

Report on Extreme Weather Events during June-December 2020

1. Introduction

As per the classification of the seasons, the months June to September (JJAS) constitute the monsoon season whereas October-December (OND) constitute the post-monsoon season. The monsoon season during JJAS is associated with the formation of Low Pressure Areas (LPAs) and monsoon Depressions over the Bay of Bengal (BoB) which move inland over India giving rise to heavy rainfall over different parts of the country. Sometimes a Depression intensifies into a Tropical Cyclone (TC) particularly during the onset phase (June) or the withdrawal phase of monsoon (September). The heavy rainfall leading to flooding is very common phenomenon during the monsoon season. This season is also characterized by the formation of LPAs over the north Indian Ocean and occasionally their intensification into cyclones. The post-monsoon season from October to December (OND) is mainly associated with TCs over north Indian Ocean, easterly waves over the southern peninsula India leading to heavy rainfall over Tamil Nadu and adjoining regions. The northern part of India witnesses Western Disturbances (WDs) and Fog particularly in the months of November and December. In this report, an attempt has been made to bring out the details of the extreme weather phenomena and their impacts during the monsoon and post-monsoon seasons of 2020.

2. Low Pressure Systems during June-September 2020

During the monsoon season 2020, in total twelve systems were formed over the north Indian Ocean i.e. over the Bay of Bengal and Arabian Sea. Out of all these 12 systems, one low pressure system intensified into a Severe Cyclonic Storm (SCS) and was named "NISARGA" over the Arabian Sea during (1-4 June, 2020). In addition, 6 were well marked LPAs. The rest 5 were simply LPAs.

2.1 Severe Cyclonic Storm NISARGA Over the Arabian Sea (1-4 June, 2020)

NISARGA was the first intense system of the season formed during 1st-4th June over the Arabian

Sea. It was also the fourth cyclone crossing Maharashtra coast during the period 1961-2020 (Figure 1). It originated from a low pressure area which was formed over the southeast and adjoining east central Arabian Sea and Lakshadweep area on 31st May, 2020. It concentrated into a depression in the early morning of 1st June, 2020. Under favourable conditions, it further intensified into cyclonic storm (CS) NISARGA in the noon of 2nd June. It further intensified into a SCS in the early morning of 3rd June, 2020. Moving northeastwards, it crossed the Maharashtra coast close to south of Alibag as a SCS with a maximum sustained wind speed of 110-120 kmph gusting to 130 kmph during 1230-1430 hrs IST of 3rd June. Moving further northeastwards across Madhya Maharashtra, Vidarbha, it weakened into a well marked LPA over southeast Uttar Pradesh and adjoining Bihar on 5th June.

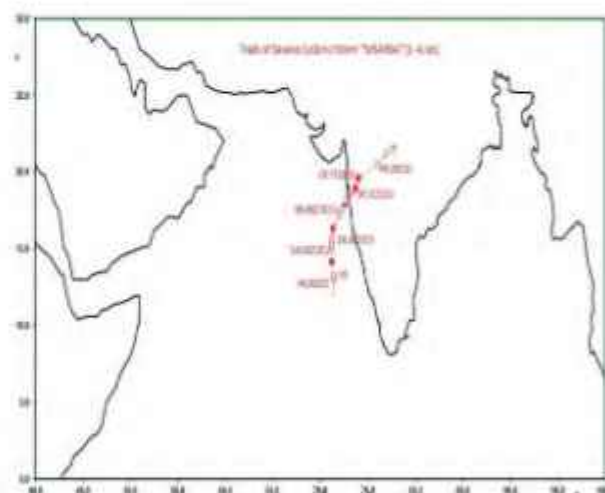


Figure 1: Track of Severe Cyclonic Storm NISARGA during 1-4 June 2020.

3. Significant Weather during June to September 2020

Figure 2 shows the significant weather events during the monsoon seasons (based on real time media report). During the season from June to September, 2020 more than 700 persons reportedly claimed dead due to Floods and Heavy Rains, Thunderstorm, Lightning & CSs from different parts of the country. Also, due to gales, damages to

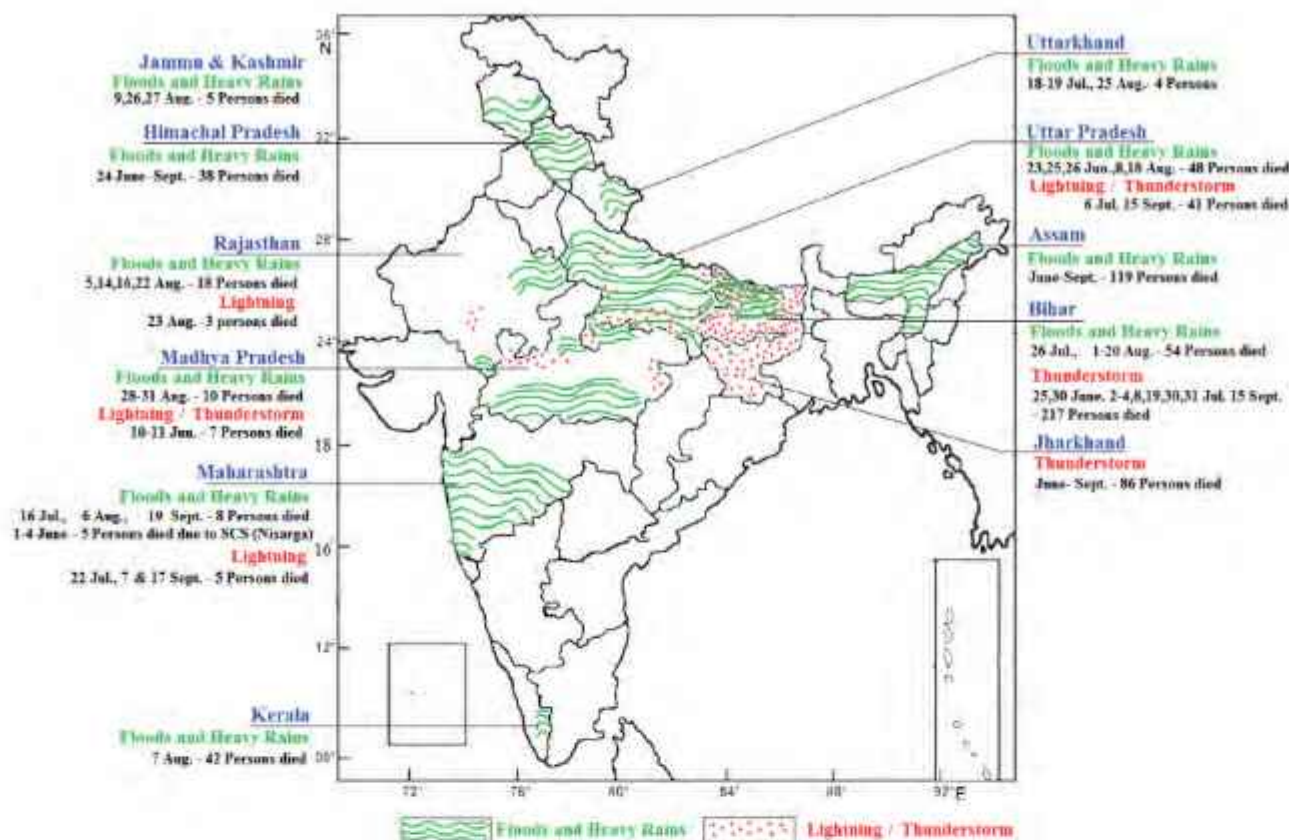


Figure 2: The significant weather events during the monsoon seasons (JJAS 2020). (CDBI, IMD Pune).

crops, fruits, houses and shops were reported from Jammu Kashmir (Bandipora, Baramullah, Budgam, Kupwara, Srinagar Dist.) on 8 & 23 June and 5 July while Hailstorm on 6 June damaged crops in Himachal Pradesh (Shimla Dist.).

Cyclonic Storm: Due to SCS NISARGA, 5 persons reportedly claimed dead from Alibag, Pune & Raigad districts & 2000 livestock perished from Nasik district of Maharashtra. Damage to crops, houses also reported.

Floods & Heavy Rain: In total 346 persons reportedly claimed dead from different parts of the country during the season. Of these, 119 persons reportedly claimed dead and more than 64 lakhs animals including poultry birds perished due to the events caused by heavy rains from 32 districts of Assam. Damage to crops, roads & RCC Bridge/Culvert also reported. Of the remaining casualties, 54 deaths were reported from Bihar (26th July and 1st to 20th August), 48 from Uttar Pradesh (23-26 June, 8&18 August), 38 persons and 88 livestock from Himachal Pradesh (24 June-30 September), 18 from Rajasthan (5th, 14th, 16th and

22nd August), 10 from Madhya Pradesh (28-31 August) 8 from Maharashtra (16 July, 4th August, and 19th September), 5 persons and 36 livestock from Jammu & Kashmir (9th, 26th and 27th August) and 4 persons from Uttarakhand (18th, 19th July and 25th August). Landslide claimed 42 lives in Kerala on 7th August. Some other districts with no casualties, from Bihar, Madhya Pradesh, Maharashtra and Jammu & Kashmir were also affected.

Lightning: Due to Lightning, 54 persons reportedly claimed dead during 11 June to 17 September from different parts of the country. Of these, 36 persons reportedly claimed dead from Allahabad, Badaun, Chitrakoot, Chandauli, Gazipur, Jaunpur, Kaushambi, Kushinagar, Mirzapur districts of Uttar Pradesh on 6 July and 15 September. While, 6 from Amarawati, Gondia, Palgarh, Osmanabad districts of Maharashtra on 22 July, 7&17 September. Also, 5 from Anuppur district of Madhya Pradesh (11 June), 4 persons from Poonch and Udhampur districts of Jammu & Kashmir (20 July, 26 August), 3 persons from Rajsmand district of Rajasthan (23 August).

Thunderstorms: Due to thunderstorms, 310 persons reportedly claimed dead from north & northeast parts of the country. Of these, 217 persons belonged to 35 districts of Bihar on 25 & 30 June, 2-4, 8, 19, 30 & 31 July and 15 September. While, 86 persons reportedly claimed dead from 19 districts of Jharkhand during 1 June to 17 September. Also, 5 persons were reported dead from Uttar Pradesh on 12 June and 2 persons from Mandsaur in Madhya Pradesh during 10-11 June.

4. Cyclonic Disturbances During October-December 2020.

The post-monsoon season from October to December 2020 witnessed many (total of 6) intense cyclonic systems over the north Indian Ocean. Two Very Severe Cyclonic Storms (VSCSs), one over the Bay of Bengal and the other over Arabian Sea; one cyclonic storm over Bay of Bengal; one Deep Depression (DD) over Bay of Bengal and two Depressions, one each over the Bay of Bengal and Arabian Sea formed in the Post-monsoon season. The details of these systems are summarised below, and also in Table 1 and their tracks are shown in Figure 3. The details of the systems formed during October to December 2020 are given in Table 1. As mentioned above, the year 2020 witnessed development of many systems over the North Indian Ocean (NIO). As shown in Table 1 and Figure 3, amongst the 3 CSs the VSCS NIVAR and CS BUREVI formed over the Bay of Bengal crossed the Indian coast, whereas the VSCS GATI crossed north Somalia coast. Further, it is also seen from Table 1 and Figure 3 that the DD during 11-14 Oct and the Depression during 22-24 Oct crossed north Andhra Pradesh coast and West Bengal and adjoining Bangladesh coast respectively. The INSAT 3D imagery based on 1830 UTC of 25th November during VSCS NIVAR is shown in Figure 4a. Similarly, the INSAT imagery at 1300 hrs IST of 3rd December during CS BUREVI is shown in Figure 4b.

5. Cyclonic Storms and Other Significant Weather Events during October-December 2020.

In addition to the CSs, the country experienced cold waves, lightening & thunderstorm, heavy rain and

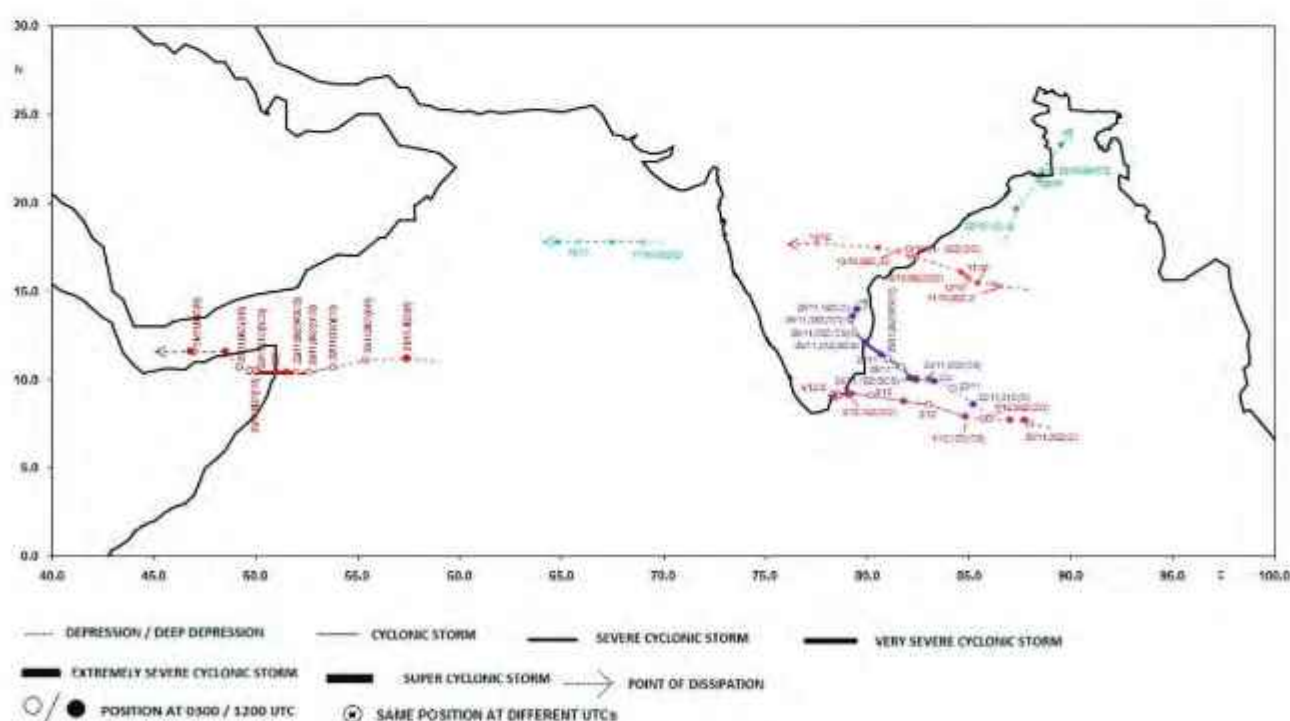
floods, during the post-monsoon season 2020 as shown in Figure 5. In total, 182 persons reportedly claimed dead & more than 85,000 livestock perished from different parts of the country. The casualties mentioned here are based on the media and government reports.

Floods & Heavy Rains: Total 128 persons reportedly claimed dead & more than 75,000 livestock perished from southern, north eastern and north west parts of the country during the month of October only. Of these, more than 50 persons reportedly claimed dead from Telangana during 1-20 October. Telangana's capital, Hyderabad, is the worst affected district. 40 persons reportedly claimed dead from Kolhapur, Pune, Satara, Sangli, Solapur & Yavatmal districts of Maharashtra during 12 to 16 October and 513 livestock perished from Beed, Kolhapur, Sindhudurg, Solapur, Pune, Satara, Sangli, Solapur districts on 16 October. While, Ahmednagar, Akola, Aurangabad, Buldhana, Hingoli, Jalna, Latur, Nanded, Nashik, Osmanabad, Parbhani, Palghar, Raigad, Ratnagiri, Thane & Washim districts were also affected during 10 to 20 October. But the worst affected district is Solapur. 13 persons reportedly claimed dead from East Godavari, Krishna, Visakhapatnam, West Godavari districts of Andhra Pradesh on 13, 14 & 24 October. 5 persons reportedly claimed dead from Bagalkot, Gadag, Gulbarga, Raichur districts of Karnataka during 10-13 October and 518 livestock perished from Gulbarga district on 15 October. While, Belgaum, Bidar, Bijapur, Yadgir districts of Karnataka were also affected during the first fortnight of the month. 4 persons reportedly claimed dead & more than 74,000 big & small animals including poultry birds perished due to the events caused by heavy rains from Barpeta, Biswanath, Dhemaji, Goalpara, Hojai, Morigaon, Nagaon, Sonitpur, West Karbi Anglong districts of Assam during the month of October. 2 persons each reportedly claimed dead from Gujarat on 22 October, East Khasi Hills & West Khasi Hills of Meghalaya on 25 October and West Sikkim on 2 October. While, One from Kerala on 24 October. Gajapati district of Odisha also affected on 14 October.

Cyclonic Storms: Total 21 persons reportedly

Table 1. Details of the systems formed during Oct-Dec 2020.

System No	System & Date	Place of origin and dissipation
1	Depression 11-14 Oct	Crossed north Andhra Pradesh coast close to Kakinada as a deep depression between 0100 to 0200 hrs UTC of 13th Oct. Weakened into well marked low pressure area over south Madhya Maharashtra and neighbourhood at 1200 hrs UTC of 14th October
2	Depression 17 – 19 Oct	Weakened into well marked low pressure area west central Arabian Sea and neighborhood at 0000 hrs UTC of 19th Oct
3	Depression 22-24 Oct	Crossed west Bengal and adjoining Bangladesh coast as a depression between 0600 to 0700 hrs UTC of 23rd Oct. Weakened into well marked low pressure area over central parts of Bangladesh at 0000 hrs UTC of 24th October
4	Very Severe Cyclonic Storm (VSCS) GATI 21-24 Nov	Crossed north Somalia coast as a very severe cyclonic storm between 1400 to 1500 hrs UTC of 22nd November. Weakened into well marked low pressure area Gulf of Aden and adjoining Somalia at 0600 hrs UTC of 24th November
5	Very Severe Cyclonic Storm (VSCS) NIVAR 22-27 Nov	Crossed Tamil Nadu and Puducherry coasts near Puducherry as a Very Severe Cyclonic Storm between 1800-2100 UTC of 25th November. Weakened into well marked low pressure area over south coastal Andhra Pradesh and adjoining west central Bay of Bengal at 0000 hrs UTC of 27th November
6	Cyclonic Storm (CS) BUREVI 30 Nov-5 Dec	Crossed Sri Lanka coast close to north of Trincomalee as a Cyclonic Storm between 1700-1800 hrs UTC of 2nd December Weakened into well marked low pressure area over Gulf of Mannar at 0600 hrs UTC of 5th December

**Figure 3: Tracks of cyclonic disturbances (Depression and above) during the post-monsoon Season from October to December-2020.**

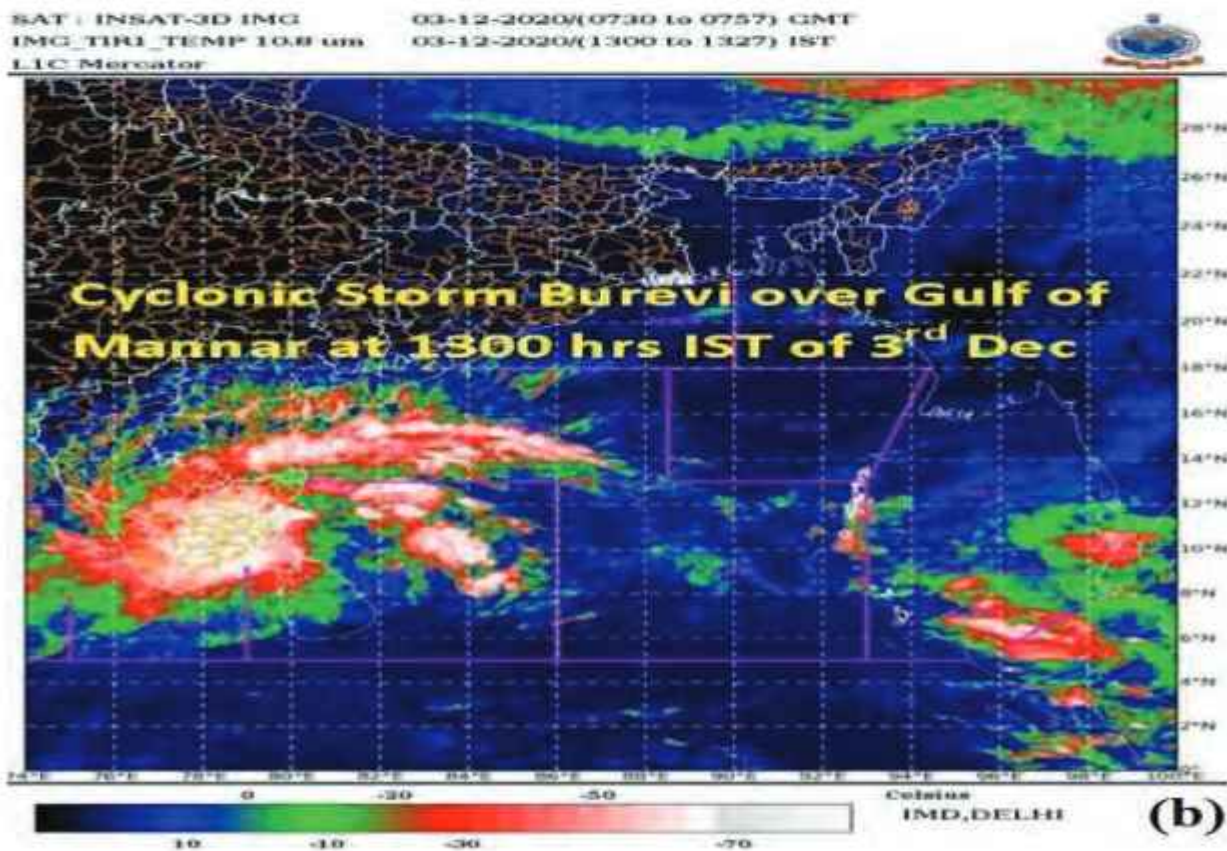
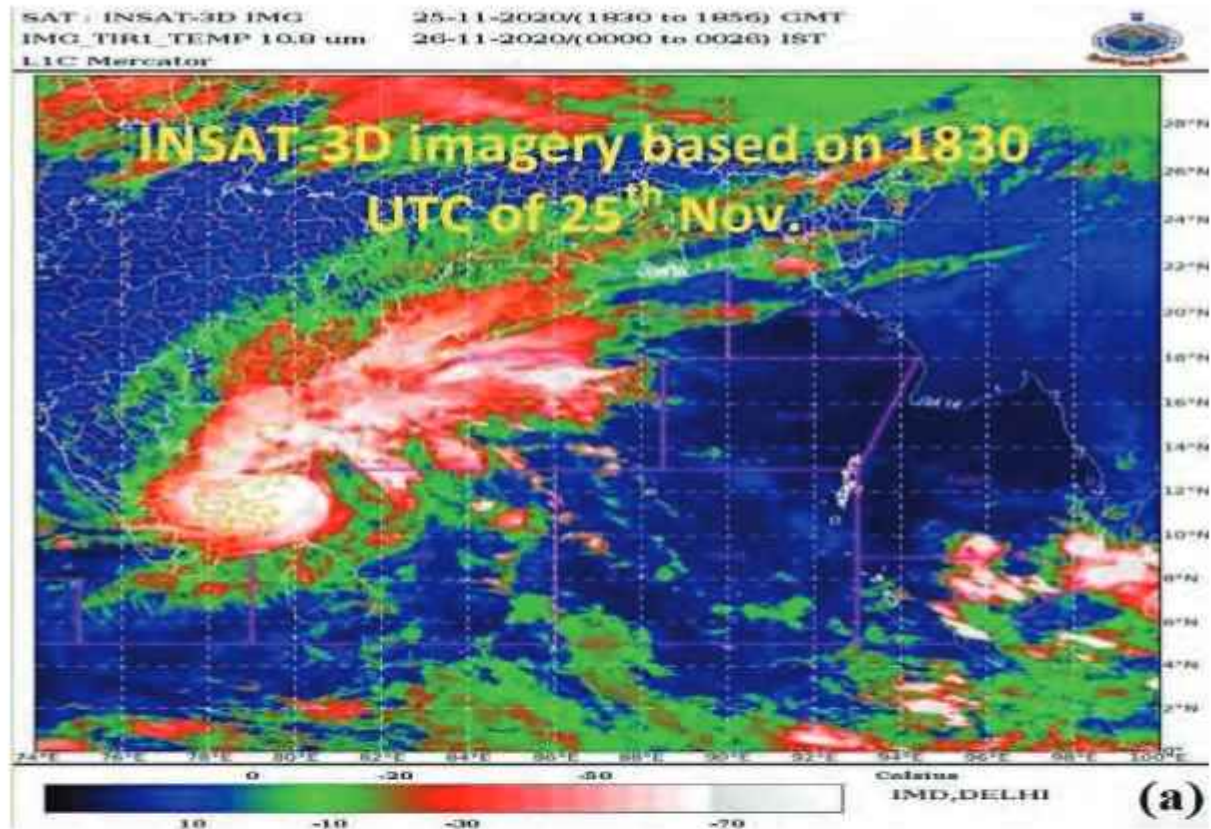


Figure 4: (a) INSAT imagery at 1830 UTC of 25th Nov, 2020 (b) INSAT imagery at 1300 hrs IST of 3rd Dec, 2020.

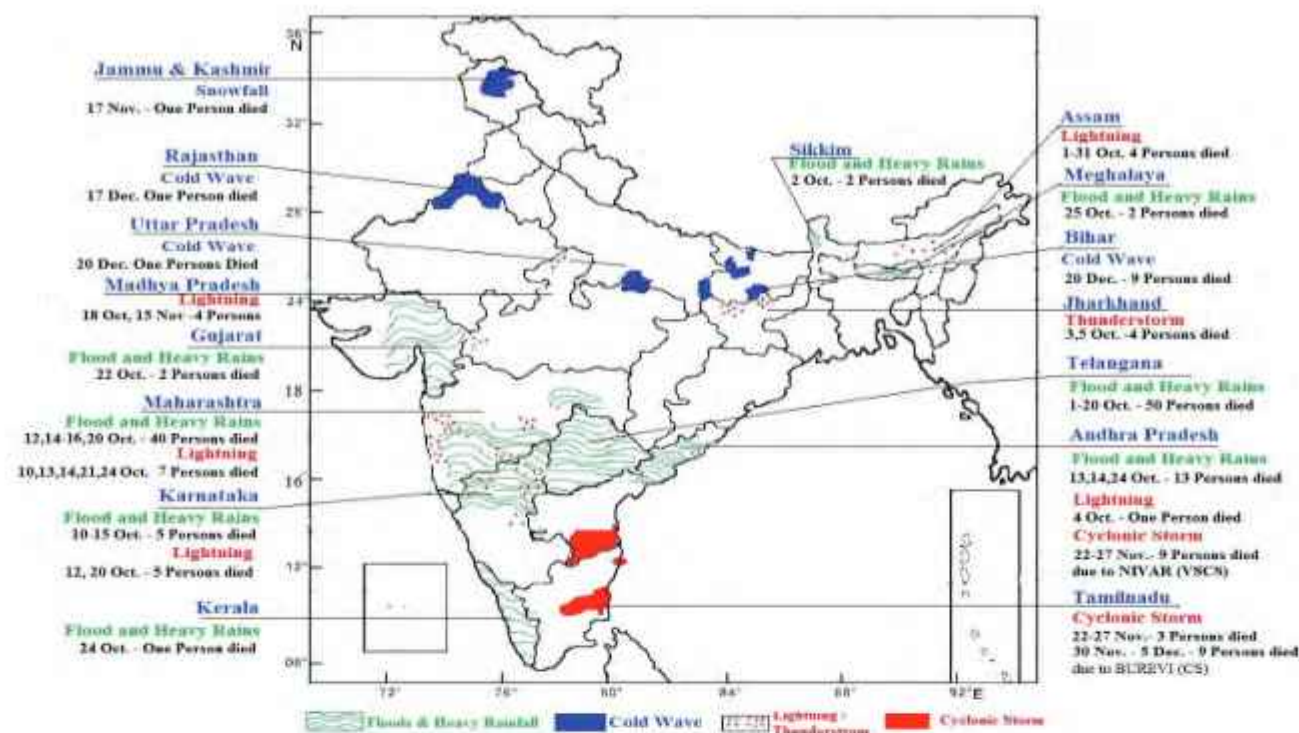


Figure 5: Significant Weather Events formed during Oct-Dec 2020 based on the real time data.
(Source : CDBI, IMD Pune).

claimed dead due to the cyclonic storms in the Bay of Bengal. 12 persons reportedly claimed dead due to VSCS NIVAR which formed during the period 22-27 November. Of these, 9 persons reportedly claimed dead from Chittoor, Cuddapah, Nellore districts of Andhra Pradesh and 3 from Chennai district of Tamil Nadu. Also, more than 10,000 livestock perished from Andhra Pradesh. While, due to CS BUREVI which formed during the period of 30 November to 5 December, 9 persons reportedly claimed dead and more than 200 livestock perished from Tamil Nadu. The states Tamil Nadu, Kerala and the Union territory Puducherry affected due to CS BUREVI. Agricultural, structural, etc. damage reported from the affected states viz. Tamil Nadu, Andhra Pradesh, Kerala & the Union territory Puducherry due to both the cyclones.

Lightning: Due to Lightning, total 17 persons reportedly claimed dead during 4 October to 25 November. Of these, 7 persons reportedly claimed dead from Hingoli, Nashik, Osmanabad, Pune, Ratnagiri, Thane districts of Maharashtra on 10, 13, 14, 21 & 24 October. 5 persons reportedly 7

claimed dead & more than 70 livestock perished from Bellary, Belgaum, Gulbarga, Yadgir districts of Karnataka on 11, 12 & 20 October. 4 persons reportedly claimed dead from Jhabua, Morena districts of Madhya Pradesh on 18 October & 15 November. While one person reportedly claimed dead from Visakhapatnam, Andhra Pradesh on 4th October.

Cold Wave: Total 11 persons reportedly claimed dead in the 2nd fortnight of December. Of these, 9 persons from Kaimur (Bhabua), Nawada, Saran, Sheohar, Vaishali districts of Bihar and one person from Banda, Uttar Pradesh on 20 December. While one person reportedly claimed dead from Sri Ganganagar, Rajasthan on 17 December.

Thunderstorms: 4 persons reportedly claimed dead from Chatra, Giridih, Palamu districts of Jharkhand on 3 & 5 October.

Acknowledgements

This report has been compiled by Dr. D. R. Pattanaik by referring to the inputs from IMD Pune, RSMC New Delhi and the monsoon report of 2020.