

Low Visibility/Dense Fog: One person died in an accident on the Yamuna Expressway on 22 December in Agra district due to low visibility. As reported, due to dense fog accidents occurred and 24th persons died in Haryana on 24 December. Similarly on 30th December in Chandigarh (Haryana) 7 people died due to fog.

Acknowledgements: This report is prepared by referring to the Daily as well as Weekly Weather Reports issued from NWFC and the other inputs available from NWFC and the Climate Diagnostic Bulletins published by Climate Research and Services (CRS) office, IMD Pune.

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