



Government of Odisha

FINAL MEMORANDUM

VERY SEVERE CYCLONIC STORM "TITLI" AND SUBSEQUENT FLOODS



October 2018

SPECIAL RELIEF COMMISSIONER
REVENUE & DISASTER MANAGEMENT DEPARTMENT
(DISASTER MANAGEMENT)

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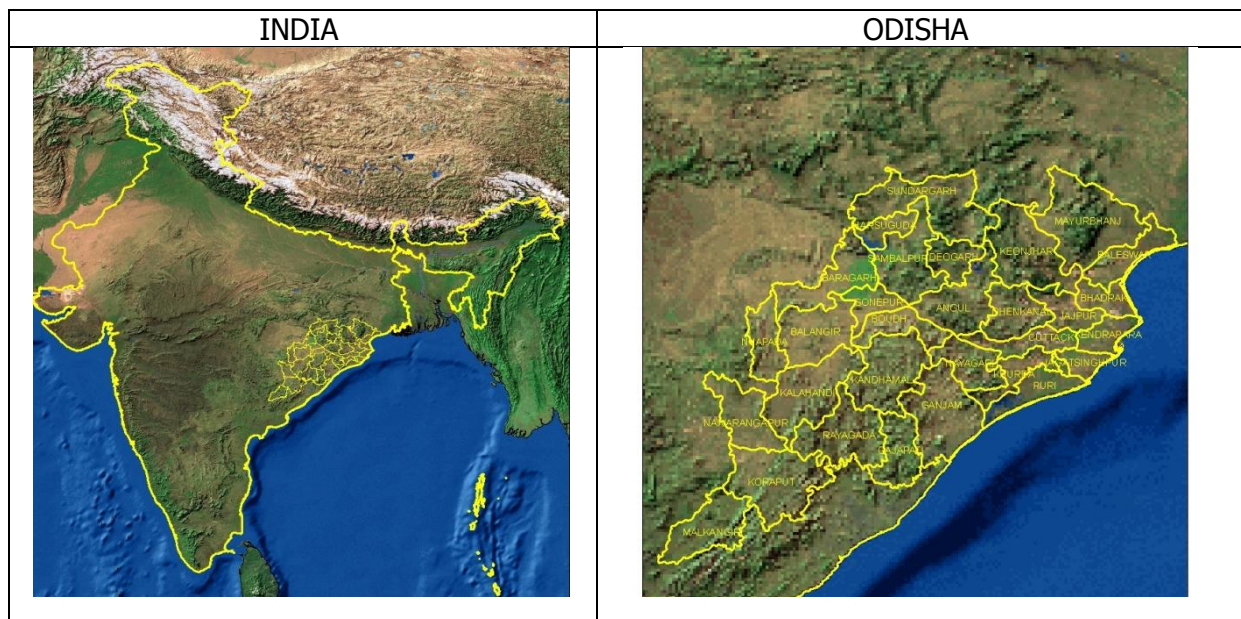
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Chapter- I

INTRODUCTION

State Profile

Odisha extends from 17° 49'N to 22° 36'N latitude and from 81° 36' E to 87° 18'E longitude on the eastern coast of India with an area of about 155,707 Sq km. The state is broadly divided into four geographically regions viz. the northern plateau, central river basins, eastern hills and coastal plains. The 480 km long coastline of Odisha is opened to Bay of Bengal. Besides, the State is intercepted by peninsular river systems like Subarnarekha, Budhabalang, Brahmani, Baitarani, Mahanadi, Rushikulya and Vansadhara, apart from a number of tributaries and distributaries. The state is divided into 30 districts for administrative convenience. The 30 districts have been subdivided into 58 sub-divisions and further divided into 314 blocks.



State's vulnerability to various disasters

The Odisha state is located in the eastern seaboard of India and is one of the most disaster prone states in the country. The 480 Kms of coastline, the 11 major river systems and the geo-climatic conditions make almost the entire State vulnerable to different disasters, particularly, floods, cyclones, droughts and heat waves. There are eleven major river systems in Odisha such as Subarnarekha, Budhabalanga, the Baitarani, Brahmani, Mahanadi, Rushikulya, Vansadhara, Nagabali, Indravati, the Kolab and Bahuda. Its densely populated coastal plains are the alluvial deposits of its river systems. The rivers in these areas with heavy load of silt have very little carrying capacity, resulting in frequent floods, only to be compounded by breached embankments. About two-third of the total cultivated area being rain-dependent, drought poses a serious threat at regular intervals in the event

of failure of Monsoon. Although the State has no experience of any significant earthquakes, its probability of occurrence in future cannot be ruled out. Though a large part of the state comes under Earthquake Risk Zone-II (Low Damage Risk Zone), the Brahmani-Mahanadi graven and their deltaic areas come under Earthquake Risk Zone-III (Moderate Damage Risk Zone) covering 44 out of the 106 urban local bodies of the state. Though the coastal area of the State was not affected by the tsunami of December 2004, it remains a potential hazard for the State. Disasters in the recent past, the heat wave of 1998; Super Cyclone in 1999, very severe cyclonic storm Phailin in 2013 and very severe cyclonic storm Phailin in 2013; floods in 2001, 2003, 2005, 2008 and 2011 and severe drought in 2002 and 2009 and 2015 revealed the many challenges that must be faced in order to improve its preparedness and emergency response to the frequently recurring disasters.

The Bureau of Material Technology and Promotion Council (BMTPC), Government of India has divided the state in to different multi hazard zones. The area statistics of the different disasters is given in the following Table. The geographical distribution of different hazard zones of Odisha is represented in the following Figure.



Type of Hazard	Particulars	% of Area vulnerable
Flood	Flood Prone	1.9%
	Flood Protected	2.4%
	Outside Flood Area	95.7%
Cyclone	198-180 Km/h	24.1%
	169.2 Km/h	3.3%

	158.9-140.9 Km/h	72.6%
Earthquake	Low damage risk Zone	84.2%
	Moderate damage risk zone	15.8%

Details of areas vulnerable to floods, cyclones and earthquakes

Source: *Vulnerability Atlas of India, 1996*

Disaster Occurrences in the recent past

One or other calamities like flood, cyclone or drought occur every year in Odisha and bring in its trail much loss and sufferings to the people and the state. The record of previous disasters in the State substantiates the fact that the state is prone to one or more forms of natural disasters. There are many instances where a particular area has been struck by a number of disasters simultaneously or repeatedly by one or the other type of disasters. Rivers flowing through the state expose vast areas to floods. The 480 Km coastline exposes the state to cyclones and storm surges. Droughts are also a regular feature as the western districts of the State are prone to repeated droughts. The state is also vulnerable to tornadoes, heat wave, fire, industrial hazards and human epidemics.

During the period from 1993-2017, the state has experienced 18 years of flood, 11 years of drought and 7 years of cyclone including super cyclone of 1999. The following table indicates the year wise occurrences of various disasters during last two decades with their geographically impacts in the state.

Year wise occurrences of various disasters.

Year	Calamity	Districts Affected
1993	Floods	27
1994	Floods Drought	5 10
1995	Floods & Cyclone	23
1996	Drought	28
1997	Drought	16
1998	Drought, Heat wave	26
1999	Super Cyclone	14
2000	Drought	29
2001	Floods	24
2002	Drought	29
2003	Floods	23

2004	Floods	05
2005	Floods	15
2006	Floods	27
2007	Floods (July) Floods (Aug & Sept)	12 15
2008	Floods (June &Sept)	21
2009	Flood Drought/ Pest Attack	17 18
2010	Flood Drought Cyclonic rain	6 17 23
2011	Flood	21
2013	Very Severe Cyclone Phailin Flood	18 13
2014	Very Severe Cyclone Hudhud Flood	15 27
2015	Drought Heavy Rain	27 14
2016	Flood and heavy rain Drought	6 4
2017	Flood and heavy rain Drought Pest Attack Unseasonal Rain	13 15 24 19

Vulnerability to Cyclones

The East Coast of India is one of the six most cyclone-prone areas in the world. Although the North Indian Ocean (the Bay of Bengal and Arabian Sea) generates only about 7% of the world's cyclones (5 to 6 TCs per year) their impact is comparatively high and devastating, especially when they strike the coasts bordering the North Bay of Bengal. The coastline of Odisha is only about 17% of the Indian east coast, it has been affected by nearly 35% of all cyclonic and severe cyclonic storms that have crossed the east coast and associated storm surges that have often inundated large tracts of coastal districts. On an average, about five to six tropical cyclones form in the Bay of Bengal every year, of which two to three are within the mild to severe range. The severe cyclonic events in the Bay of Bengal which have impacts on the Odisha coast are given in following Table. Taking together the storms and severe storms, coastal Odisha is about twice as vulnerable as compared to the other eastern states.

Sl.No	Date/Year	Category of Cyclone	Landfall and loss
1	7-12 October, 1737	Super Cyclone	Crossed West Bengal Coast over Sunderbans and had impact over Odisha
2	31 October, 1831	Very Severe Cyclonic Storm	Crossed Odisha Coast near Balasore, Loss of life- 50,000
3	2-5 October, 1864	Very Severe Cyclonic Storm	Crossed West Bengal Coast near Contai and had impact over Odisha
4	1-2 November, 1864	Very Severe Cyclonic Storm	Crossed Andhra Pradesh near Machilipatnam and had impact over Odisha
5	22 September, 1885	Super Cyclone	Crossed Odisha Coast at False Point, Loss of life- 5000
6	14-16 October, 1942	Very Severe Cyclonic Storm	Crossed West Bengal Coast near Contai and had impact over Odisha
7	8-11 October, 1967	Very Severe Cyclonic Storm	Crossed Odisha Coast between Puri and Paradeep
8	26-30 October, 1971	Very Severe Cyclonic Storm	Crossed Odisha Coast near Paradeep, Loss of life- 10,000
9	14-20 November, 1977	Super Cyclone	Crossed Andhra Coast near Nizampatnam and had impact over Odisha
10	4-11 May, 1990	Super Cyclone	Crossed Andhra Pradesh Coast about 40 Km S-W of Machlipatnam and had impact over Odisha
11	25-31 October, 1999	Super Cyclone	Crossed Odisha Coast near Paradeep at noon of 29 October
12	12-14 October, 2013	Very Severe Cyclonic Storm, Phailin	Crossed Odisha Coast near Gopalpur at evening of 12 October
13	12-14 October, 2014	Very Severe Cyclonic Storm 'Hudhud'	Crossed Andhra Pradesh Coast at Vishakapatnam and impact on south Odisha

The Building Material Technology Promotion Council (BMTPC) of Ministry of Urban Development, based on Hazard Vulnerability identified cyclone prone districts of Odisha taking into consideration cyclone hazards of the coastal area. As per wind and cyclone hazard Zones map of Odisha, out of 30 districts of the state, 14 districts are categorized as high damage risk zone either fully or partially.



Wind and Cyclone Hazard Zones of Odisha

During the last decade, the State has faced one or other forms of disasters like flood, cyclone, tornado or drought every year. From 1891 to 2000, 98 nos. of cyclones/ severe cyclones had crossed the Odisha coast. This is more than that of the coast of West Bengal, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Goa, Gujrat & Kerala. Most of the cyclones cross coast of Odisha, followed by Andhra Pradesh and Tamil Nadu and then West Bengal.

Total number of Cyclonic crossing different coasts (1891-2000)

State	Total No.
West Bengal	69
Odisha	98
Andhra Pradesh	79
Tamil Nadu	62
Karnataka	02
Maharashtra & Goa	18
Gujarat	28
Kerala	03

[Source: IMD]

Generally, two cyclone seasons i.e., one during pre-monsoon period (April, May & June up to onset of monsoon) and another post monsoon (October to December) prevail for the coast of Odisha. If the disturbances are grouped in terms of pre- and post- monsoon season, they are more in the post-monsoon season.

Vulnerability to Floods

Amongst all the natural disasters affecting the State, floods are the most frequent and devastating. Almost 80% of the annual rainfall is concentrated over a short monsoon period of 3 months. While the coastal plains are very flat, the slopes in the inlands are precipitous. This leads to heavy siltation, flash floods and poor discharge of flood waters into the sea and thus the embankments are breached with alarming frequency. High population densities in the flood-prone coastal and delta regions, increased encroachment in the flood plains because of comparatively better livelihood opportunities and development are important contributors to the increased vulnerability to flood. Poor socio-economic condition of the majority living in the flood plains, and the local economy being primarily dependent on the monsoon paddy add to the vulnerability of the community.

Heavy rainfall during monsoon causes floods in the rivers. Flow of water from neighbouring States of Jharkhand and Chhattisgarh also contributes to flooding. The flat coastal belts with poor drainage, high degree of siltation of the rivers, soil erosion, breaching of the embankments and spilling of floodwaters over them cause severe floods in the river basin and delta areas. In Odisha, rivers such as the Mahanadi, Subarnarekha, Brahmani, Baitarani, Rushikulya, Vansadhara and their many tributaries and branches flowing through the State expose vast areas to floods. In Odisha, damages are caused due to floods mainly in the Mahanadi, the Brahmani, and the Baitarani. These rivers have a common delta where flood waters intermingle, and when in spate simultaneously, wreak considerable havoc. This problem becomes even more acute when floods coincide with high tide. The water level rises due to deposits of silt on the river-bed. Rivers often overflow their banks or water rushes through new channels causing heavy damages.

The entire coastal belt is prone to storm surges, which is usually accompanied by heavy rainfall thus making the estuary region vulnerable to both storm surges and river flooding. Few districts in the western part of Odisha are prone to flash floods. The floods of 1980, 1982, 2001, 2003, 2008, 2011 and 2013 in the State were particularly severe; property worth crores of rupees was destroyed in the floods. The basin-wise major flood events during 200-2013 of the state is given in Table.

Basin wise-river wise floods – 2000 -2013

Event Year	Phases	River Basin	Districts affected	Type of Flood
2001	1 st Phase July-Aug	Mahandi, Brahmani, Baitarani, Subarnarekha & Budhabalanga	24	Severe
2003	1 st Phase July-Aug	Brahmani, Baitarani	2	Low
	2 nd Phase Aug-Sept	Mahandi, Baitarani, Indrabati, Nagabali, Kolab, Bansadhara	23	Severe
	3 rd Phase Oct	Rushikulya, Baitarani, Budhabalanga, Mahandi	13	High
2004	1 st Phase Aug	Baitarani, Subarnarekha, Budhabalanga	4	Medium
	2 nd Phase Oct	Bansadhara	2	Low
2005	1 st Phase June	Brahmani, Baitarani	3	Low
	2 nd Phase July-Aug	Mahandi, Brahmani, Baitarani	7	Medium
	3 rd Phase Sept	Subarnarekha, Budhabalanga, Bansadhara	4	Medium
2006	1 st Phase July	Mahandi, Baitarani, Subarnarekha, Bansadhara	18	High
	2 nd Phase Aug	Bansadhara, Budhabalanga, Subarnarekha, Baitarani	11	Medium
	3 rd Phase Aug	Mahandi, Baitarani, Subarnarekha, Budhabalanga	20	High
	4 th Phase Aug	Mahandi, Baitarani, Subarnarekha, Budhabalanga	20	High
	5 th Phase Aug	Mahandi, Baitarani, Subarnarekha	14	High
2007	1 st Phase July	Baitarani, Subarnarekha, Budhabalanga	11	Severe
	2 nd & 3 rd Phase Aug	Subarnarekha, Budhabalanga, Baitarani, Rushikulya, Bansadhara	15	High
	4 th Phase Sept	Subarnarekha, Budhabalanga, Baitarani,	10	Medium

		Rushikulya, Bansadhara		
2008	1 st Phase June	Baitarani, Subarnarekha, Budhabalanga	6	Severe
	2 nd Phase Sept	Mahandi, Brahmani, Baitarani	19	Severe
2009	1 st Phase Aug-Sept	Subarnarekha, Budhabalanga, Baitarani, Mahandi, Rushikulya, Nagabali	17	Medium
2010	1 st Phase Aug-Sept	Indrabati, Bansadhara, Kolab	6	Low
2011	1 st Phase June	Subarnarekha, Budhabalanga	4	Low
	2 nd Phase Aug	Subarnarekha	4	Low
	3 rd Phase Sept	Mahandi	19	Severe
	4 th Phase Sept	Subarnarekha, Budhabalanga, Baitarani, Brahmani	10	Severe
2012	1 st Phase Aug	Mahanadi	4	Low
	2 nd Phase Nov	Rushikulya	1	Low
2013	1 st Phase Oct	Baitarani, Subarnarekha, Budhabalanga, Rushikulya	6	Severe
	2 nd Phase Oct	Mahandi, Baitarani, Brahmani, Subarnarekha, Budhabalanga, Rushikulya	13	High

Chapter- II

CYCLONE FORECAST

India Meteorological Department (IMD) reported on 7.10.2018 about formation of a low pressure area over south east of Bay of Bengal and adjoining North Andaman Sea and likely formation of a well marked during next 12 hours and intensification into a deep depression. The low pressure area became a well marked low pressure area over the same region at 17.30 of 7.10.2018. It was predicted that the system would very likely to concentrate into a Depression during next 24 hours and very likely to move north-westwards towards Odisha coast during next 72 hours.

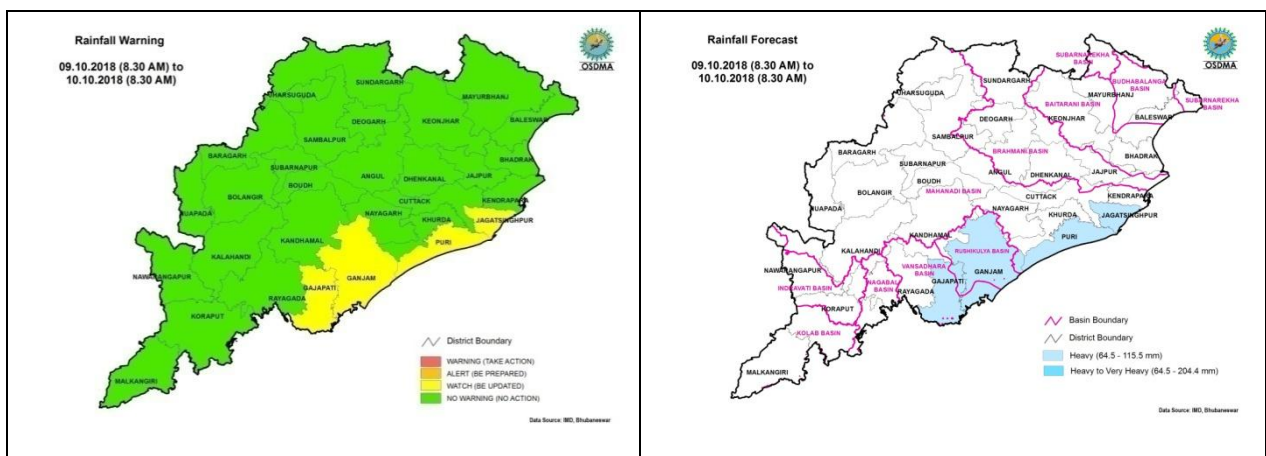
On 8.10.2018 at 2.00 PM, IMD informed that the well marked low pressure area over southeast and adjoining east-central Bay of Bengal concentrated into a depression and laid centred at 0830 hrs IST of 8th October 2018 over east-central Bay of Bengal, near latitude 14.0°N and longitude 88.8°E, about 720 km south-southeast of Gopalpur (Odisha) and 690 km southeast of Kalingapatnam (Andhra Pradesh). It would very likely to intensify further into a Deep Depression during next 24 hours and into a Cyclonic Storm during subsequent 24 hours. It would very likely to move north-westwards towards Odisha and adjoining north Andhra Pradesh coasts during next 72 hours. The forecast was as follows:

Date	Time	Max. sustained surface winds speed (KMPH)	Category of cyclonic disturbance
08.10.18	0830 IST	40-50 gusting to 60	Depression
08.10.18	1730 IST	45-55 gusting to 65	Depression
09.10.18	0530 IST	50-60 gusting to 70	Deep Depression
09.10.18	1730 IST	55-65 gusting to 75	Deep Depression
10.10.18	0530 IST	60-70 gusting to 80	Cyclonic Storm
10.10.18	1730 IST	65-75 gusting to 85	Cyclonic Storm
11.10.18	0530 IST	70-80 gusting to 90	Cyclonic Storm

After getting this information from the IMD, the State Government started closely monitoring the situation. Based on the forecast issued from IMD and other international Agencies, the tracking of the system was thoroughly done by the Experts of Odisha State Disaster Management Authority (OSDMA) in GIS platform, possibility of its likely impact over

the Odisha. The position and movement of the system was intimated to all the Collectors and to the print and electronic media.

On 9.10.2018 at 8.00 AM, IMD reported that the depression over east central Bay of Bengal intensified into deep depression at 2330 hrs IST of 8th October,2018 and moved further west-northwestwards with a speed of about 11 kmph in last 03 hours, and laid centered at 0230 hrs IST of 9th October 2018 near latitude 14.6°N and longitude 87.3°E, about 570 km southeast of Gopalpur (Odisha) and 530 km southeast of Kalingapatnam (Andhra Pradesh). It would very likely to intensify into a Cyclonic Storm during next 24 hours. It would very likely to move westnorthwestwards for some more time and then northwestwards towards Odisha & adjoining north Andhra Pradesh during next 72 hours. The rainfall prediction with colour code was given by IMD in its bulletin. Maps were prepared and shared to the districts for taking further action.



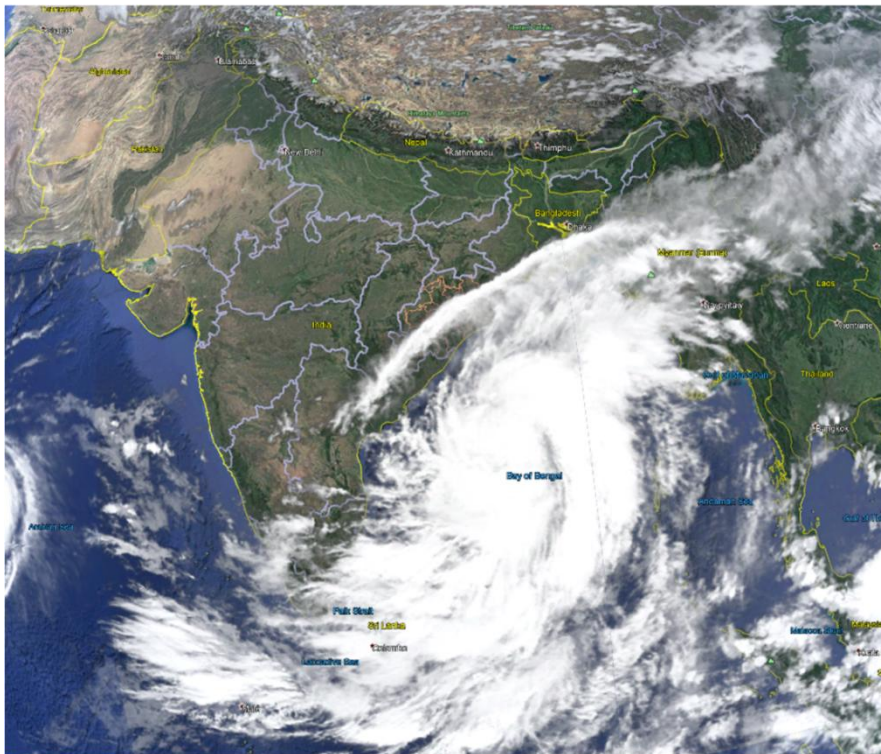
The warning message regarding the intensity of cyclone was changed suddenly after 6 hours by IMD. Earlier predicted landfall as a cyclonic storm was changed into Severe Cyclonic Storm. An "Orange Message" (Cyclone warning) was issued at 4.00 PM on 9.10.2018 that the Deep Depression had intensified



into a Cyclonic Storm named as "TITLI", centered over west-central Bay of Bengal at latitude 14.8°N and longitude 86.7° E, about 530 km southeast of Gopalpur, Odisha and 489 km east-southeast of Kalingapatnam, Andhra Pradesh. It would likely to be intensified into

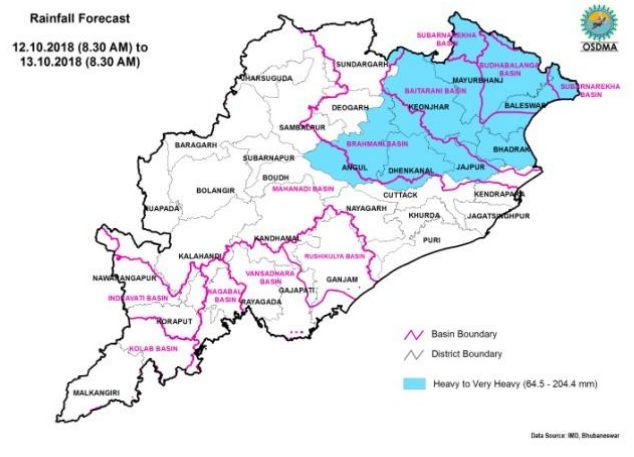
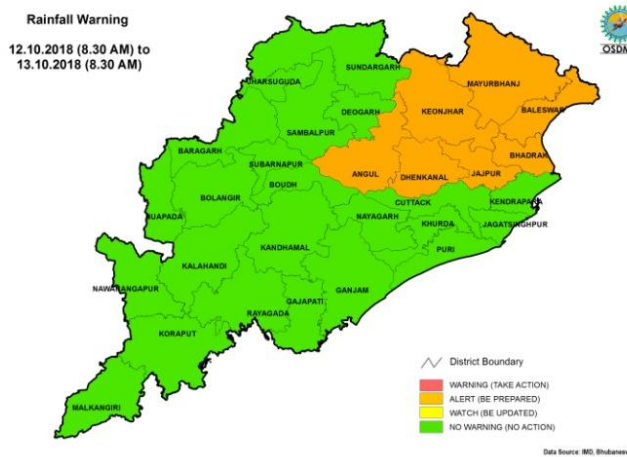
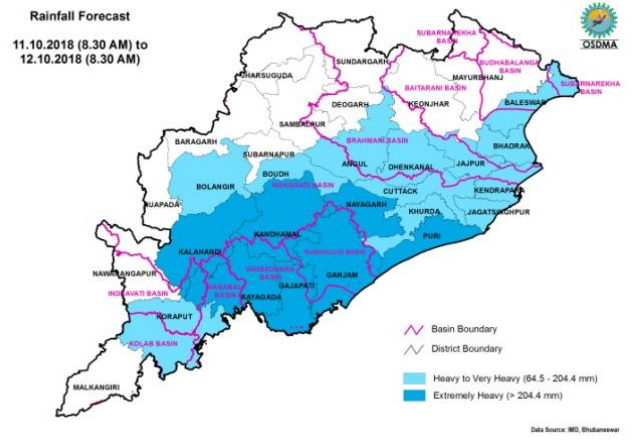
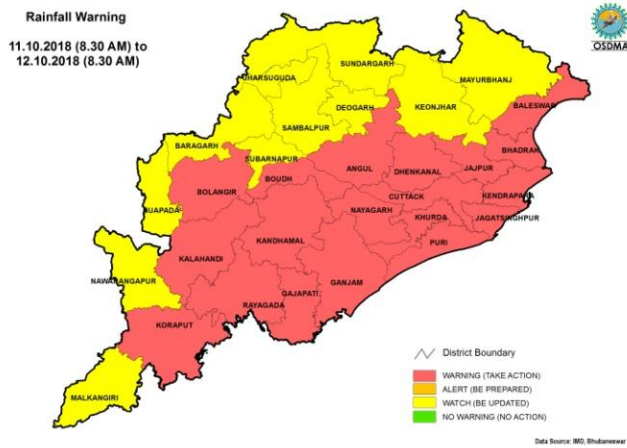
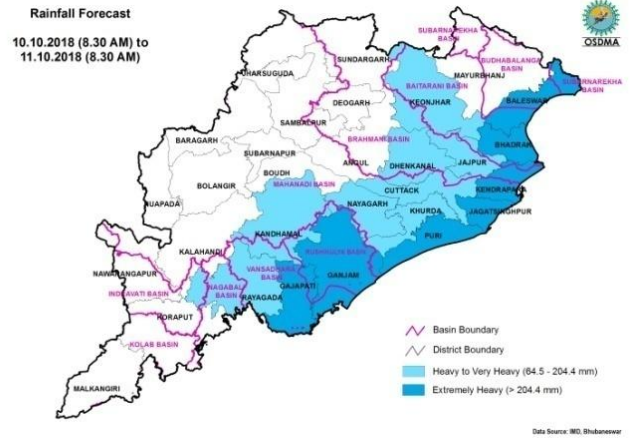
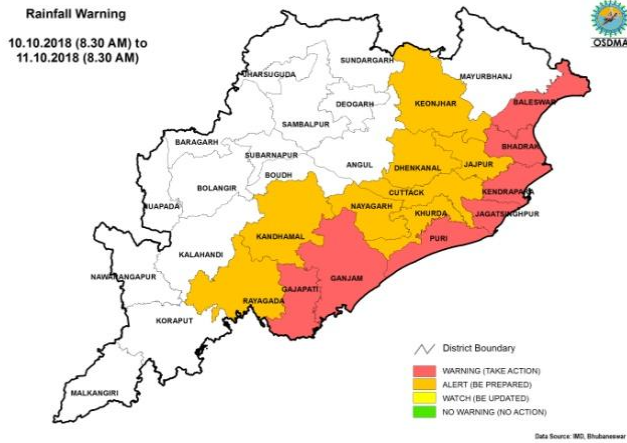
Severe Cyclonic Storm during 24 hours and cross Odisha and adjoining North Andhra Pradesh coast between Gopalpur and Kalingapatnam around morning of 11th October, 2018.

Date: 09.10.2018 Time: 13.30 IST



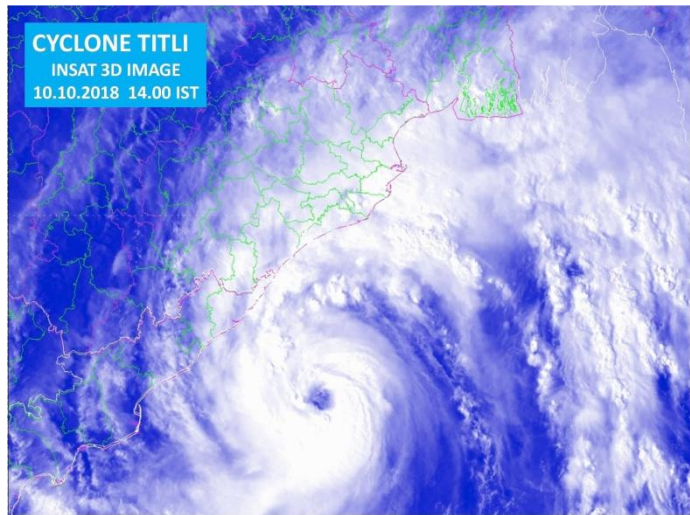
The same message about the landfall warning was continued up to 6.00 AM of 10.10.2018. Suddenly, at 9.45 AM, IMD issued a red message for intensification of the Titli as severe Cyclonic Storm and forecasted its intensification as Very Severe Cyclonic Storm with a wind speed of 120-130 kmph during next 18 hours. The earlier forecasted rainfall was modified as follows:

Date	Time	Max. sustained surface winds speed (KMPH)	Category of cyclonic disturbance
10.10.18	0530 IST	100-110 gusting to 125	Severe Cyclonic Storm
10.10.18	1130 IST	105-115 gusting to 130	Severe Cyclonic Storm
10.10.18	1730 IST	110-120 gusting to 135	Severe Cyclonic Storm
10.10.18	2330 IST	120-130 gusting to 145	Very Severe Cyclonic Storm
11.10.18	0530 IST	120-130 gusting to 145	Very Severe Cyclonic Storm
11.10.18	1730 IST	70-80 gusting to 90	Cyclonic Storm
12.10.18	0530 IST	50-60 gusting to 70	Deep Depression



Accordingly, all the Collectors were informed about the system well in advance. They were directed to take all precautionary/ preparatory measures to meet the cyclone impact.

As per the national Bulletin issued by IMD at 1.30 PM on 10.10.2018, the Severe Cyclonic Storm 'TITLI' over westcentral Bay of Bengal moved northwestwards with a speed of about 15 kmph during past 06 hours, intensified into a Very Severe Cyclonic Storm and lay cantered at 1130 hrs IST 10th October 2018 over west-central Bay

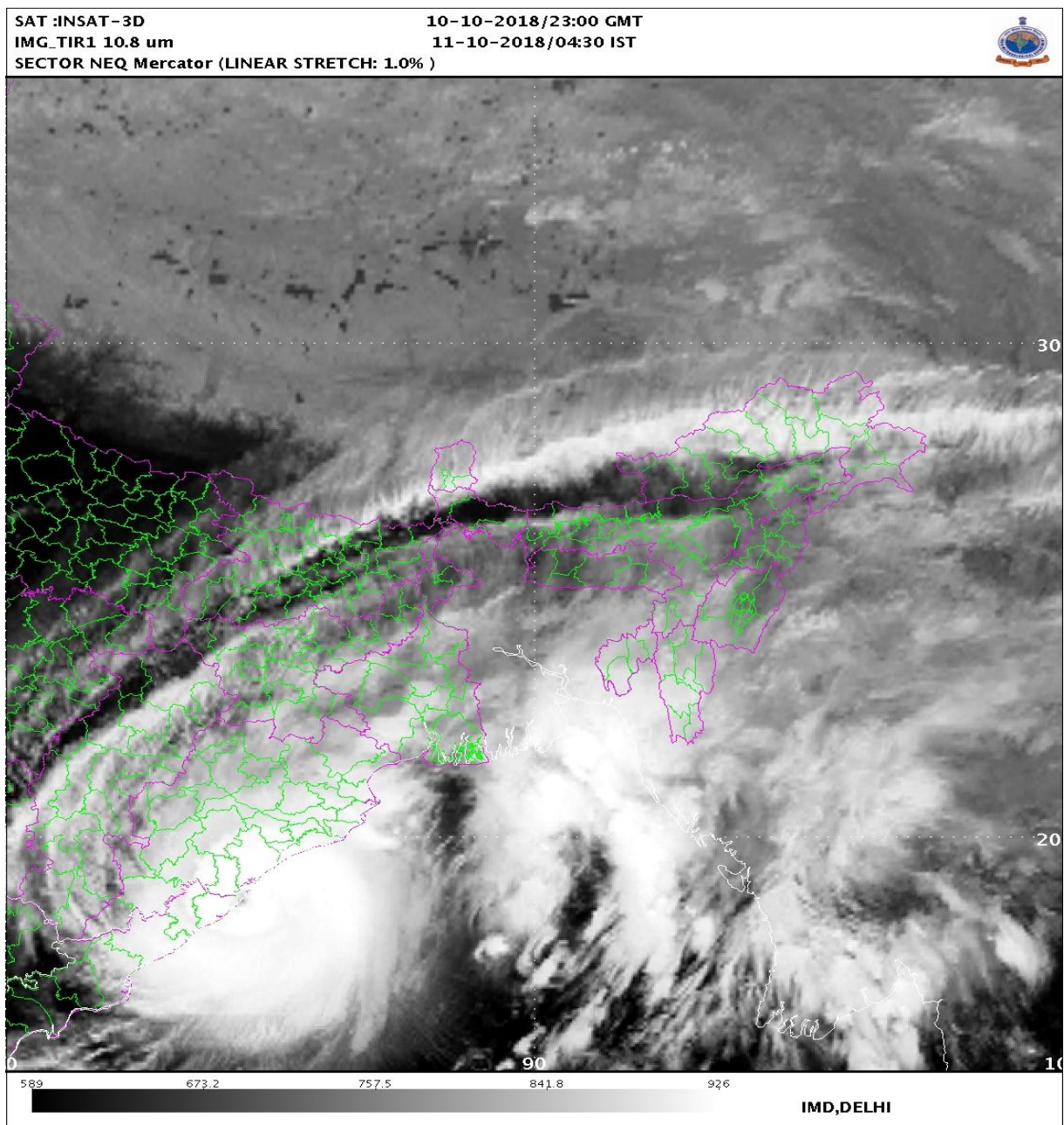


of Bengal near latitude 16.8°N and longitude 85.6°E, about 280 km southsoutheast of Gopalpur (Odisha) and 230 km southeast of Kalingapatnam (Andhra Pradesh). It would very likely to intensify further during next 12 hours. It would very likely to move north-northwestwards and cross Odisha & adjoining north Andhra Pradesh coasts between Gopalpur&Kalingapatnam around morning of 11th October. Thereafter, it would very likely to re-curve northeastwards, move towards Gangetic West Bengal across Odisha and weaken gradually. The cyclone was closely monitored at the State Emergency Operation Center.

The cyclone 'Titli' crossed between north Andhra Pradesh and south Odisha coast near 18.8° N and 84.5° E (near Palasa, Srikakulam district) to the southwest of Gopalpur, as a Very Severe Cyclonic Storm with estimated maximum sustained surface wind speed of 140-150 kmph gusting to 165 kmph between 0430 and 0530 hours IST of 11th October 2018. Gopalpur reported 102 kmph and Kalingapatnam reported 56 kmph surface wind speed at 0530 hrs IST of 11th October.

The Cyclone moved further northwestwards with a speed of about 14 kmph during past 06 hours, weakened into a Severe Cyclonic Storm and laid centred at 1130 hrs IST of 11th October 2018 over south Odisha near latitude 19.3°N and longitude 83.8°E, about 110 km west of Gopalpur and 140 km southwest of Phulbani. Then, it remained practically stationary, weakened slightly further and laid centred at 1430 hrs IST 11th October 2018 over south Odisha near latitude 19.3°N and longitude 83.8°E, about 110 km west of Gopalpur and 140 km southwest of Phulbani. Gopalpur reported 65 Kmph surface wind at 1430 hours IST of 11th October 2018. After that it moved northeastwards in past six hours with speed 15 kmph and laid centred at 2030 hrs IST of 11th October 2018 over south Odisha near latitude 20.1°N and longitude 84.0°E, 90 km east-northeast of Bhawanipatna and 50 km west-southwest of Phulbani.

The deep depression weakened into depression and moved northeast words in past six hours with a speed of 12kmph and centred near latitude 20.9⁰ N and longitude 85.5⁰ E about 80 km south of Kenonjhar on 12.10.2018 at 14.30 IST. Then it moved east northeast word with a speed of 17 kmph and continued to move the same path. The deep depression weakened into a depression near latitude 20.19⁰ N and longitude 85.5⁰ E. Further it moved northeast toward and weakened into a well mark low pressure area over Gangetic West Bengal and neighborhood at 5.30 hrs of 13.10.2018. It further weakened into a low pressure area and laid over Gangetic West Bengal and adjoining Bangaldesh and north Bay of Bengal at 8.30 hrs of 13.10.2018.



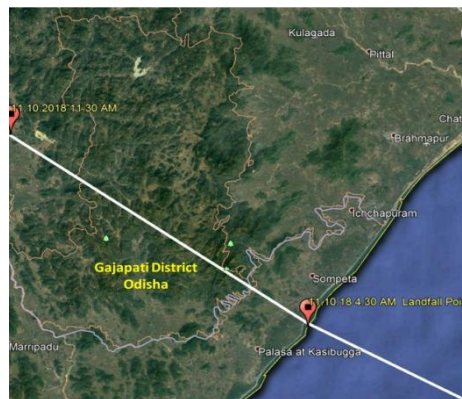
Satellite image of cyclone Titli during Landfall on 11.10.2018 at 4.30 AM.

Chapter – III

OCCURRENCE & INTENSITY

Landfall & Wind Speed

The Cyclone "Titli" made landfall at 0430AM on 11th October 2018 between north Andhra Pradesh and south Odisha coast near Palasa of Srikakulam District (AP) as a Very Severe Cyclonic Storm. As reported by IMD, the maximum sustained surface wind speed of 140-150 kmph gusting to 165 kmph during landfall. Gopalpur, Odisha reported 102 kmph surface wind speed at 05.30 AM on 11th October. After passing through coast the storm entered into the Gajapati district which is about 18km from the coastline. It continued in its path for 5 hours in Gajapati district maintaining about 130-140 kmph and gradually weakened in to Severe Cyclonic storm.



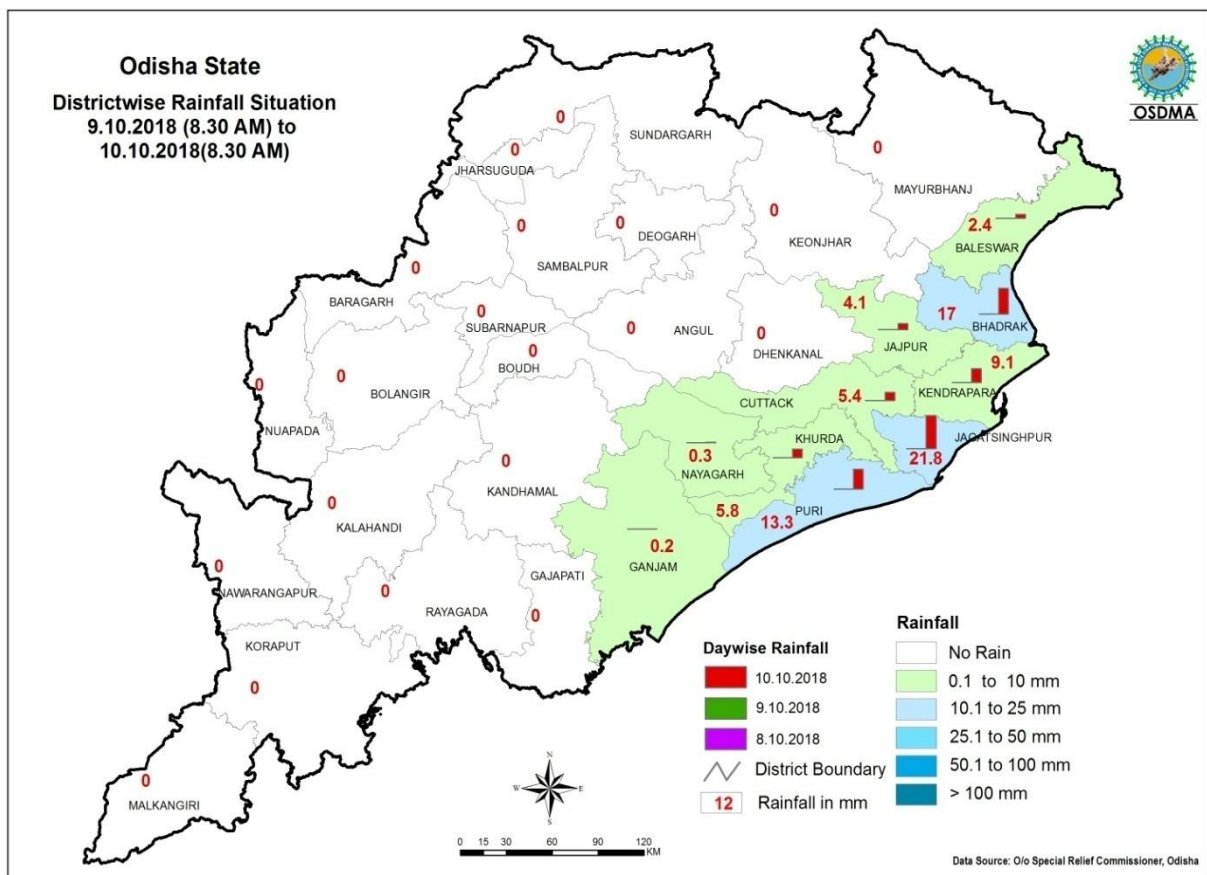
The cyclone recurved its path between Rayagada&Kandhamal district and passed through Nayagarh, Cuttack, Dhenkanal, Jajpur, Bhadrak, Balasore and Mayurbhanj districts of Odisha and entered into the Gangetic West Bengal on 13.10.2018. The coastal and adjoining districts of the state experienced high wind and very heavy rainfall during period 11th to 13th October, 2018.

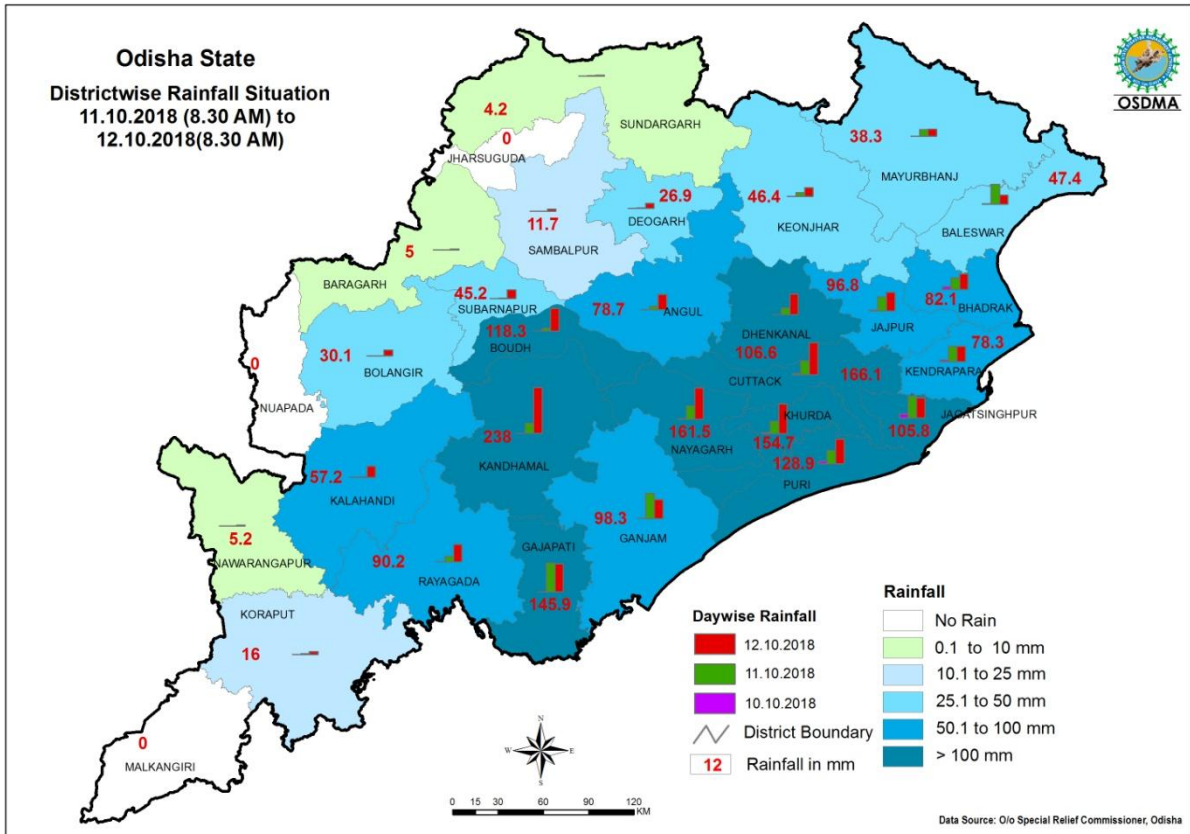
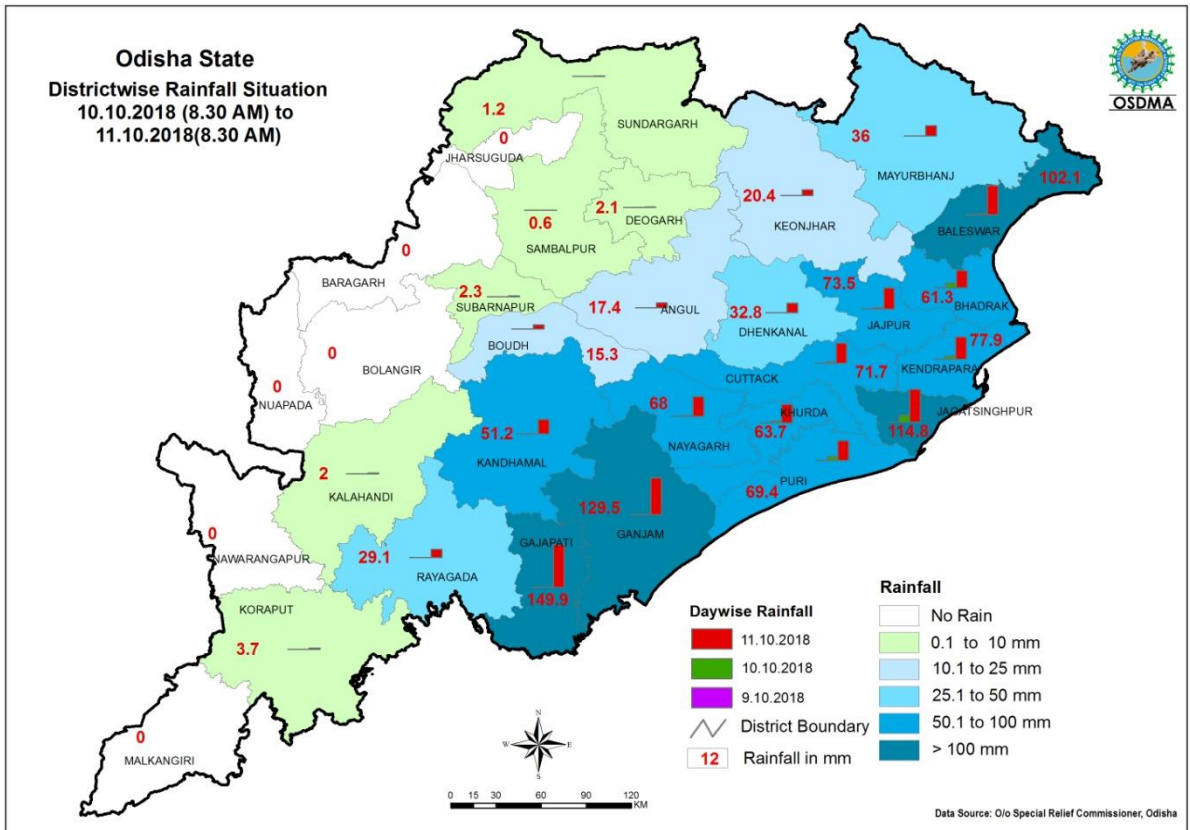
Rainfall (from 10th to 13th October 2018)

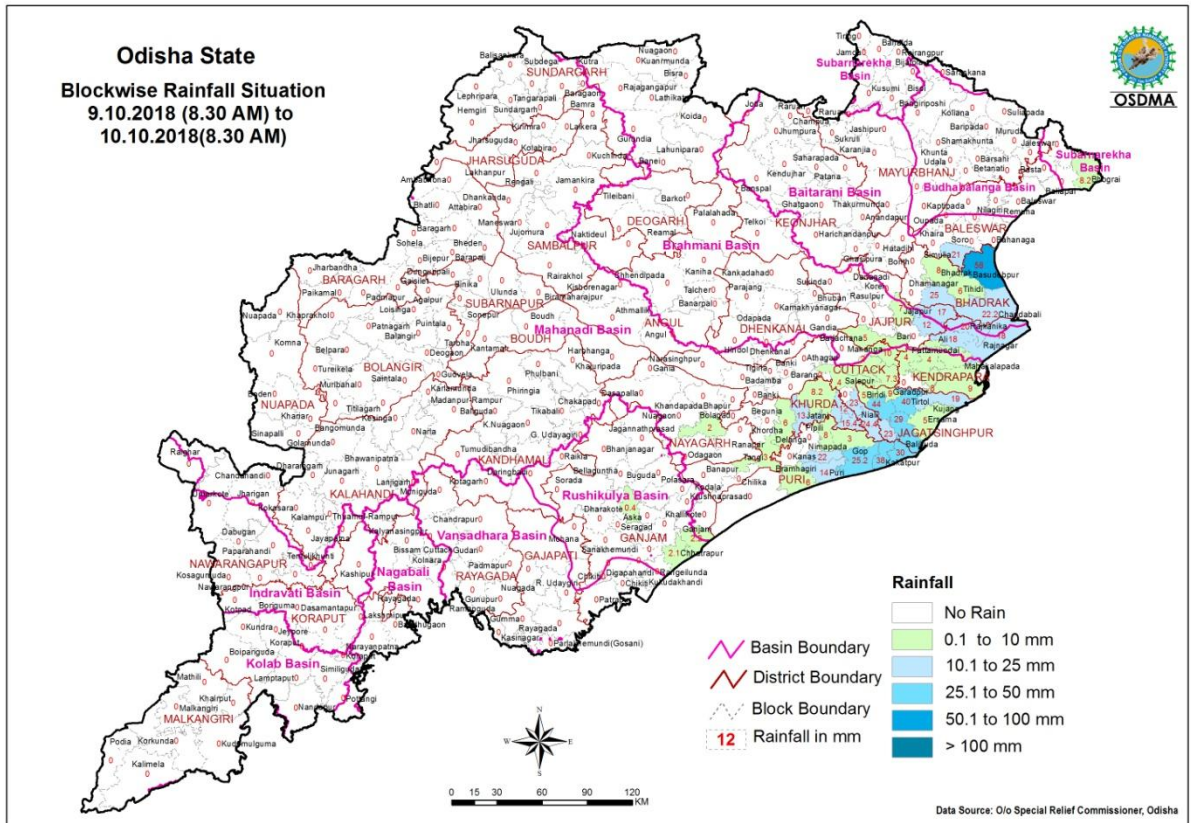
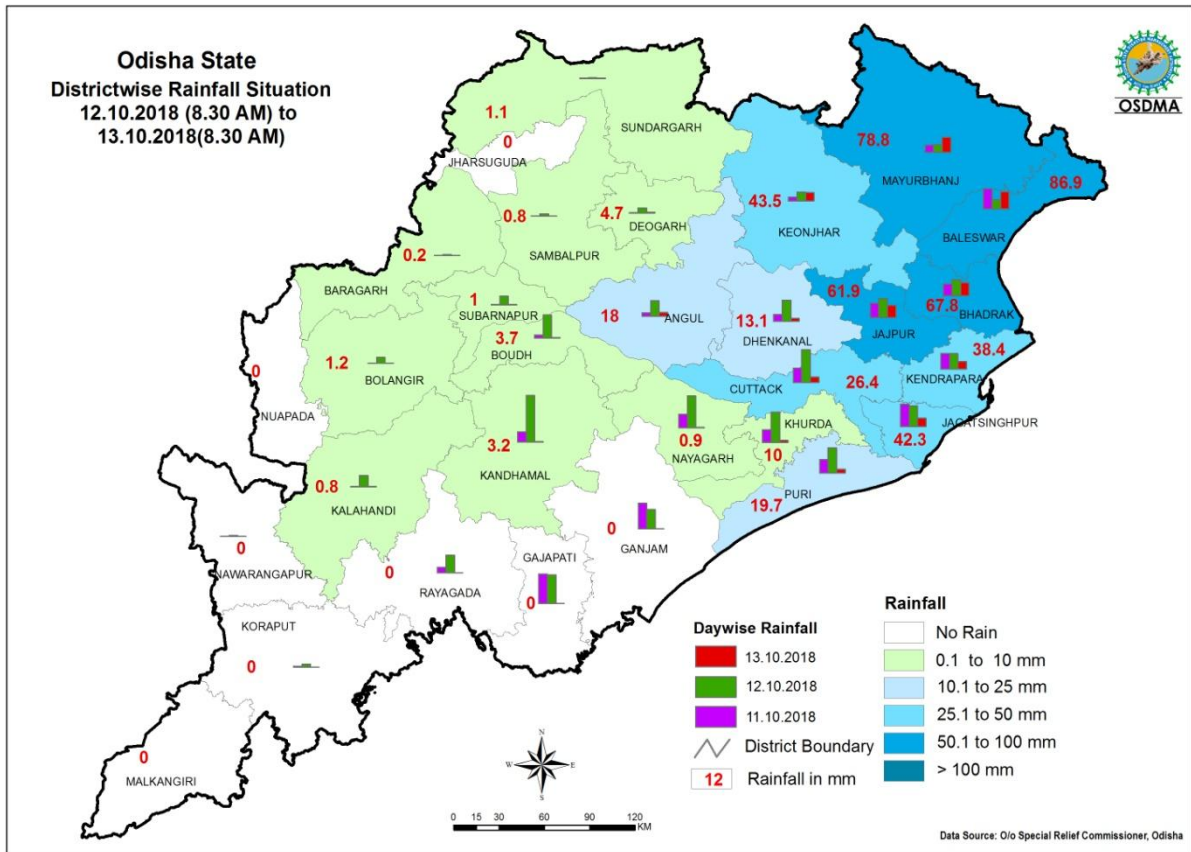
Under the influence of the cyclone, very heavy rainfall occurred in many parts of the state from 10th to 13th October 2018. The cumulative amount of rainfall during this period was as high as 295.8 mm in Gajapati district followed by 292.4 mm in Kandhamal District. The average rainfall of the affected districts recorded from 10th to 13th, October 2018 is indicated below:

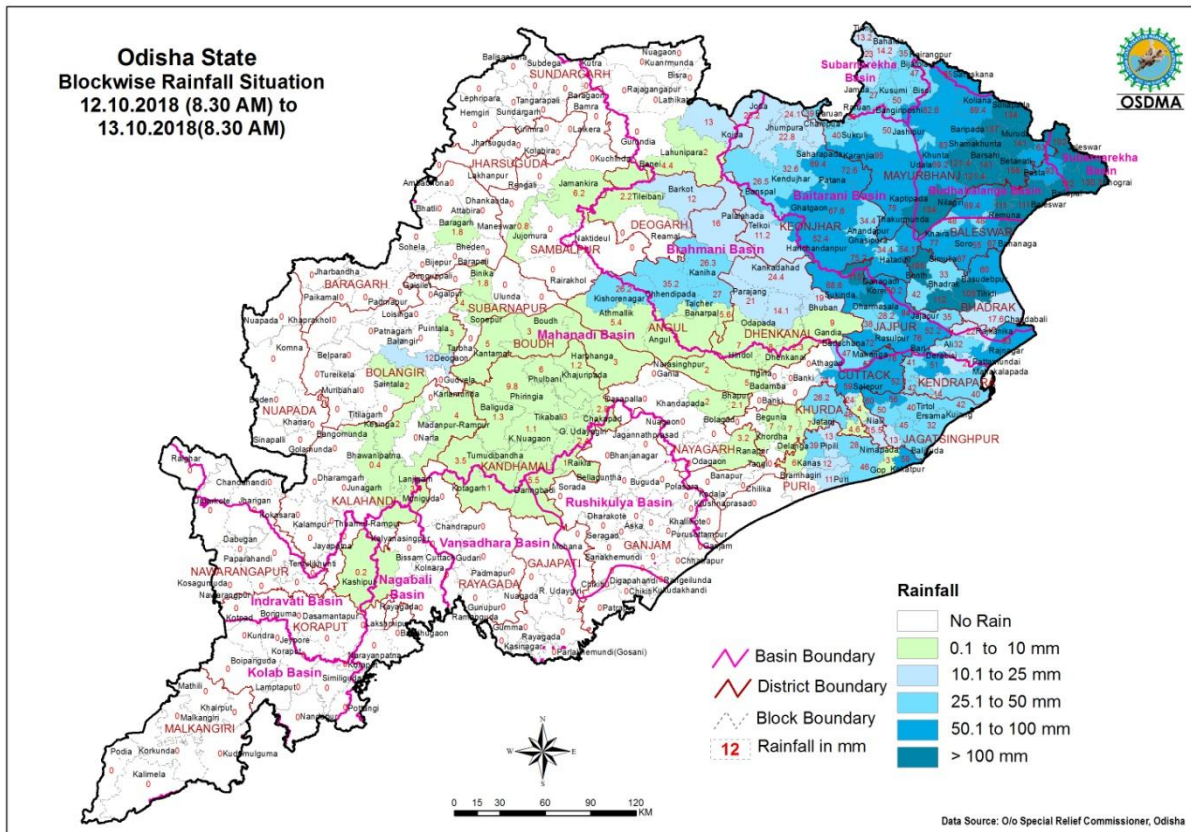
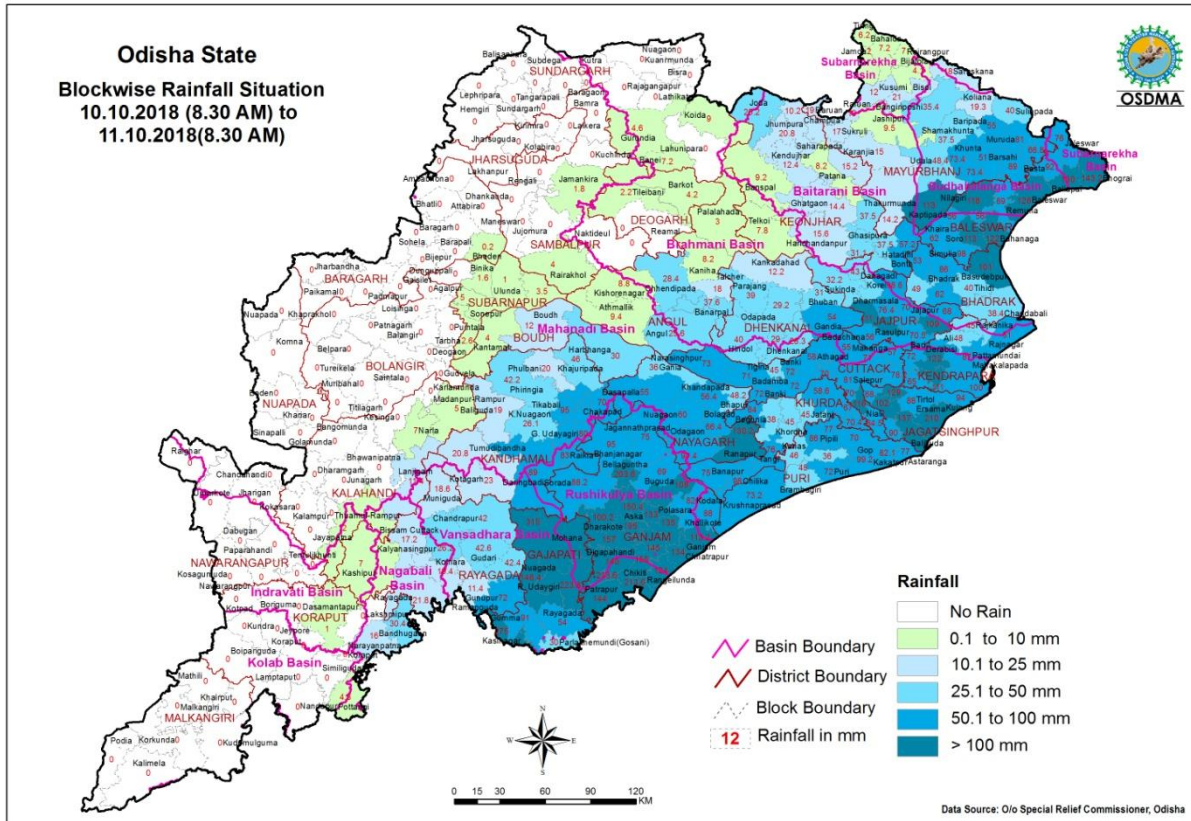
SI No	District	Rainfall in mm				Total Rainfall in mm
		Oct 10 th	Oct 11 th	Oct 12 th	Oct 13 th	
1	Gajapati	0.0	149.9	145.9	0.0	295.8
2	Kandhamal	0.0	51.2	238.0	3.2	292.4
3	Jagatsinghpur	21.8	114.8	105.8	42.3	284.5
4	Cuttack	5.4	71.7	166.1	26.4	269.6
5	Balasore	2.4	102.1	47.4	86.9	238.8

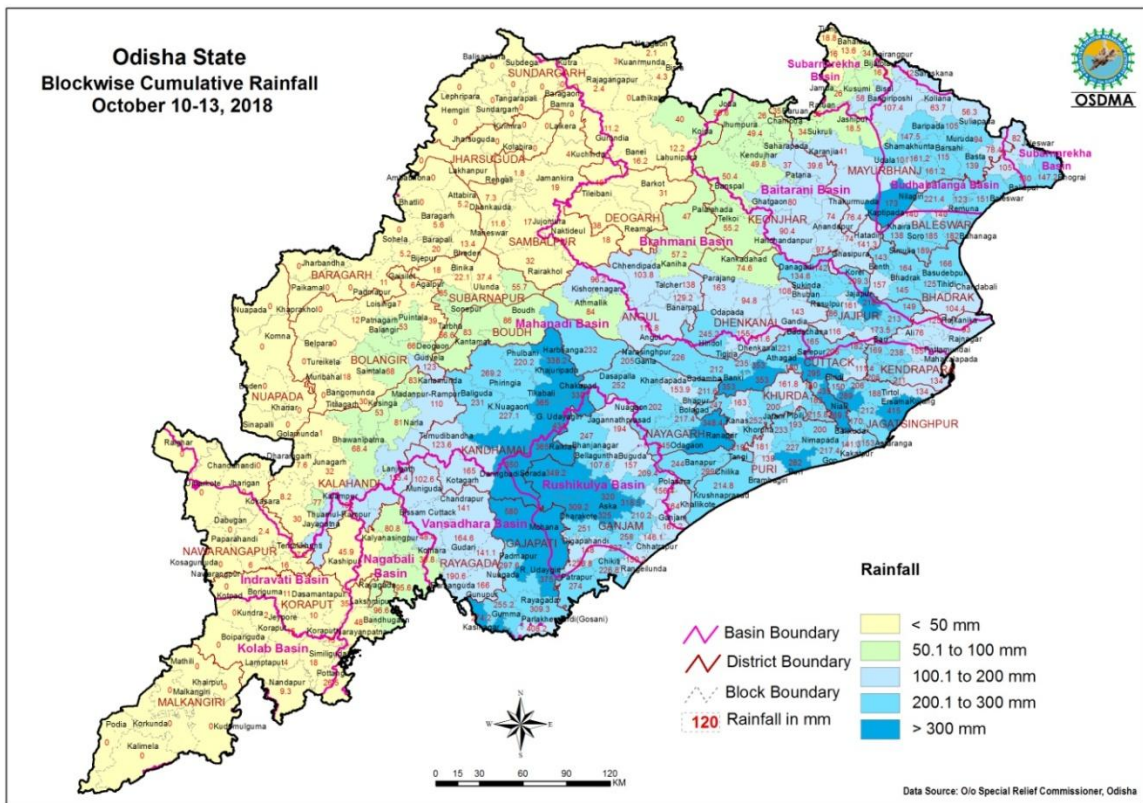
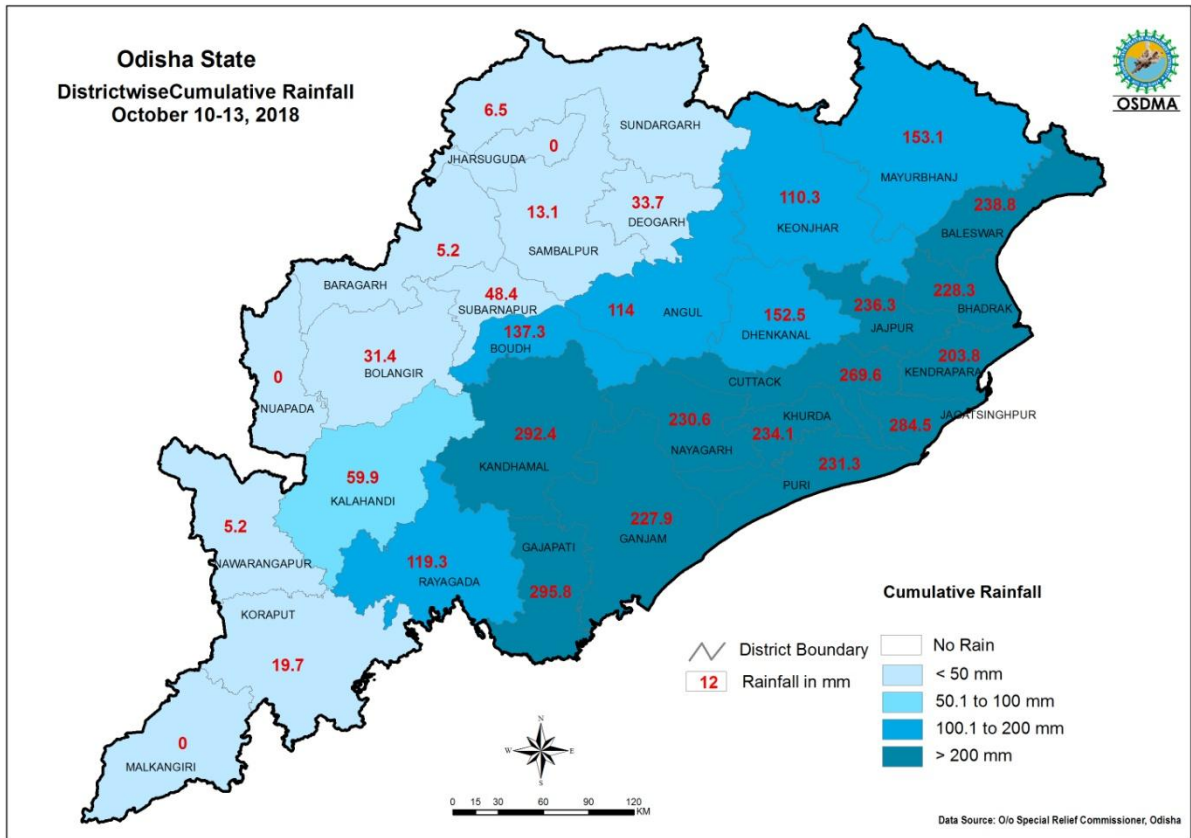
6	Jajpur	4.1	73.5	96.8	61.9	236.3
7	Khordha	5.8	63.7	154.7	10.0	234.1
8	Puri	13.3	69.4	128.9	19.7	231.3
9	Nayagarh	0.3	68.0	161.5	0.9	230.6
10	Bhadrak	17.0	61.3	82.1	67.8	228.3
11	Ganjam	0.2	129.5	98.3	0.0	227.9
12	Kendrapara	9.1	77.9	78.3	38.4	203.8
13	Mayurbhanj	0.0	36.0	38.3	78.8	153.1
14	Dhenkanal	0.0	32.8	106.6	13.1	152.5
15	Rayagada	0.0	29.1	90.2	0.0	119.3
16	Angul	0.0	17.4	78.7	18.0	114.0
17	Keonjhar	0.0	20.4	46.4	43.5	110.3











Rivers flooding

Due to heavy rainfall from 11th to 13th October 2018, Rusikulya, Vansadhara, Baitarani, Budhabalanga and Jalaka rivers witnessed flood situations. The torrential downpour in the upper catchment of Rushikulya River caused heavy flood situations in the many blocks of Ganjam district. The highest water level recorded in different Rivers during this period is given below:

River	Forecast station	DL	WL	Water Level in Meter		
				Oct 11	Oct 12	Oct 13
Rushikulya	Purushottampur	16.83	15.83	18.23	18.60	17.48
Vansadhara	Gunupur	84.0	83.0	85.15	84.91	84.0
	Kashinagar	54.6	53.6	56.12	56.30	54.47
Baitarani	Akhuapada	17.83	16.83	16.34	17.38	18.05
Budhabalanga	N.H-5 (Govindpur)	8.13	7.21	3.30	8.02	8.24
Jalaka	Balasore (Mathani)	5.50	-	6.0	6.41	6.88

Chapter- IV

Rainfall Details

Due to the effect of cyclonic storm the State faced torrential rainfall from 11th to 13th October 2018. Many of the Blocks in the State received rainfall of more than 100.00mm. The details of rainfall recorded at various stations are given below:

RAINFALL STATUS OF THE NINETEEN DISTRICTS					
FROM Dt.11.10.2018 to Dt.13.10.2018					
District – Angul			(Rainfall in mm.)		
Sl. No.	Name of the Block/ Station	DATE			Total
		11	12	13	
1	Angul	25.6	87.2	2.0	114.8
2	Banrapal	37.6	91.6	5.6	134.8
3	Chhendipada	28.4	75.4	35.2	139.0
4	Talcher	18.0	120.0	27.0	165.0
5	Kaniha	8.2	49.0	26.3	83.5
6	Athamallik	9.4	74.6	5.4	89.4
7	Kishorenagar	8.8	87.4	26.2	122.4
8	Pallahara	3.0	44.0	16.0	63.0
Average		17.4	78.7	18.0	114.0
District - Balasore					
1	Bhograi	143.2	4.0	130.3	277.5
2	Basta	92.0	13.0	93.0	198.0
3	Jaleswar	76.0	6.0	102.0	184.0
4	Baliapal	130.0	0.0	112.0	242.0
5	Balasore	126.0	25.0	111.0	262.0
6	Remuna	89.0	34.0	111.0	234.0
7	Nilagiri	118.0	103.4	69.4	290.8
8	Soro	113.0	72.0	55.0	240.0
9	Bahanaga	122.0	60.0	67.0	249.0
10	Simulia	98.0	91.0	67.0	256.0
11	Khaira	62.0	76.0	77.0	215.0
12	Oupada	56.0	84.0	48.0	188.0
Average		102.1	47.4	86.9	236.4

District - Bhadrak					
1	Bhadrak	86.0	78.0	33.0	197.0
2	Bhandaripokhari	49.0	108.0	42.0	199.0
3	Basudevpur	101.0	65.0	60.0	226.0
4	Bonth	53.0	90.0	105.0	248.0
5	Chandbali	38.4	66.0	17.6	122.0
6	Dhamnagar	62.0	83.0	112.0	257.0
7	Tihidi	40.0	85.0	105.0	230.0
Average		61.3	82.1	67.8	211.3
District - Boudh					
1	Boudh	12.0	74.0	3.0	89.0
2	Kantamal	4.0	79.0	5.0	88.0
3	Harabhanga	30.0	202.0	3.0	235.0
Average		15.3	118.3	3.7	137.3
District - Cuttack					
1	Athagarh	58.0	163.0	0.0	221.0
2	Banki-Dampada	72.0	281.0	0.0	353.0
3	Barang	70.0	110.0	24.0	204.0
4	Baramba	71.0	141.0	5.0	217.0
5	Cuttack Sadar	81.0	214.0	59.0	354.0
6	Kantapara	116.0	319.0	4.0	439.0
7	Mahanga	57.0	125.0	78.0	260.0
8	Niali	84.5	185.2	15.5	285.2
9	Nischintakoili	78.2	33.2	52.1	163.5
10	Narasinghpur	73.0	153.0	2.0	228.0
11	Salipur	71.0	135.0	57.0	263.0
12	Tangi-Choudwar	55.0	110.0	47.0	212.0
13	Tigiria	45.0	190.0	0.0	235.0
Average		71.7	166.1	26.4	264.2
District - Dhenkanal					
1	Dhenkanal	28.3	103.3	2.3	133.9

2	Gondia	54.0	89.0	9.0	152.0
3	Odapada	29.0	126.0	8.0	163.0
4	Hindol	40.0	205.2	7.0	252.2
5	Kamakhyanagar	29.2	65.6	14.1	108.9
6	Bhuban	31.0	77.0	19.0	127.0
7	Parjang	39.0	124.0	21.0	184.0
8	Kankadahad	12.2	62.4	24.4	99.0
Average		32.8	106.6	13.1	152.5
District - Gajapati					
1	Kashinagar	275.0	117.0	0.0	392.0
2	Parlakhemundi	30.0	100.3	0.0	130.3
3	Rayagada	54.0	148.3	0.0	202.3
4	Gumma	91.0	120.0	0.0	211.0
5	Nuagada	146.4	95.3	0.0	241.7
6	R.Udaygiri	223.8	151.2	0.0	375.0
7	Mohana	315.0	265.0	0.0	580.0
8	Gosani	64.0	170.0	0.0	234.0
Average		149.9	145.9	0.0	295.8
District - Ganjam					
1	Chhatrapur	134.0	12.1	0.0	146.1
2	Ganjam	113.2	54.0	0.0	167.2
3	Purusottampur	135.0	75.2	0.0	210.2
4	Kabisuryanagar	133.0	185.5	0.0	318.5
5	Polasara	108.0	101.4	0.0	209.4
6	Kodala	82.0	74.4	0.0	156.4
7	Khallikote	88.0	76.0	0.0	164.0
8	Hinjilicut	145.0	135.0	0.0	280.0
9	Rangeilunda	124.0	26.2	0.0	150.2
10	Kukudakhandi	155.0	72.0	0.0	227.0
11	Chikiti	213.6	13.2	0.0	226.8
12	Patrapur	144.0	87.0	0.0	231.0

13	Sanakhemundi	157.0	94.0	0.0	251.0
14	Digapahandi	140.0	8.0	0.0	148.0
15	Bhanjanagar	95.0	152.0	0.0	247.0
16	Belaguntha	203.6	19.2	0.0	222.8
17	Jagannathprasad	75.0	119.0	0.0	194.0
18	Buguda	69.0	88.0	0.0	157.0
19	Aska	150.4	0.0	0.0	150.4
20	Dharakote	100.2	209.0	0.0	309.2
21	Sheragada	195.0	130.0	0.0	325.0
22	Sorada	88.2	261.0	0.0	349.2
Average		129.5	90.6	0.0	220.0
District - Jagatsinghpur					
1	Jagatsinghpur	102.0	187.0	50.0	339.0
2	Biridi	68.0	82.0	60.0	210.0
3	Raghunathpur	129.0	77.0	56.0	262.0
4	Balikuda	137.0	75.0	45.0	257.0
5	Naugaon	90.0	80.0	13.0	183.0
6	Tirtol	88.0	100.0	40.0	228.0
7	Kujanga	94.0	40.0	42.0	176.0
8	Erasama	210.0	205.0	32.0	447.0
Average		114.8	105.8	42.3	262.8
District - Jajpur					
1	Jajpur	70.0	148.0	84.0	302.0
2	Binjharpur	109.0	104.0	52.2	265.2
3	Dasarathpur	68.0	81.0	35.0	184.0
4	Korei	98.6	110.7	50.2	259.5
5	Danagadi	43.0	99.0	115.0	257.0
6	Sukinda	32.2	102.4	68.6	203.2
7	Rasulpur	76.4	84.6	28.2	189.2
8	Dharmasala	111.0	75.0	38.0	224.0
9	Barachana	56.0	60.0	72.0	188.0
10	Bari	70.5	103.0	76.0	249.5
Average		73.5	96.8	61.9	232.2

District - Kalahandi					
1	Bhawanipatna	0.0	68.4	0.4	68.8
2	Kesinga	0.0	53.0	2.0	55.0
3	Karlamunda	0.0	83.0	0.0	83.0
4	Madanpur Rampur	5.0	105.0	4.0	114.0
5	Narla	7.0	74.0	0.0	81.0
6	Langigarh	11.4	104.0	3.4	118.8
7	Thuamul Rampur	2.0	100.0	0.0	102.0
8	Dharmagarh	0.0	7.6	0.0	7.6
9	Junagarh	0.0	32.0	0.0	32.0
10	Kalampur	0.0	77.0	0.0	77.0
11	Jaipatna	0.0	30.0	0.0	30.0
12	Koksara	0.0	8.2	0.0	8.2
13	Golamunda	0.0	1.0	0.0	1.0
Average		2.0	57.2	0.8	59.9
District - Kandhamal					
1	Baliguda	19.0	212.0	1.3	232.3
2	Chakapad	70.0	260.0	2.8	332.8
3	Daringibadi	89.0	316.0	5.5	410.5
4	G.Udayagiri	80.0	351.0	2.4	433.4
5	Khajuripada	46.0	292.2	1.2	339.4
6	Kotagarh	23.0	142.0	1.0	166.0
7	Nuagan	26.1	201.0	1.1	228.2
8	Phiringia	42.2	227.0	9.8	279.0
9	Phulbani	20.0	200.2	6.0	226.2
10	Raikia	83.0	282.0	1.0	366.0
11	Tikabali	95.0	270.0	3.0	368.0
12	Tumudibandh	20.8	102.8	3.5	127.1
Average		51.2	238.0	3.2	292.4
District - Kendrapara					
1	Kendrapara	122.0	116.0	51.0	289.0
2	Derabis	72.0	97.0	41.0	210.0
3	Marshaghai	111.0	100.0	14.0	225.0
4	Mohakalpara	100.0	34.0	40.0	174.0

5	Garadapur	65.0	140.0	42.0	247.0
6	Pattamundai	87.0	68.0	21.0	176.0
7	Aul	48.0	28.0	32.0	108.0
8	Rajnagar	51.0	42.0	83.0	176.0
9	Rajkanika	45.0	80.0	22.0	147.0
Average		77.9	78.3	38.4	194.7
District - Keonjhar					
1	Keonjhar	12.4	37.4	32.6	82.4
2	Banspal	9.2	41.2	26.5	76.9
3	Telkoi	7.8	47.4	11.2	66.4
4	Patna	8.2	28.8	69.4	106.4
5	Saharpada	15.2	24.4	72.6	112.2
6	Ghatgaon	14.4	65.6	67.6	147.6
7	Harichandanpur	15.6	74.8	52.4	142.8
8	Anandapur	37.5	54.7	34.4	126.6
9	Ghasipura	31.1	66.4	75.2	172.7
10	Hatadihi	57.2	84.1	54.1	195.4
11	Champua	10.2	15.8	24.1	50.1
12	Joda	25.2	34.4	23.2	82.8
13	Jhumpura	20.8	28.6	22.8	72.2
Average		20.4	46.4	43.5	110.3
District - Khordha					
1	Balianta	67.0	115.0	48.0	230.0
2	Balipatna	70.4	145.4	4.6	220.4
3	Bhubaneswar	58.6	103.2	26.2	188.0
4	Jatani	45.0	155.0	7.0	207.0
5	Banapur	75.0	169.0	0.0	244.0
6	Begunia	38.0	125.0	7.0	170.0
7	Bolagarh	64.0	183.0	0.0	247.0
8	Chilika	98.0	201.0	0.0	299.0
9	Khordha	45.0	207.0	7.0	259.0
10	Tangi	76.0	143.0	0.0	219.0
Average		63.7	154.7	10.0	228.3

District - Mayurbhanj					
1	Samakhunta	37.5	110.0	83.0	230.5
2	Badasahi	51.0	64.0	141.0	256.0
3	Betanati	89.0	50.0	158.0	297.0
4	Morda	81.0	13.0	141.0	235.0
5	Rasgovindapur	66.8	11.6	63.0	141.4
6	Kuliana	19.3	44.4	89.4	153.1
7	Sarasakana	18.0	24.0	65.0	107.0
8	Suliapada	40.0	16.3	134.0	190.3
9	Bangriposi	35.4	72.0	82.8	190.2
10	Baripada	55.0	50.0	137.0	242.0
11	Khunta	73.4	87.8	121.4	282.6
12	Gopabandhunagar	73.4	87.8	121.4	282.6
13	Udala	48.4	52.6	69.2	170.2
14	Kaptipada	113.0	60.0	134.0	307.0
15	Besoi	21.0	37.0	50.0	108.0
16	Bijatala	4.1	12.1	47.1	63.3
17	Rairangapur	7.0	27.0	35.0	69.0
18	KusumI	12.0	14.0	27.0	53.0
19	Jamda	2.0	14.0	23.0	39.0
20	Bahalda	7.2	6.4	14.2	27.8
21	Tiring	6.2	12.6	13.2	32.0
22	Joshipur	9.5	9.0	50.0	68.5
23	Karanjia	15.0	26.0	95.0	136.0
24	Thakurmunda	14.2	62.2	75.0	151.4
25	Sukuruli	17.0	17.0	40.0	74.0
26	Raruana	19.0	16.0	39.0	74.0
Average		36.0	38.3	78.8	153.1
District - Nayagarh					
1	Bhapur	48.2	163.4	2.1	213.7
2	Daspalla	55.0	197.0	0.0	252.0
3	Gania	36.0	169.0	0.0	205.0
4	Khandapara	56.4	97.5	2.0	155.9

5	Nayagarh	66.4	151.0	0.0	217.4
6	Nuagaon	60.0	142.0	0.0	202.0
7	Odagaon	91.4	153.6	0.0	245.0
8	Ranpur	130.2	218.2	3.2	351.6
Average		68.0	161.5	0.9	230.3
District - Puri					
1	Astarang	77.0	76.0	59.0	212.0
2	Brahmagiri	45.0	94.0	0.0	139.0
3	Delang	86.0	147.0	39.0	272.0
4	Gop	99.2	118.2	46.0	263.4
5	Kakatpur	82.1	59.2	3.0	144.3
6	Kanas	46.0	135.0	6.0	187.0
7	Krushnaprasad	73.2	141.6	0.0	214.8
8	Nimapara	70.0	130.0	28.0	228.0
9	Pipili	77.0	116.0	13.0	206.0
10	Puri	72.0	210.0	11.0	293.0
11	Satyabadi	36.0	191.0	12.0	239.0
Average		69.4	128.9	19.7	218.0
District - Rayagada					
1	Raygada	21.8	73.8	0.0	95.6
2	Kolnara	19.4	61.4	0.0	80.8
3	Kalyansingpur	17.2	63.6	0.0	80.8
4	Kashipur	7.0	38.9	0.2	46.1
5	Gunupur	72.0	94.0	0.0	166.0
6	Padmapur	42.4	98.7	0.0	141.1
7	Gudari	42.6	122.0	0.0	164.6
8	Ramanaguda	11.4	179.2	0.0	190.6
9	Bissam Cuttack	26.2	77.2	0.0	103.4
10	Muniguda	18.6	84.0	0.0	102.6
11	Chandrapur	42.0	99.0	0.0	141.0
Average		29.1	90.2	0.0	119.3

(Note: The rainfall is recoded at 08.30 AM for the past 24 hours)

Chapter- V

RESPONSE

Preparedness Measures Undertaken:

All Collectors were instructed to ensure the following measures.

- Zero casualty must be ensured.
- Identify people living near the coast in **Ganjam, Khordha & Puri** and shift them to safe shelters.
- People living in kutcha houses who are likely to be affected by the cyclone shall also be evacuated to cyclone/ flood shelters and other safe pucca buildings in **Gajapati, Ganjam, Khordha, Nayagarh and Puri**.
- District authorities to assess the situation in their respective districts and take steps to evacuate the people living in vulnerable conditions to safe shelters.
- Special care must be taken to shift the old, infirm, physically challenged, women and children to shelters much before the cyclone approaches.
- Cooked food through free kitchen, safe drinking water, health and sanitation facilities must be arranged at the shelters. Lighting arrangement may also be made.
- Availability of sufficient food stuff in hostels of all residential schools including those of ST & SC Development Department should be ensured.
- Provision of food and other essential relief items may also be made for other affected people in need of assistance.
- All cyclone and flood shelters should be made ready to house the people. Generator, inflatable tower light, mechanical cutters and other equipment available in shelters should be put to test run.
- The livestock and domestic animals in vulnerable should be evacuated to safer places. No cattle should be left tied in kutcha house.
- District Emergency Operation Centre and control rooms of the offices of other Departments must operate round the clock.
- Flood is always associated with cyclone. Hence, necessary arrangement to address the flood situation, if any, may also be made.
- 300 power boats with crew and adequate quantity of POL of SRC was ready & prepositioned in different districts.

- All offices should make their back-up power arrangement for peak period. Generators available in the different offices including health institutions should be immediately checked and adequate fuel stored.
- Necessary advance arrangements may be made through the concerned departments for restoration of the damaged roads immediately after the cyclone subsides.
- Steps should be taken to disseminate correct information about the upcoming cyclone among the people and with advice not to panic.
- Fisheries and ARD Department to take necessary steps to communicate the warning messages to marine fishermen

Dissemination of Warnings

- All cyclone bulletins and warning messages shared by IMD disseminated with Key State level Officers, Collectors and Media
- DD, AIR and other electronic media made arrangements for broadcast/ telecast the same for information of Public
- District Administration disseminated the warning through official channels and PRI members
- Public address systems were used for dissemination at local level
- Fisheries and ARD Department communicated the warning messages to marine fishermen

10.10.2018

- The Collectors were specifically directed to ensure complete evacuation of people living in low lying areas and in kutcha houses to safer places by 10.10.2018 evening.
- **About 3.00 lakh** people were shifted in the 24 hours preceding the landfall of the cyclone.
- Free Kitchen centers were opened from the night of 10th October 2018 for the evacuated people.
- The cattle population was also shifted to safety and cattle feed/ fodder arrangements were made for them.

Deployment of Disaster Response Force

26 Teams of ODRAF, 14 Teams of NDRF with emergency equipment were deployed to 16 districts for search, rescue & relief operation in the areas affected by cyclone & flood. The district wise deployment is given below.

Sl.No.	District	NDRF Teams	ODRAF Teams
1	Ganjam	4	4
2	Gajapati	2	2
3	Puri	2	-
4	Kendrapara	1	-
5	Nayagarh	-	-
6	Bhadrak	1	-
7	Jagatsinghpur	1	3
8	Jajpur	1	-
9	Khordha	-	3
10	Cuttack	-	1
11	Balasore	1	3
12	Mayurbhanj	-	3
13	Kalahandi	-	2
14	Boudh	-	2
15	Sambalpur	1	-
16	Rayagada	-	3
	Total	14	26

Besides the above deployment, Fire Services Teams in each block of the districts were kept in readiness for any eventuality.

Chapter- VI

RELIEF & RESTORATION MEASURES

Relief & Rescue Operation

Evacuation

360132 People had been evacuated to safer places during this flood. Evacuated persons were kept in temporary shelters. They were provided with adequate quantity of dry food as well as cooked food through free kitchen at **1612** centers.

Emergent Relief

Emergent relief has been distributed in the flood affected villages. 6827.85 MT of rice, 66.93 MT of Chuda (flattened rice), 6.675 MT of Guda (Juggery) have been distributed to the affected people of Gajapati district. In addition to that the dry foods, candles, matchboxes, kerosene and other materials have also been distributed.

Food Assistance

All affected families of Ganjam, Gajapati and Gunupur Sub- Division of Rayagada are being given relief for 15 days. Food assistance @ Rs. 60/- per adult per day and Rs. 45/- per child per day are being given to the affected persons.

Air Dropping

Two helicopters of Indian Navy were requisitioned for airdropping of food packets in the inaccessible and marooned areas of Aska, Purusottampur & Patrapur blocks of Ganjam district. 2120 of dry food packets have been air-dropped.

Closure of schools

Keeping in view the possible adverse impacts of the impending Severe Cyclonic Storm "TITLI", on 09.10.2018, it has been decided for closure of all schools, colleges and anganwadi centres in the districts of Gajapati, Ganjam, Puri and Jagatsinghpur will remain closed on 10th and 11th of October, 2018. On 10th October, again keeping in view the adverse effect of this cyclone, Govt. had decided for closure of all Anganwadi Centres, Schools & Colleges on 11 – 12 October, 2018.

Polythene Sheet Distribution

1,54,528 polythene sheets have been distributed in Gajapati and ganjam districts to cyclone, flood & landslide victims.

Health and Sanitation Measures

In addition to the stock of medicines in the districts headquarters stored prior to the cyclone, essential drugs like halogen tables, antibiotics, paracetamol tablets, antacids, snake bite injections, bleaching powders and ORS packets have rushed to all the affected districts. Medical teams have been deployed in affected districts. Essential medicines and vaccines are being distributed in the affected areas to prevent epidemics. State level officers are regularly visiting and camping in the cyclone & flood affected areas. Dis-infection of drinking water sources have been carried out regularly. The detail health care measures undertaken by Health Department are as follows.

Medical Relief Centers opened	:	193
Mobile Team Deployed	:	86
No. pregnant women shifted to Maa Gruha/ Delivery point	:	348
ORS packet distributed	:	1230000
Halogen tablets distributed	:	5070000
Minor Ailment Treated	:	46361
Inj. ASV supplied	:	2500
I.V Fluids Supplied	:	80000
Bleaching Powder (25kg. bag) Supplied	:	5450
Cleaning Activities conducted	:	5659 villages
Drinking Water Sources disinfected	:	113103

Animal Care

The detail measures undertaken in veterinary sector is as follows.

Cattle feed supplied to affected areas for distribution (Ganjam&Gajapati)	:	711 MT
Animal vaccinated	:	208462
Animals treated	:	129637
Veterinary Team deployed	:	158
No. of veterinary camps opened	:	1798
Carcass disposed	:	48858 (including poultry)

Drinking Water

Piped water supply sources in rural as well as urban area were submerged under floodwater. The pumps and pipes were filled with sand in some places causing severe damage to the water supply system. However, efforts were made to restore the system either temporally or permanently. However, water has been supplied through tankers. Mobile vans have been deployed for disinfections and repair of tube wells. The detail measures undertaken in drinking water sector is as follows.

Water pouches distributed	:	621900
Water tanker deployed	:	62
Mobile Van/ Team Engaged	:	37
PWS Restored	:	655
Tube wells disinfected	:	29696

Mobile Water Treatment Plant deployed to Ganjapati District : 2 nos.

Repair and restoration of power supply

Power supply to 8,86,606 consumers have been restored.

Restoration Measures

According to available reports extensive damage has been caused to public properties, mainly roads, river/canal embankments, power supply/water supply installations and telecommunication infrastructure. The concerned departments have been advised to take up restoration work on war-footing with the available funds.

Sl. No.	Department	Restoration Measures Undertaken
1	Works Dept.	Breach Closed on PWD Roads- 67 out of 67 occurred in Ganjam, Rayagada, Gajapati & Kandhamal districts. Breach Closed on NH roads - 6 out of 6 occurred in Ganjam&Gajapati districts
2	RD Dept.	568 roads have been cleared out of 570 roads damaged in Rayagada, Gajapati, Kandhamal & Ganjam districts.
3	Forest & Environment	8165 uprooted trees have been cut to clear the roads in Gajapati , Ganjam and Rayagada district and made trafficable.
4	Energy Dept.	No. of Consumers Restored- 8,86,606 consumers.

Chapter- VII

IMPACT

Area Affected:

SI	District	Blocks Affected	Villages Affected	ULBs Affected	Population Affected	Houses Damaged	Human Casualty
1	Balasore	7	222		46784	539	
2	Cuttack	11	382	3	332971	977	
3	Dhenkanal	3	66	2	463	814	
4	Gajapati	7	1636	2	577817	34278	43+ 4 missing
5	Ganjam	22	3250	18	3950000	14314	11+ 8 missing
6	Jagatsinghpur	1	30		13923	6	
7	Jajpur	1	2		123	195	
8	Kandhamal	10	385		6780	905	02
9	Kendrapara	9	461		381337	0	
10	Keonjhar	2	6		60	38	01
11	Khordha	9	242	3	38347	1361	
12	Mayurbhanj	10	57		3080	688	
13	Nayagarh	5	130	1	1577	768	01
14	Puri	11	464	2	340210	1641	
15	Angul	4	55		925	869	01
16	Rayagada	9	860	3	161377	2194	
17	Bhadrak	7	443	2	175380	2786	
	Total	128	8691	36	6031154	62373	59+ 12 missing

Livestock Affected

7.60 Lakh livestock were affected due to cyclone & floods. The district-wise figures of affected livestock are given in following table.

SI.	District	Livestock Affected			Total
		Large	Small	Poultry	
1	Puri	1896	76	3250	5222
2	Gajapati	193708	121831	214822	530361
3	Ganjam	91646	48428	50275	190349
4	Kandhamal	6649	7764	3480	17893
5	Rayagada	5611	3090	7581	16282
6	Cuttack	285	84	150	519
	Total	299795	181273	279558	760626

Land Slide:

Land slide occurred at village Baraghara under Gangabada GP of Gajapati District and at Bengedangaghat, Daringibadiin Kandhamal District due to heavy rainfall.

The major casualties under the influence of the cyclone "Titli" and accompanied extremely heavy rain has occurred in village Baraghara under Gangabada GP of Gajapati District. This village is situated at a distance of about 60 km from Garabandha Police Station, consists of 74 households with population of 374. The tribal village is situated on the hill top of Mahindragiri. One has to walk 7 Kms. by foot to reach the village from Gangabada GP. There is dense forest coverage. On 9.10.2018, the Chairman of Raigad Block who happens to be a resident of the same village along with Executive Engineer, RWSS, Gajapati being deputed by District Administration had gone to village Gangabada for evacuation and warning to the villagers to move to safe places in view of cyclone "Titli". Accordingly, 61 families of the village moved to safe places but 13 families did not go out of their houses in spite of repeated warnings. On 11.10.2018 at 1.00 AM, huge landslide took place. 13 families who were in Baraghara Basti ran helter and shelter out of fear. Due to this landslide, 18 persons have died. On 13.10.2018 rescue team visited the spot by opening the road, held post mortem of dead bodies.

Damage to public infrastructure

Massive and unprecedented damage has been caused to public properties like canal/ river embankments, roads, bridges, culverts, drains, water works, tube wells, LI points, electrical installations, telecommunications infrastructure, Government buildings etc.

The details of damages caused to public infrastructure of Departments are given at

Annexure- I.

CHAPTER- VIII

ASSISTANCE SOUGHT FOR

Ex-gratia Payment to the families of deceased persons: *[Item -1(a) of SDRF Norms].*

71 Persons have lost their lives (59 confirmed and 12 missing) due to floods & landslides in the State. Ex-gratia assistance @ Rs.4.00lakh as per SDRF Norms has been disbursed to the families of deceased persons. The requirement of funds for the purpose comes to Rs **284.00 lakh**.

Clothing and utensils for families: *[Item -1 (d) of SDRF Norms]*

About **20453** families whose houses have been fully damaged or severely inundated for a period more than **7** days have been provided with clothing and utensils. An amount of **Rs. 777.214 lakh** is required for the purpose.

Gratuitous Relief for families in dire need of immediate sustenance after a calamity: *[Item -1 (e) of SDRF Norms]*

About 45.51 lakh affected persons of Ganjam, Gajapati and Rayagada districts of who were in dire need of immediate sustenance after the cyclone & subsequent floods were provided with Gratuitous Relief for **15** days @Rs.60/- per adult per day and @Rs.45/- per child per day. The total expenditure incurred towards providing gratuitous relief till date comes to **37581.00 lakh**.

Cost of Search and Rescue measures: - (Item 2(a) of revised SDRF norms)

ODRAF, NDRF, and Fire Service Teams were pre-positioned at strategic and vulnerable places for search & rescue operation. An amount of **Rs.1000.00 lakh** has been spent for the purpose.

Evacuation of affected people:*[Item -2(a) of revised SDRF Norms]*

360132 persons were evacuated by means of hired vehicle to safer places. The details are to be ascertained.

Provision for temporary accommodation, food, clothing and medical care

[Item -3(a) of revised SDRF Norms]

- a) **1612 nos.** relief camps were also opened to accommodate **360132** people. An amount of Rs.**500.00** lakh was spent towards cost of providing temporary accommodation, food, clothing and medical cares in the relief camps.
- b) About 10 lakh families whose houses have been damaged were provided with polythene sheets for use as temporary shelter materials. The total amount spent @Rs.1500/- per family is **Rs.15000.00 lakh**.

Emergency supply of drinking water in rural areas and urban areas [Item -3 (c) of SDRF Norms]

For immediate provision of drinking water to the cyclone/ flood victims, water tankers have been engaged in the rural and urban areas. 551900 water pouches were also been distributed. Truck mounted generators and mobile tankers have been hired and engaged in supply of safe drinking water. An amount of **Rs.1000.00 lakh** have been spent for the purpose.

Clearance of Debris in the public areas: (Item 4(a) of SDRF norm)

An amount of **Rs.500.00 lakh** has been spent for clearance of debris from the cyclone & flood affected areas.

Disposal of Carcasses: (Item 4(c) of SDRF norm)

An amount of **Rs.16.29 lakh** has been spent for disposal of carcasses from the cyclone, flood & landslide affected areas.

De-Silting of Agricultural land (thickness of sand/ silt deposit more than 3" [Item -5(a) of SDRF Norms] :

1325.1 hect. cropped area have sand cast more than 3". An amount of **Rs.161.662 lakh** has been placed with the Collectors concerned for providing assistance for de-silting to the affected farmers.

Sl. No.	District	Crop Area Sand Cast (in hect.)	Assistance Required @ Rs.12200/- per hect.
1	Ganjam	486	5929200
2	Gajapati	808.1	9858820
3	Kandhamal	25	305000
4	Cuttack	6	73200
	Total	1325.1	161,66,220

Agriculture input subsidy to SMF farmers where crop loss is 33% and above: [Item-5 B (a) of SDRF Norms]

3.97 lakh hect. of agriculture area have been affected. Out of this **3.04 lakh** hectares of cropped area have sustained crop loss of more than 33%. An amount of **Rs. 30766.58 lakh** is required for providing input subsidy to the affected farmers.

Sl.	Districts	Total Agricultural area Affected[in Hect.]	Total agricultural area where crop loss is > 33%
1	Balasore	17100	6192
2	Bhadrak	29160.3	28028.1
3	Cuttack	14686	5940
4	Gajapati	52310	44528.316
5	Ganjam	193768.406	193768.406
6	Jagatsinghpur	13982	0
7	Jajpur	3641	2301
8	Kandhamal	18917	8813
9	Kendrapara	136	0
10	Khurda	7586	1012.74
11	Mayurbhanj	6798	197
12	Nayagarh	7123	3.8
13	Puri	2760	0
14	Rayagada	28802	13225.1
		396769.706	304009.462

Assistance to Small & Marginal Sericulture farmers: [Item -5 B (c) of SDRF Norms]

248 hectares of Tassar Plantation Eri and Mulberry crops have sustained crop loss more than 33%. An amount of **Rs. 341.80 lakh** is required for providing input subsidy to the affected beneficiaries.

Replacement of draught animals: [Item -6(i) of SDRF Norms]

829 nos. of large animals, **3977** small animals & **44052** poultry birds have lost lives due to Cyclone, floods & landslide. The total expenditure for replacement of these animals comes to **Rs.314.47 lakh**.

Medical Care for cattle & poultry against epidemics: [Item -6 (ii) of SDRF Norms]

Vaccinations of Livestock in the affected districts have been made to reduce the morbidity and mortality of the livestock. Health and De-worming camps were also conducted to check different contagious and infectious diseases. An amount of **Rs 143.84 lakh** is spent @ Rs.8000/- per camp for 1798 camps for the purpose.

Provisions of fodder / feed concentrate in the cattle camps: [Item -6 (ii) of SDRF Norms]

An amount of **Rs.148.98 lakh** has been spent towards providing fodder / feed concentrate @1 kg per large animal and @ 250 gm per small animal per day for 3 days. 711 MT cattle feed has been used for the purpose.

Assistance to fishermen: [Item -7(i) of SDRF Norms]

37 nos. of boats & 160 nos. of nets have been fully damaged and 398 nos. of boats & 308 nos. of nets have been partially damaged due to cyclone. An amount of **Rs.28.70 lakh** has been placed with the concerned Collectors for providing assistance to the affected fishermen.

Input subsidy for fish seed farms: [Item -7(ii) of SDRF Norms]

85.49 Hectares of fish seed farms have been damaged due to this cyclone & flood. Funds amounting to **Rs.7.01 lakh** has been placed with the Collectors concerned for providing input subsidy to the affected fish seed farmers.

Assistance for de-silting of Fish Pond: [Item -5(i) (A)(c) of SDRF Norms]

456.45 Hectares of fish ponds have been damaged due to this cyclone & flood. Funds amounting to **Rs.55.69 lakh** has been placed with the Collectors concerned for providing assistance to the affected fish pond farmers.

Assistance to Artisans in handicrafts sector by way of subsidy for repair / replacement of damaged equipments: [Item -8 of SDRF Norms]

a) Traditional Crafts

Rural Artisans have been affected due to cyclone/floods. Extensive damages have been caused to their equipment and their raw materials. An amount of **Rs.0.86 lakh** has been placed with the HT&H Department for providing subsidy to them as per the SDRF Norms.

b) Handloom Weavers

Handloom weavers have lost their Loom equipment and accessories due to this cyclone & flood and need replacement. An amount of **Rs.7.239 lakh** is required for providing assistance to the beneficiaries.

Assistance for repair / restoration of damaged houses: [Item -9 of SDRF Norms]

65234 houses have been damaged due to cyclone & floods and landslide out of which **20453** houses have been fully & severely damaged and **40920 kutcha and pucca** houses have been partially damaged. **1556** huts and **2305** cowsheds have been damaged. An amount of **Rs.20944.17 lakh** is required for providing assistance for repair / restoration of the damaged houses of affected people.

Repair/ restoration of the damaged infrastructure: -

A sum of **Rs.168412.303 lakh** is required for repair/ restoration of the damaged infrastructure in eligible sectors.

Assessment of loss to the life & properties

[Rs. in Lakh]

Sl.	DEPARTMENTS	Loss (Rs. in lakh)
1.	Water Resources Department	
	Loss to rivers & canal embankment	30033.68
	Loss to drainage channels	364.20
	Loss Repair to Minor Irrigation Project	2827.65
	Loss to buildings of MI Sector	120.00
	Loss to Lift Irrigation Projects	1657.38
	Loss to river & canal embankment roads	629.25
	Loss to damaged buildings of WR sector	667.90
2.	Works Department	
	Loss to Roads, Culverts	11695.99
	Loss to NHs maintained by State	1421.00
3	Rural Development Department	
	Loss to Roads, Culverts	28641.53
	Loss to Buildings (PHC/ CHC etc)	1776.20
4	Housing & Urban Development Department	
	Damages to urban roads, drains & culverts	5633.37
	Repair of water supply system tube wells	1712.00
5	Panchayati Raj & DW Department	
	Repair of GP/ PS Roads	44236.33
	Repair of Drinking water supply system	5039.65
	Loss to Panchayat Ghars	8229.02
	Repair of School Buildings	3482.63
6	Agriculture Department	
	Repair/ restoration of damaged Water Harvesting Structure	893.99
	Loss to Seed storage Godown	46.50
	Damage to lift irrigation	7.65
	Damage to infrastructures	204.00
7	Energy Department	
	Repair/ restoration of Electrical lines	13303.18
8	Fisheries & Animal Resources Department	
	Provision of cattle feed	148.98
	Medicines & Animal Care	143.84
	Loss of net and boats	28.70

	Animal/ livestock Loss (Replacement of animal)	314.47
	Disposal of Carcasses	16.29
	Damage to Veterinary Institutions like VD, LAC etc.	253.00
	Repair of damaged fish pond	55.69
	Repair of fish seed farm	4.593
	Loss to Govt. Fish farms & fish fed ice plant	58.25
9	ST & SC Dev., Minorities & Backward Classes Department	
	Repair of School Buildings	684.09
10	Women & Child Dev. Dept.	
	Repair of Anganwadi Centres& other buildings	1728.50
11	Textile & Handloom Dept.	
	Loss to Rural Artisans (Handicraft Sector)	0.86
	Loss to Handloom Sector (Weavers)	7.24
	Loss to Sericulture Sector	341.80
12	Cooperation Department	
	Damage to Buildings of cooperative society	1348.23
	Damage to Buildings of MARKFED	62.65
	Damage to Aska Co-operative Sugar Industries	1510.84
	Damage to ARCS office , Gunupur, Rayagada	1.00
	Damage to assets of RMCs of Gajapati, Ganjam, Rayagada, Kandhamal	85.00
13	Special Relief Commissioner	
	HB Assistance	20944.17
	Ex-gratia for loss of lives	284.00
	Emergent Relief (Gratuitous Relief)	37581.00
	Search & Rescue	1000.00
	De-silting of Agriculture land (Sand cast)	161.662
	Provision of input subsidy to farmers	30766.58
	Provision of Temporary accommodation, food, clothing & medical care	15500.00
	Emergency Supply of Drinking Water	1000.00
	Clearing of Debris	500.00
	Clothing & Utensils	777.21
	Grand Total	277931.75

CHAPTER- IX

State Disaster Response Fund

Status of Expenditure from State Disaster Response Fund(SDRF) Account
(as on 01.11.2018)
Year - 2018-19
State – Odisha

(Rs. in crore)

Sl. No.	Item	Amount
	(I) Receipts	
	Opening balance in SDRF account as on 1.4.2018	
1.	(a) SDRF	1363.74
	(b) NDRF	0.00
	(c) Total	1363.74
2	SDRF Releases made during instant financial year (Central and State share)	
	(a) First instalment	432.50
	(b) Second instalment	0.00
	(c) Total	432.50
3	NDRF releases during the instant financial year, if any	0.00
4	Interest received on investments made as per the CRF scheme	0.00
5	Total funds available in the SDRF account(1+2+3+4)	1796.24
	(II) Expenditure	
6	Expenditure incurred as per norms on approved natural calamities as per the scheme of SDRF/NDRF(indicate calamity-wise expenditure)	
	(a) Cyclone	1324.96
	(b) Flood	78.35
	(c) Fire	9.48
	(d) Hailstorm	0.03
	(e) Landslides	0.04
	(f) State Specific disasters	93.30
	(g) Total	1506.16
7	Expenditure incurred on training to specialized Teams of the State personnel	1.29
8	Expenditure incurred on procurement of search and rescue equipment etc.(as per extant approved items)	18.13
9	Total expenditure incurred(6+7+8)	1525.58
10	Balance available in the SDRF account of the instant financial year	
	(a) SDRF	270.66
	(b) NDRF	0
	(c) Total	270.66

CHAPTER- X

CONCLUSION

As per the assessment made by different departments of the State Government as well as the Collectors of the respective affected districts, the total amount required towards different relief measures and immediate repair and restoration of damaged infrastructure in permissible sectors as per the Norms of assistance from SDRF and NDRF comes to **Rs.2779.32 crores.**

As indicated in Chapter-IX, a balance amount of Rs. 270.66 crore is available in the SDRF account of the State as on 1st November 2018.

Through this Memorandum, the State Government seeks assistance of the required funds from National Disaster Response Fund in order to meet the expenditure on the ongoing relief and restoration works.

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ANNEXURE-1

Damage Assessment Report of Public Properties by Departments

Departments	Sector	Items	Damage in physical terms	Requireme nt of funds for repair of immediate nature	Out of (5), amount available from annual maintenanc e budget	Out of (5), amount available from related schemes/prog rams/other sources	Out of (5), amount proposed to be met from SDRF/NDRF in accordance with list of works indicated in the Appendix to the revised items and norms
1	2	3	4	5	6	7	8
Works	PWD Roads	No. of breaches-	67 nos	8575.21	0	0	8575.21
		Length of Road damaged –	2486.37		0	0	
		No. of culverts damaged –	25 nos.	3120.78	0	0	3120.78
		No. of culverts washed away –	430 nos.		0	0	
		Total			11695.99	0	0
	NH Roads	No. of breaches-	7 nos.	1421.00	0	0	1421.00
		Length of Road damaged –	395.24 km				
		No. of culverts damaged –	13 nos.				
		No. of culverts washed away –	1 nos.				
		Land Slides	3.150 km				
		Total					
	Grand Total			13116.99	0	0	13116.99

Rural Development	Rural Roads	No. of Roads damaged	1406 nos	25924.23			25924.23
		Length of Road damaged –	2743.22 km				
		No. of breaches –	828 nos				
		No. of CD/Bridge damaged–	600 nos	2717.30			2717.30
		No. of CD/Bridge washed away –	40 nos				
	Buildings (Health, Revenue, Education, RD, Finance, Home, FARD & others)	No. of building damaged	378	1776.20			1776.20
	Total		30417.73			30417.73	
Housing & Urban Development	Urban Roads	Length of drain damaged –	536 nos	5633.37	0	0	5633.37
		Length of Road damaged					
		No. of culverts damaged					
	Urban Water Supply System	Repair of water supply system , hire charges of Water Tanker & Gen Sets	151	1712.00			1712.00
		Total	687	7345.37			7345.37
Panchayati Raj & Drinking Water	Panchayat Roads	No. of Roads damaged –	27298.33 km	40947.58	0	0	40947.58
		Length of breaches –					
		Length of Road damaged –					
		No. of culverts damaged –	2193 nos	3288.75	0	0	3288.75

		No of culverts washed away					
		PS/ GP Building Damaged	5486	8229.02			8229.02
		Primary School Building Damaged	2322	3482.63			3482.63
		AWC Damaged	1119	1728.5			1728.5
		Pipe Water Supply System/ Tube Wells	3360	5039.65			5039.65
		Total		62716.13			62716.13
Water Resources	River Embankments	No of breaches –	125 nos	3997.50	0	0	3997.50
		Length of breach in Km –	13.09 KMs				
		No of partial damage -	564 nos	16425.45	0	0	16425.45
		Length of partial damage in Kms	346.05				
	Canal Embankments	No of breaches –	189 nos	2501.68	0	0	2501.68
		Length of breach in Km –	6.43 kMs				
		No of partial damage -	574 nos	7109.05	0	0	7109.05
		Length of partial damage in Kms	246.03				
	River/ canal Roads	No. of roads damaged	67	629.25			629.25
		Length of roads damaged	178.58 Kms				
	Buildings	No. of Building Damaged	55	667.90			667.90

	M I projects (Flow)	No of Minor Irrigation projects damaged – 289 nos	AfluxBund,Ca nalBanks,Hea d Works	2827.65	0	0	2827.65
		No. of Buildings Damaged	6	120.00	0	0	120.00
	MI Projects(Lift)	No. of LIPs Damaged- 1767 nos	Head Works, Distribution System	1657.38	0	0	1657.38
	Clearance of Drainage channels	Length of drainage channels congested with vegetative materials – 11031 meter	Out flanking of Drainage channel at check dam points	364.2	0	0	364.20
			TOTAL	36300.06	0	0	36300.06
Energy	Electrical lines	No of Primary sub-stations damaged –		13303.18	0	0	13303.18
	33 KV	Lines damaged	176.7 kms				
		Nos. of Pole damaged	1077 Nos.				
	11 KV	Lines damaged	903.46 kms.				
		Nos. of Pole damaged	7462 Nos.				
		Distribution Transformers damaged	2598 Nos.				
		LT lines damaged –	1968.5 kms				
		LT line pole damaged	10415 Nos.				
	Total			13303.18			13303.18
Agriculture & FE	Water Harvesting Structure	Structure damaged	322	893.99	0	0	893.99
	Seed Storage Godown at Paralakhmundi			46.50			46.50

	& Farm approach & internal roads						
	Lift Irrigation Projects(OLIC)	Partially damaged		7.65			7.65
	Damage to Infrastructure such as Buildings, roads, culverts of horticulture Sector			204.00			204.00
		Total		1152.04			1152.04
ST & SC Dev., Minorities & Backward Classes	School Building	No. of School Building Damaged	158	684.09			684.09
		Total	158	684.09			684.09
Textile, Handlooms & Handicrafts	Sericulture	Loss to Plantation	248 Ha.	98.20			98.20
		Loss to DFL	8400 Nos.	0.611			0.611
		Loss to Loom	60 Kahan, 4600 Kg & 2500 DFL	9.31			9.31
		Loss to Infrastructure	5 Nos.	39.25			39.25
		Loss to Equipment	41 Nos.	18.40			18.40
		Loss to rearing House	108 Nos.	61.66			61.66
		Loss to Fencing	399 Ha.	114.36			114.36
	Handloom	Loss to houses	6 Nos.	4.45			4.45
		Loss to raw material	12.875 bundles	0.28			0.28
		Loss to Fabrics on Loom	21 Nos.	0.13			0.13
		Loss to finished products	372 Nos.	2.38			2.38

		Loss to Loom & accessories	2 Nos.	0.16			0.16
	Handicrafts	Loss to Teracota cane & Bamboo		0.58			0.86
		Total		349.771			349.771
Co-operation		Damaged to Godown-cum-office Building of Cooperative Society in Balasore, Bhadrak, Gajapati, Ganjam, Kandhamal, Khordha, Mayurbhanj, Nayagrah		1348.23			1348.23
		Building of MARKFED in the district of Gajapati, Ganjam&Rayagada		62.65			62.65
		Damage to Aska Cooperative Sugar industries		1510.84			1510.84
		Damaged to ARCS Office, Gunupur, Rayagada		1.00			1.00
		Damage to Assets of RMC of Gajapati, Ganjam, Rayagada, Boudh, Kandhamala		85.00			85.00
		Total		3007.72			3007.72