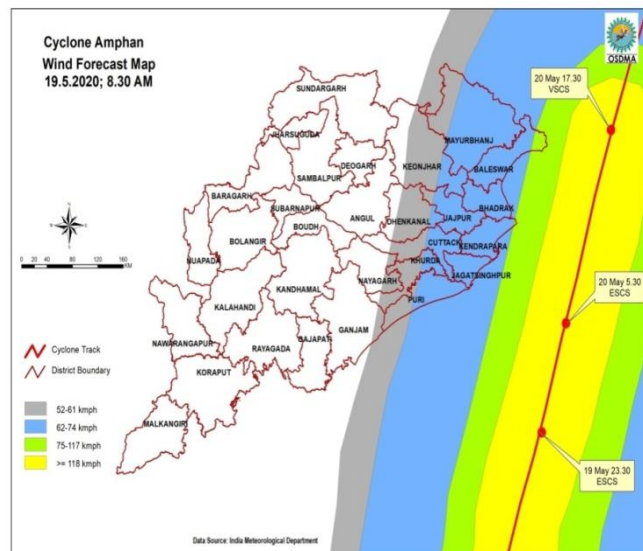
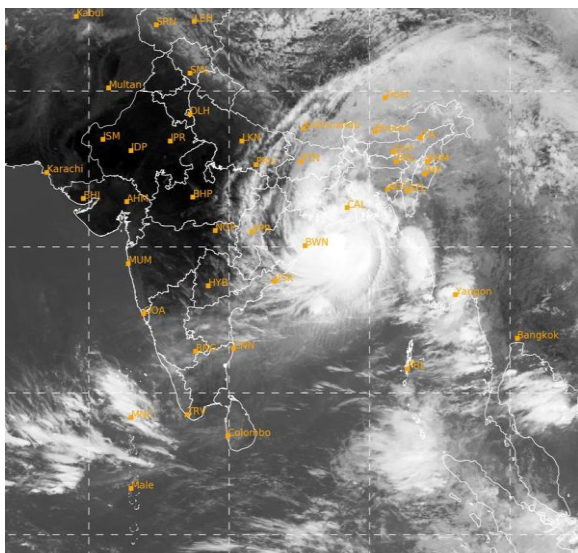




Government of Odisha

FINAL MEMORANDUM on SUPER CYCLONIC STORM "AMPHAN"



MAY, 2020

**SPECIAL RELIEF COMMISSIONER
Revenue & Disaster Management Department
(Disaster Management)**

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CHAPTER – I

INTRODUCTION

The geographic location makes Odisha Coastal Zone vulnerable to frequent cyclonic disturbances. The high wind, torrential rain and storm surge associated with the cyclone bring damage to the coastal settlements. 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) occur in Odisha. If the disturbances are grouped in terms of pre and post monsoon season, they are more in the post-monsoon season. The cyclones which had affected Odisha coast normally originated in the sea and dissipated on the land.

During the last decade, the State has faced one or other forms of disasters like flood, cyclone, tornado or drought every year.

Cyclone Occurrences in the recent past

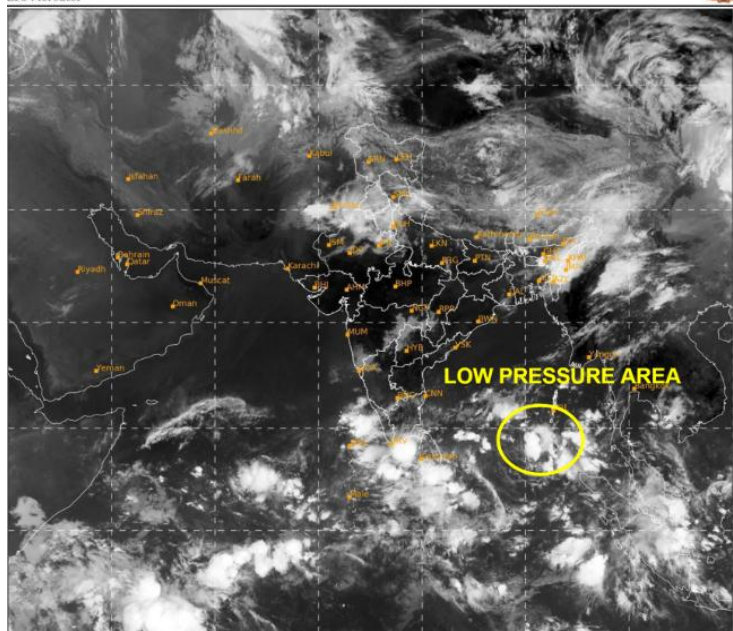
The cyclonic events in the Bay of Bengal which had severe impacts on the Odisha coast in the recent past are given in the Table below:

Sl. No.	Date/Year	Category of Cyclone	Landfall place
1	25-31 October, 1999	Super Cyclone	Crossed Odisha Coast near Paradeep at noon of 29 th October
2	12-14 October, 2013	Very Severe Cyclonic Storm 'Phailin'	Crossed Odisha Coast near Gopalpur in the evening of 12 th October
3	12-14 October, 2014	Very Severe Cyclonic Storm 'Hudhud'	Crossed Andhra Pradesh Coast at Vishakapatnam and impacted south Odisha
4	10-12 October, 2018	Very Severe Cyclonic Storm 'Titli'	Crossed Andhra Pradesh Coast at Palasa and severely affected south Odisha
5	3 May, 2019	Extremely Severe Cyclone 'FANI'	Crossed Odisha Coast near Puri
6	8-10 November, 2019	Very Severe Cyclonic Storm 'Bulbul'	Affected the coastal districts of Odisha

CHAPTER – II

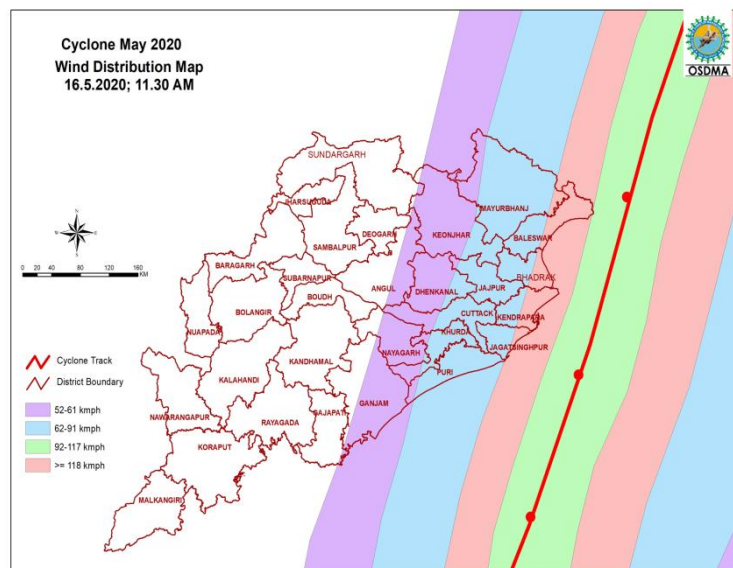
CYCLONE TRACKING

India Meteorological Department (IMD) reported on 13.05.2020 that a low pressure area had formed over southeast Bay of Bengal and adjoining Andaman Sea. It would very likely to concentrate into a Depression over central parts of south Bay of Bengal on 15th and further intensify into a Cyclonic Storm over southwest and adjoining west-central Bay of Bengal by 16th evening. It would very likely to move north-westwards initially till 17th May and then re-curve north-north-eastwards.



On 16.05.2020, at 10.30 AM, IMD informed that the well marked low pressure area over southeast Bay of Bengal had concentrated into depression over Southeast Bay of Bengal and centred at 0530 hrs of 16th May, 2020 near latitude 10.4°N and longitude 87.0°E, about 1100 km south of Paradip (Odisha), 1250 km south of Digha (West Bengal) and 1330 km south-southwest of Khepupara (Bangladesh). It would

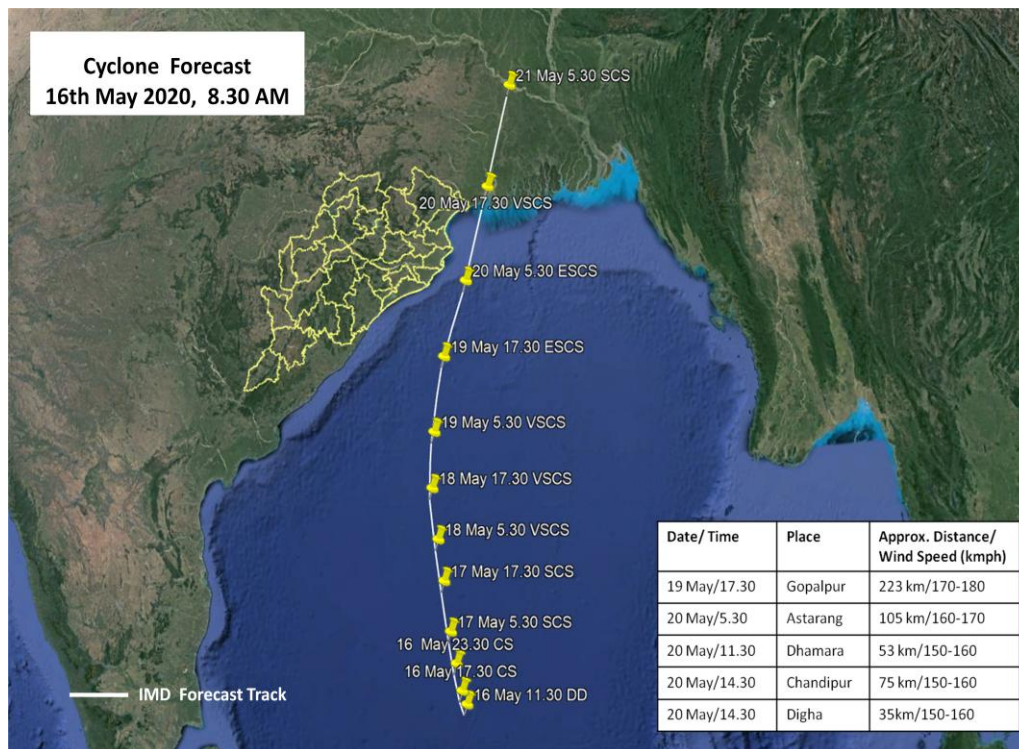
very likely to intensify rapidly into a Cyclonic Storm by evening and further into a severe cyclonic storm during subsequent 24 hours. It would very likely to move north-north-westwards initially till on 17th May and then re-curve north-north-eastwards across northwest



Bay of Bengal towards West Bengal coast during 18th to 20th May 2020.

As per the IMD bulletin, Coastal Odisha would likely to experience light to moderate rainfall with heavy falls at isolated places from 18th May evening and heavy to very heavy rainfalls at a few places on 19th May and isolated heavy rainfall over northern Odisha coast on 20th May 2020. Squally wind with speed reaching 45 to 55 kmph gusting to 65 kmph would likely to blow along and off Odisha coast from 19th morning. The wind speed would gradually increase becoming gale wind speed reaching 65 to 75 kmph from 20th morning along and off north Odisha coast. It will gradually increase thereafter.

Soon after receiving the meteorological warning, the State Government started closely monitoring the situation. Based on the forecast issued by IMD and other international Agencies like Regional Integrated Multihazard Early Warning



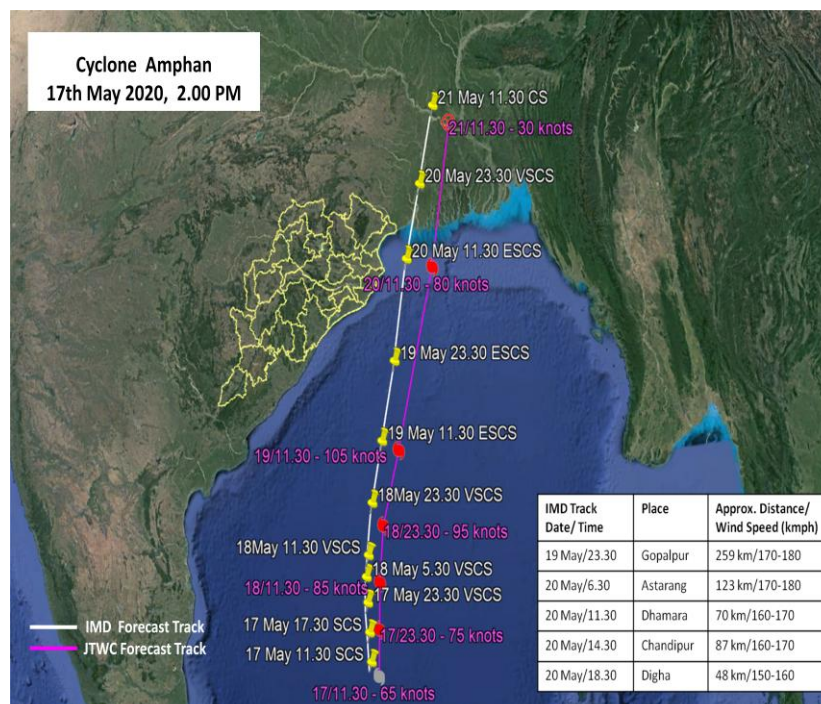
Systems (RIMES), Thailand, Joint Typhoon Warning Center (JTWC), USA, the tracking of the system was thoroughly done by the Experts of Odisha State Disaster Management Authority (OSDMA) in GIS platform with regard to possibility of its likely impact on Odisha.

On 16.5.2020 at 9.00 PM, IMD informed that the deep depression over Southeast Bay of Bengal and neighbourhood remained practically stationary during past 06 hours and rapidly intensified into a Cyclonic Storm 'AMPHAN' (pronounced

as UM-PUN). It laid centred over the same region at 1730 hrs IST of 16th May, 2020 near latitude 10.9°N and longitude 86.3°E, about 1040 km south of Paradip (Odisha), 1200 km south-southwest of Digha (West Bengal) and 1300 km south-southwest of Khepupara (Bangladesh). It would very likely to intensify further into a Severe Cyclonic Storm during next 12 hours and into a Very Severe Cyclonic Storm by 18th morning. It would very likely to move north-northwestwards initially till 17th May and then re-curve north-northeastwards across northwest Bay of Bengal towards West Bengal and adjoining North Odisha coasts during 18th to 20th May 2020.

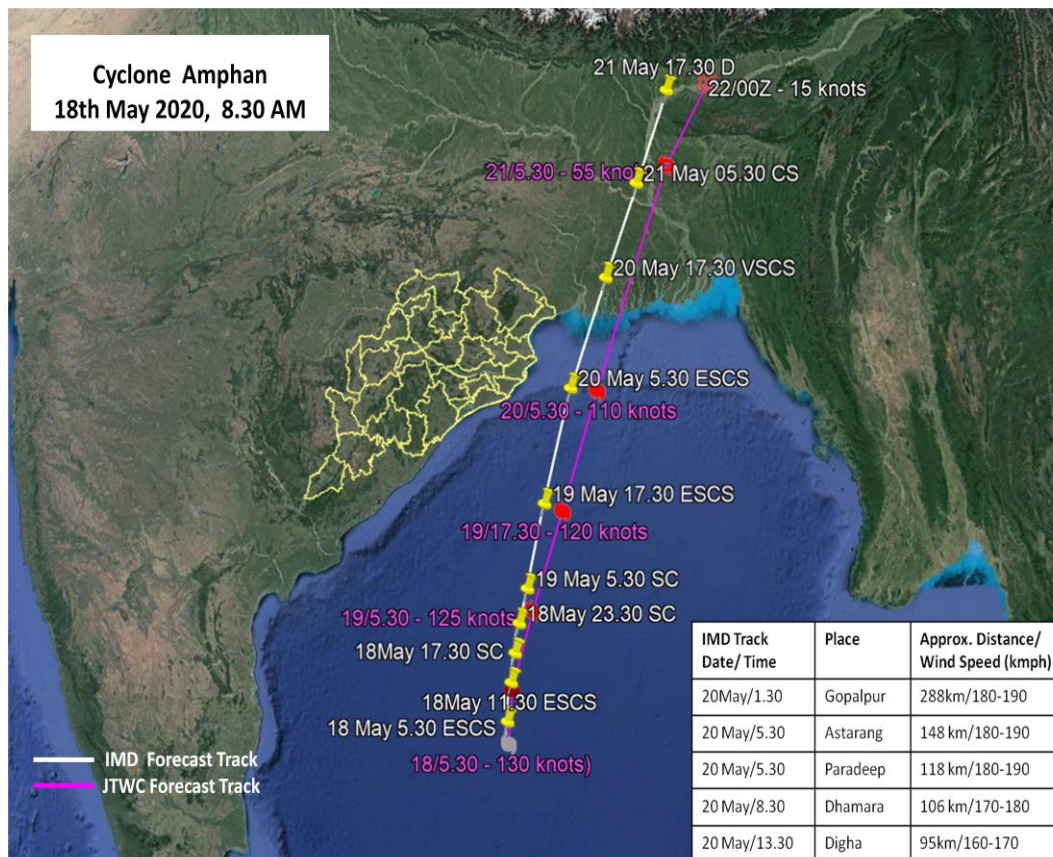
IMD issued bulletin on 17.5.2020 at 12.30 PM mentioning that the Cyclonic Storm 'AMPHAN' over Southeast Bay of Bengal and neighbourhood moved slowly northwestwards with a speed of 03 kmph during past 06 hours, intensified into a Severe Cyclonic Storm and laid centred over the same region at 0830 hrs IST of 17th May, 2020 near latitude 11.4°N and longitude 86.0°E, about 990 km south of Paradip (Odisha), 1140 km south-southwest of Digha (West Bengal) and 1260 km south-southwest of Khepupara (Bangladesh). It would very likely to intensify further into a Very Severe Cyclonic Storm during next 12 hours. It would very likely to move nearly northwards slowly during next 24 hours and then re-curve north-northeastwards and move fast across northwest Bay of Bengal and cross

West Bengal and Bangladesh coasts between Sagar Islands (West Bengal) and Hatiya Islands (Bangladesh) during the Afternoon / Evening of 20th May 2020 as a Very Severe Cyclonic Storm.

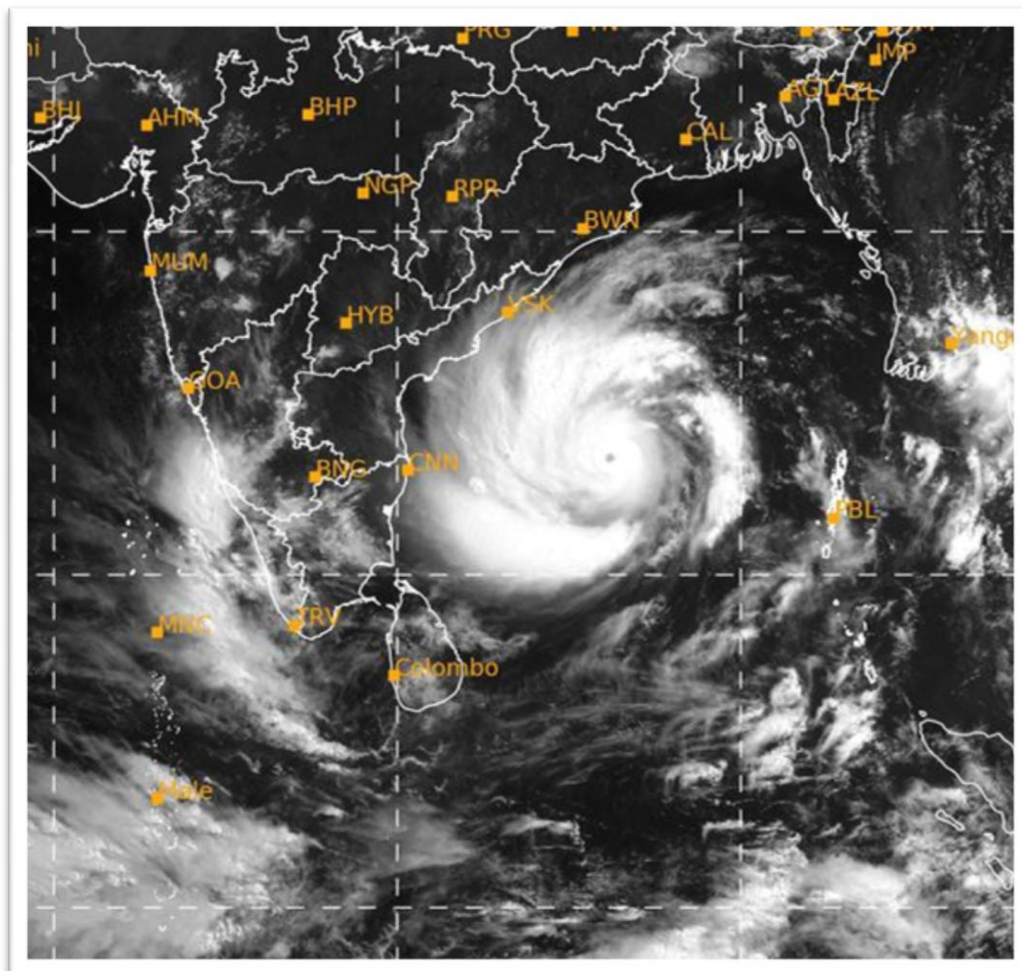


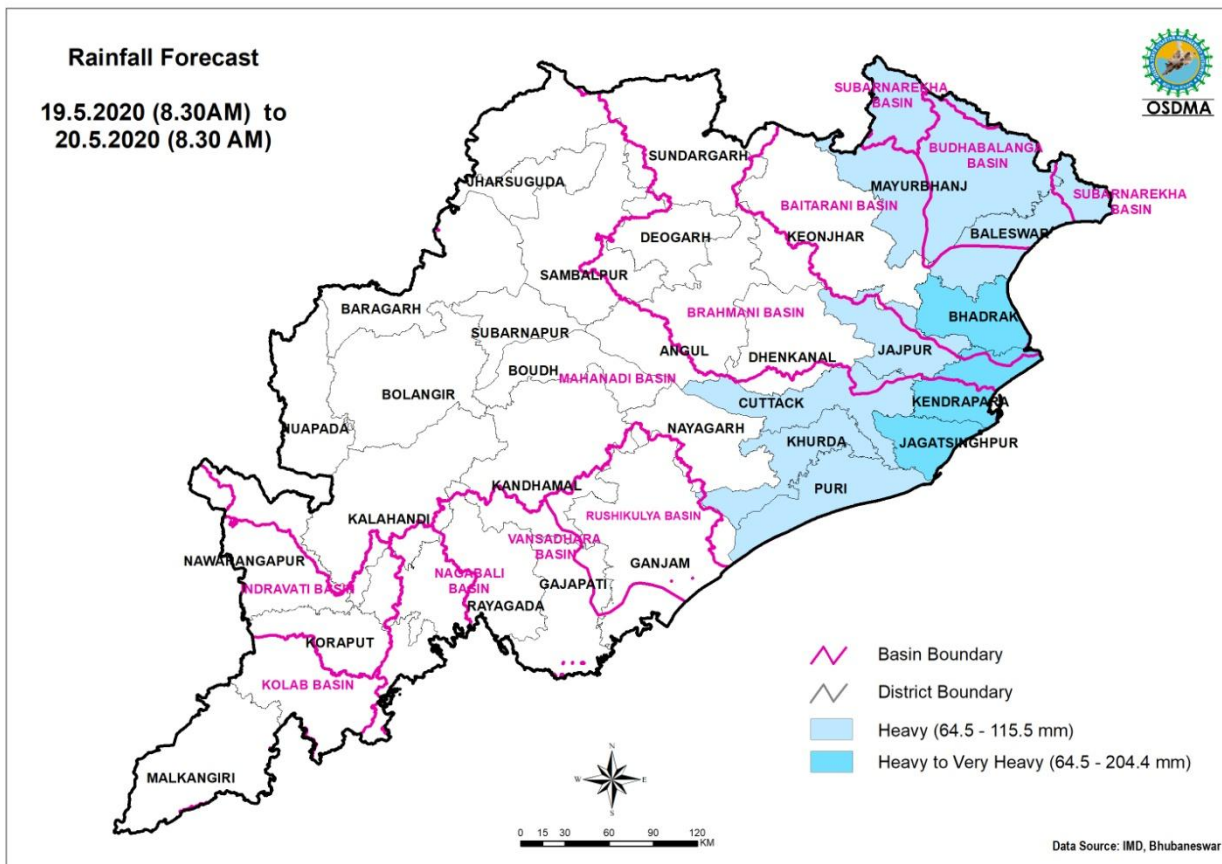
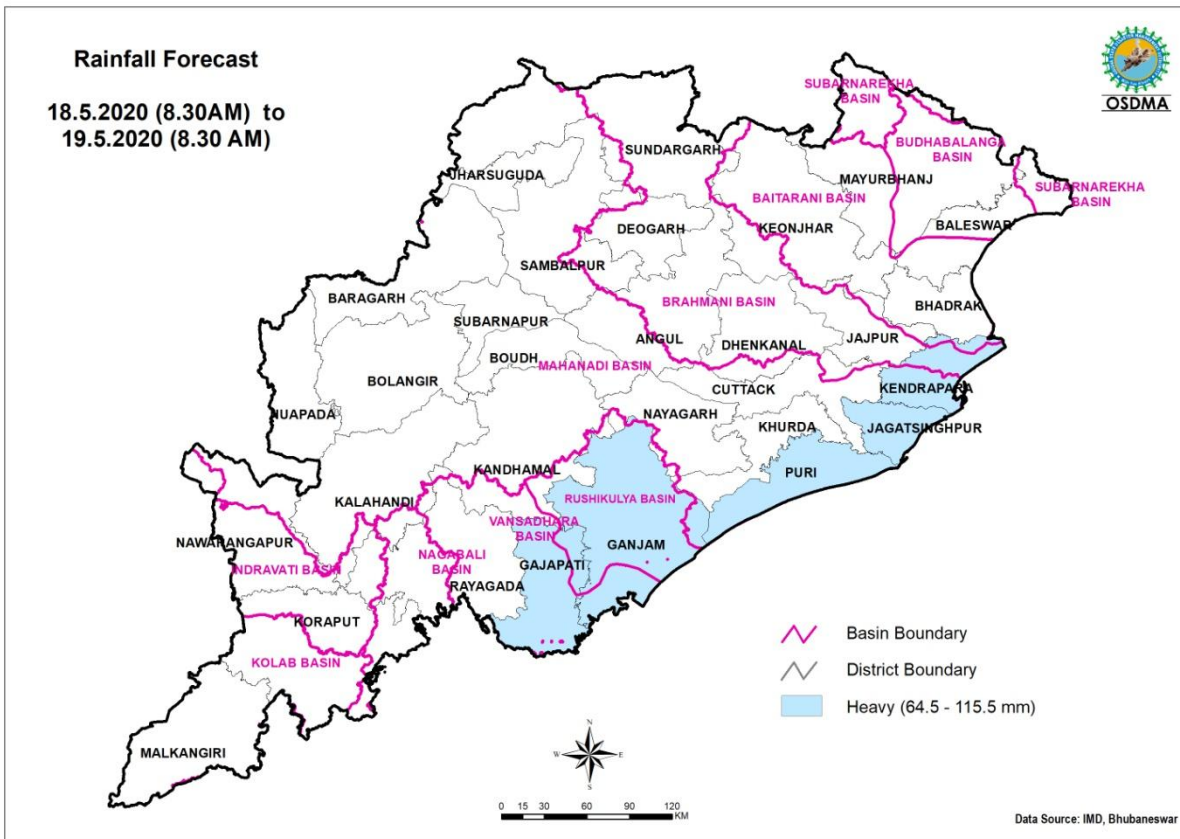
On the same day at 5.45 PM, IMD reported that the Severe Cyclonic Storm 'AMPHAN' over central parts of South Bay of Bengal and neighbourhood moved slowly northwards with a speed of 05 kmph during past 06 hours, further intensified into a Very Severe Cyclonic Storm and lay centred at 1430 hrs IST of 17th May, 2020 over central parts of South Bay of Bengal near latitude 11.7°N and longitude 86.0°E, about 960 km south of Paradip (Odisha), 1110 km south-southwest of Digha (West Bengal) and 1230 km south-southwest of Khepupara (Bangladesh). It would very likely to intensify further into an Extremely Severe Cyclonic Storm during next 24 hours. It would very likely to move nearly northwards slowly during next 12 hours and then re-curve north-north-eastwards and move fast across northwest Bay of Bengal and cross West Bengal — Bangladesh coasts between Digha (West Bengal) and Hatiya Islands (Bangladesh) during the Afternoon/ Evening of 20th May 2020 as a Very Severe Cyclonic Storm.

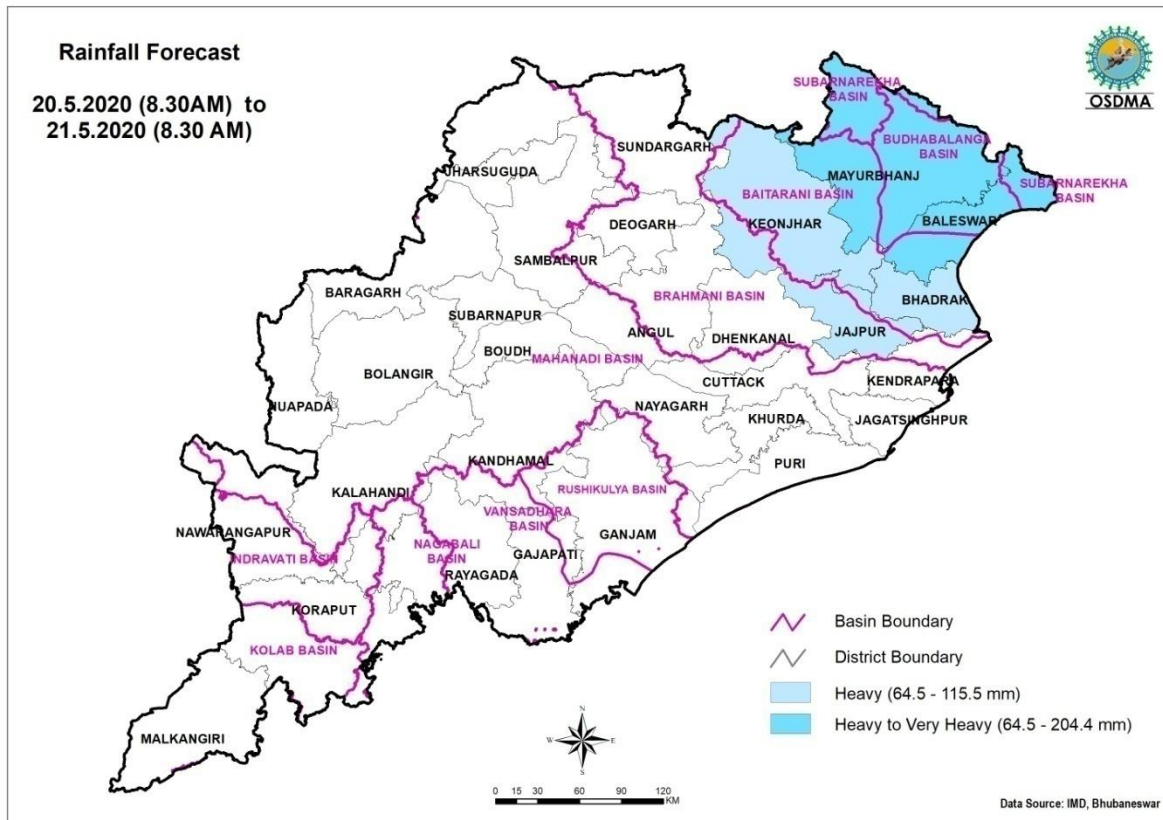
On 18.5.2020, at 8.00 AM, IMD reported that the Very Severe Cyclonic Storm 'AMPHAN' over central parts of South Bay of Bengal moved north-north-eastwards with a speed of 13 kmph during past 06 hours, intensified into an



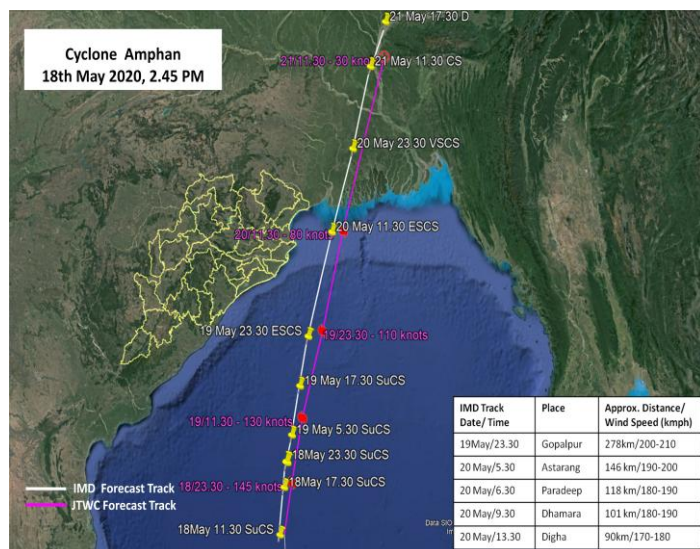
Extremely Severe Cyclonic Storm and lay centred at 0230 hrs IST of 18th May, 2020 over central parts of South Bay of Bengal and adjoining central Bay of Bengal near latitude 12.9°N and longitude 86.4°E, about 820 km nearly south of Paradip (Odisha), 980 km south-southwest of Digha (West Bengal) and 1090 km south-southwest of Khepupara (Bangladesh). It would very likely to intensify further during next 06 hours. It is very likely to move north-northeastwards and move fast across northwest Bay of Bengal and cross West Bengal — Bangladesh coasts between Digha (West Bengal) and Hatiya Islands (Bangladesh) during the Afternoon/ Evening of 20th May 2020 as a Very Severe Cyclonic Storm. IMD issued the rainfall warnings for the Odisha. Maps were prepared in GIS platform and shared to the districts for taking further action.







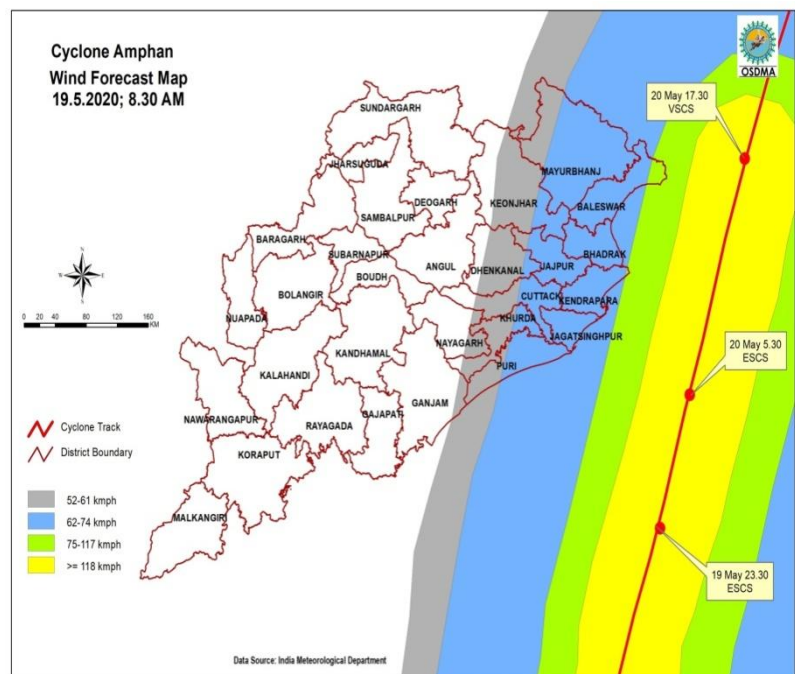
The Extremely Severe Cyclonic Storm 'AMPHAN' over west-central and adjoining central parts of South Bay of Bengal intensified further into a Super Cyclonic Storm at 1130 hrs IST of 18th May, 2020 over west-central and adjoining central parts of South Bay of Bengal near latitude 13.4°N and longitude 86.2 °E, about 770 km nearly south of Paradip (Odisha), 920 km south-southwest of Digha (West Bengal) and 1040 km south-southwest of Khepupara(Bangladesh).



On 19th May, 2020, 0530 hrs of IST, the Super Cyclonic Storm 'AMPHAN' over Westcentral Bay of Bengal moved north-northeastwards with a speed of 14 kmph during past 06 hours and lay centred at near latitude 15.6°N and longitude 86.7°E over Westcentral Bay of Bengal about 520 km nearly south of Paradip

(Odisha), 670 km south-southwest of Digha (West Bengal) and 800 km south-southwest of Khepupara (Bangladesh). IMD reported that, the cyclone would very likely to weaken into an Extremely Severe Cyclonic Storm during next 6 hours. It would very likely to move north-northeastwards across northwest Bay of Bengal and cross West Bengal — Bangladesh coasts between Digha (West Bengal) and Hatiya Islands (Bangladesh) close to Sundarbans during the Afternoon/ Evening of 20th May 2020 as a Very Severe Cyclonic Storm with maximum sustained wind speed of 155-165 kmph gusting to 180 kmph.

IMD issued the wind warnings for Odisha. The wind speed would gradually increase becoming gale wind speed reaching 75 to 85 kmph gusting to 95 kmph from 20th morning along and off north Odisha coast (Jagatsinghpur, Kendrapara, Bhadrak, Balasore) and Mayurbhanj. It will gradually increase thereafter becoming 100 to 110 kmph gusting to 125 kmph along & off the above mentioned districts of North



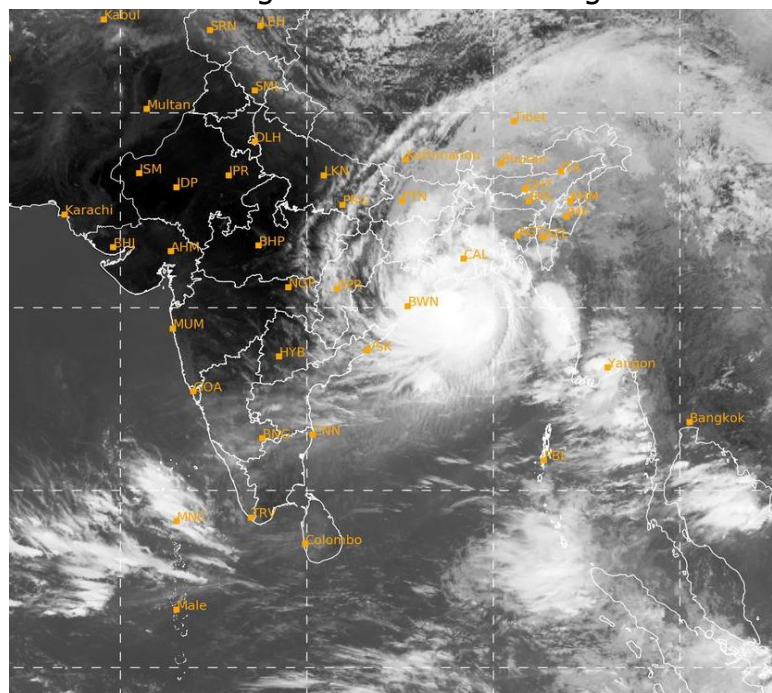
Odisha. Squally wind speed reaching 55-65 kmph gusting to 75 kmph likely to prevail over Puri, Khordha, Cuttack, Jajpur districts of Odisha during 20th May 2020.

IMD reported that the Super Cyclonic Storm 'AMPHAN' over Westcentral Bay of Bengal moved nearly northwards with a speed of 18 kmph during past 06 hours and lay centred at 1430 hrs IST of 19th May, 2020 as an Extremely Severe Cyclonic Storm near latitude 17.0°N and longitude 86.9°E over Westcentral Bay of Bengal about 360 km nearly south of Paradip (Odisha), 510 km south-southwest of Digha (West Bengal) and 650 km south-southwest of Khepupara (Bangladesh). It is very

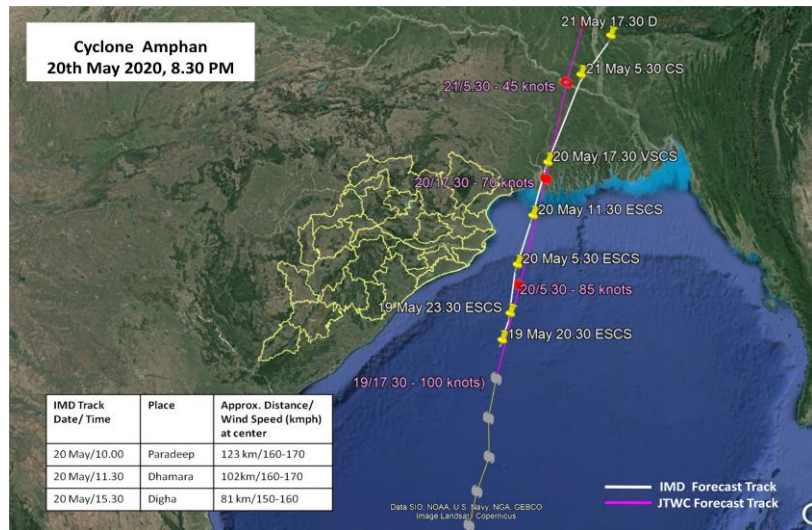
likely to move north-northeastwards across northwest Bay of Bengal and cross West Bengal Bangladesh coasts between Digha (West Bengal) and Hatiya Islands (Bangladesh) close to Sundarbans during Afternoon to Evening hours of 20th May 2020 with maximum sustained wind speed of 155-165 kmph gusting to 185 kmph.

As per the bulletin issued by IMD, the Extremely Severe Cyclonic Storm 'AMPHAN' moved nearly northwards with a speed of 20 kmph during past 06 hours and situated at 2030 hrs IST of 19th May, 2020 over Northwest and adjoining Westcentral Bay of Bengal near latitude 18.1°N and longitude 87.1°E, about 250 km nearly south of Paradip (Odisha), 390 km south- southwest of Digha (West Bengal) and 540 km south-southwest of Khepupara (Bangladesh). It would very likely to move north-northeastwards across northwest Bay of Bengal and cross West Bengal — Bangladesh coasts between Digha (West Bengal) and Hatiya Islands (Bangladesh) close to Sundarbans during Afternoon to Evening hours of 20th May 2020 with maximum sustained wind speed of 155-165 kmph gusting to 185 kmph. IMD continues to retain the forecast track of the cyclone.

On 20th May, 2020, the cyclone 'AMPHAN' moved closer to the Odisha coast as an Extremely Severe Cyclonic Storm. At 0530 hrs IST of 20th May, 2020 the cyclone located near latitude 19.1°N and longitude 87.5°E, about 155 km south-southeast of Paradip (Odisha), 280 km south of Digha (West Bengal) and 425 km southwest of Khepupara (Bangladesh).

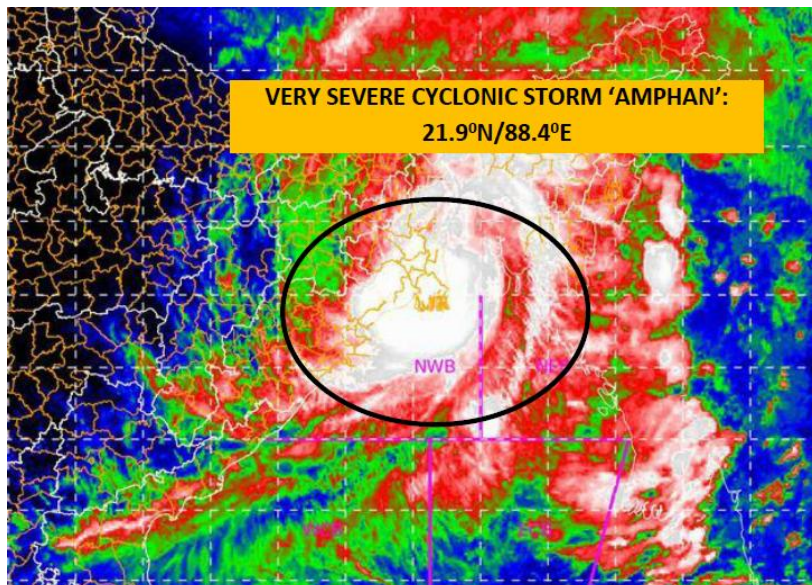


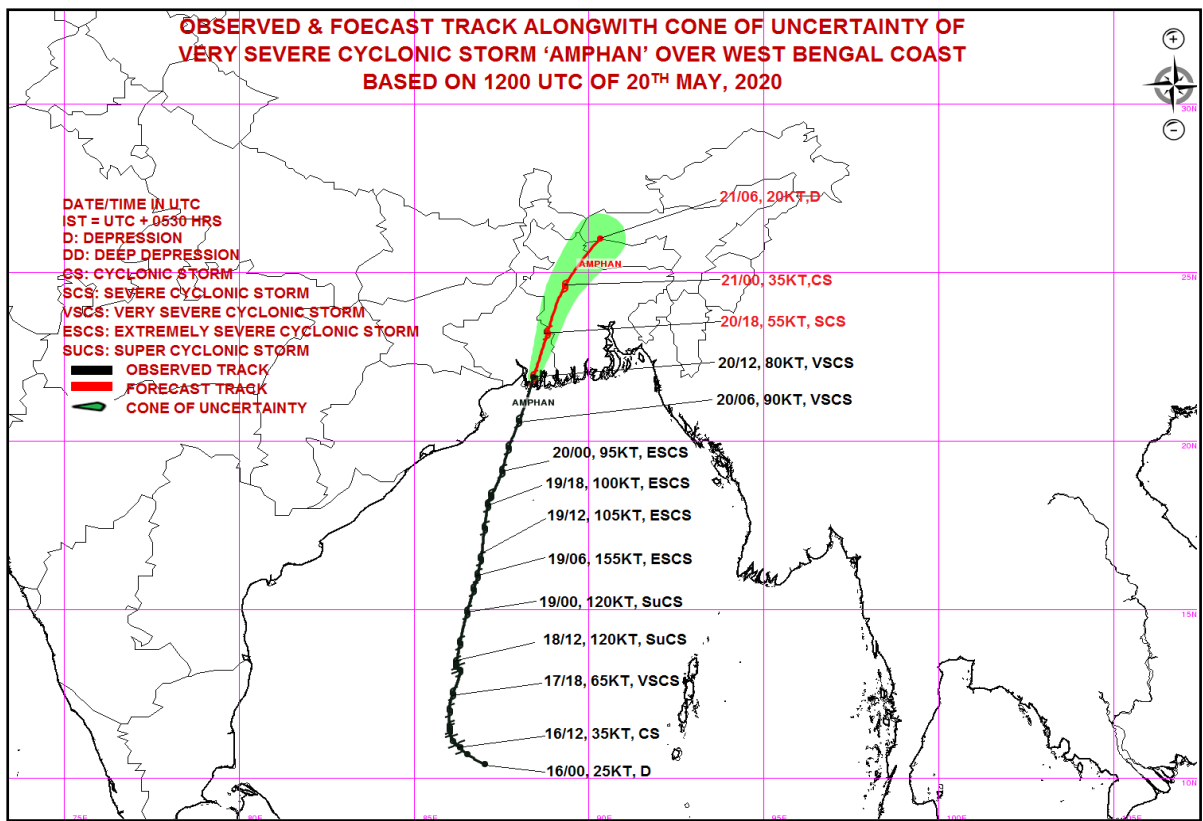
IMD predicted that the cyclone would very likely to move north-northeastwards across northwest Bay of Bengal and cross West Bengal — Bangladesh coasts between Digha (West Bengal) and Hatiya Islands (Bangladesh) close to Sundarbans during Afternoon to Evening hours of 20th



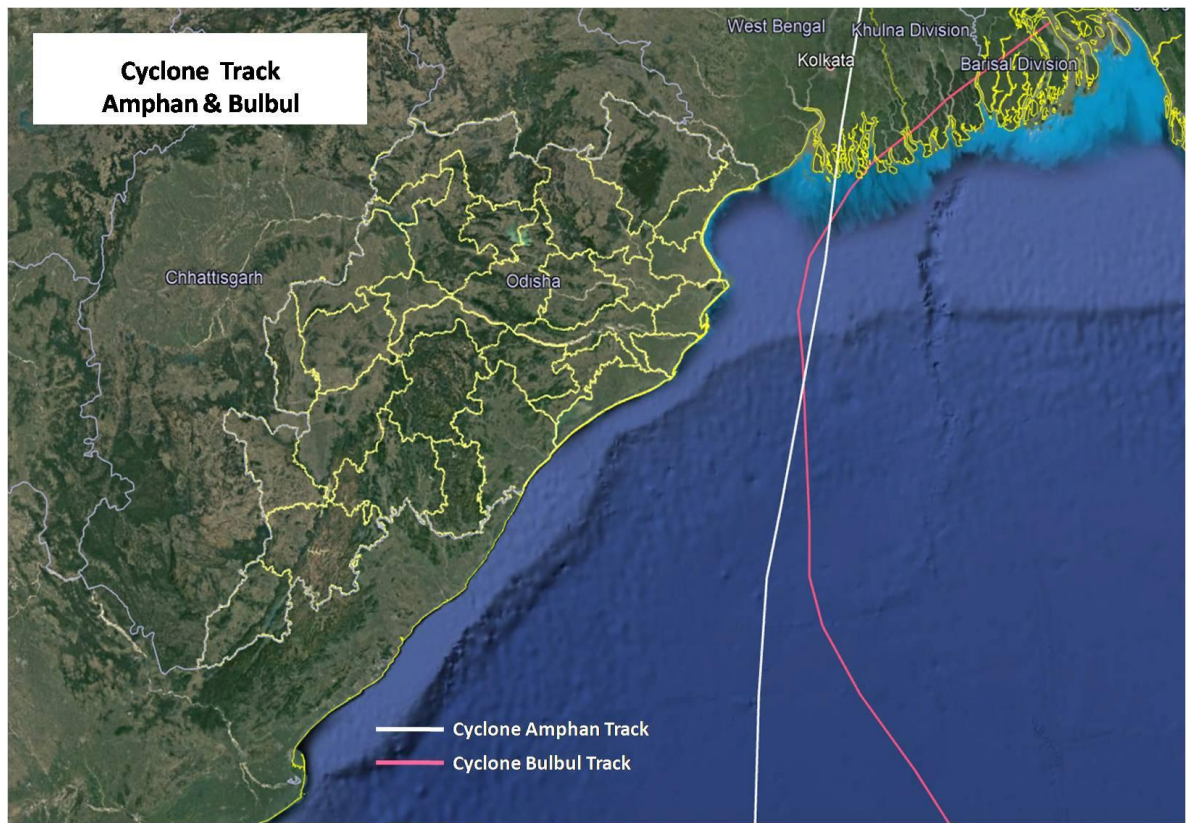
May 2020 with maximum sustained wind speed of 155-165 kmph gusting to 185 kmph. After landfall the system would likely to move north-northeastwards close to Kolkata. IMD issued red warnings for Odisha coast. The wind speed would gradually increase becoming 100 to 110 kmph gusting to 125 kmph along & off the Jagatsinghpur, Kendrapara, Bhadrak, Balasore and Mayurbhanj districts during forenoon to afternoon of 20th May 2020.

The Super Cyclonic Storm 'AMPHAN' over Northwest Bay of Bengal moved north-northeastwards with a speed of 25 kmph during past 06 hours, crossed West Bengal — Bangladesh coasts as a Very Severe Cyclonic Storm with a speed of 155-165 kmph gusting to 185 kmph across Sundarbans, near Lat. 21.65°N and longitude 88.3°E .





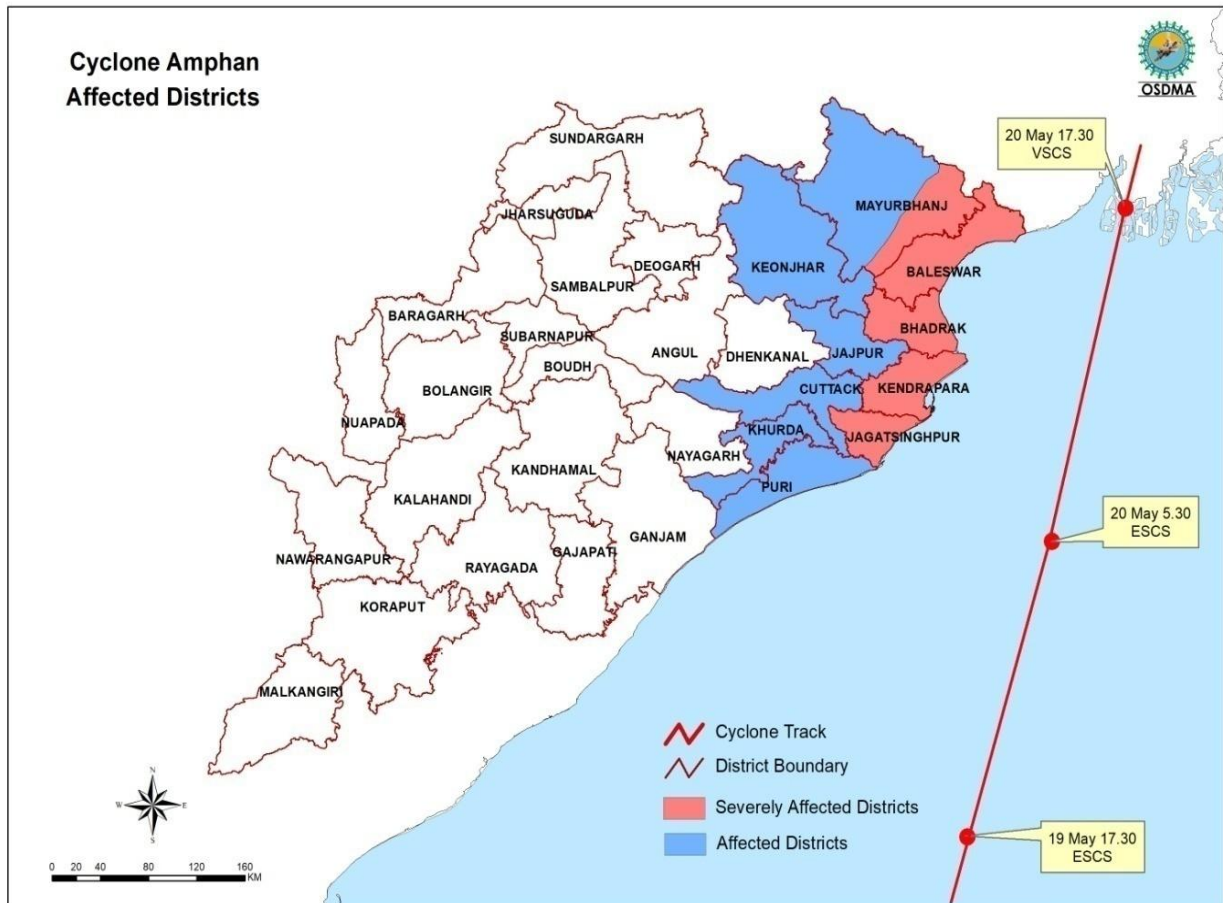
Cyclone AMPHAN took a similar track as cyclone Bulbul of 2019 tangentially affecting the coastal Odisha.



CHAPTER – III

OCCURRENCE & INTENSITY

The Super Cyclonic Storm 'AMPHAN' crossed West Bengal coasts as a Very Severe Cyclonic Storm with a speed of 155-165 kmph gusting to 185 kmph across Sundarbans, near Lat. 21.65°N and longitude 88.3°E . Due its impact, gale wind speed reaching 90 to 100 kmph gusting to 110 kmph prevailed along and off Jagatsinghpur, Kendrapara, Bhadrak, Balasore and Mayurbhanj districts of Odisha and squally wind speed reaching 55 to 65 kmph gusting to 75 kmph prevailed along & off remaining coastal and adjoining districts of Odisha (Puri, Khordha, Cuttack, Jajpur) during 20th May 2020. Gale wind speed reaching 160-170 gusting to 190 kmph prevailed over northwest Bay of Bengal.



Rainfall:

Under the impact of cyclone heavy rain was experienced in Jagatsinghpur, Balasore, Kendrapara, Jajpur, and other districts.

DISTRICT AVERAGE RAINFALL				
(Rainfall in mm)				
Sl. No.	District	20.05.2020	21.05.2020	Total
1	Jagatsinghpur	119.4	36.0	155.4
2	Balasore	54.2	62.3	116.5
3	Kendrapara	74.3	38.2	112.5
4	Jajpur	50.2	52.2	102.4
5	Mayurbhanj	28.6	67.0	95.6
6	Puri	71.2	22.0	93.2
7	Bhadrak	54.9	31.6	86.5
8	Cuttack	43.5	26.8	70.3
9	Khordha	34.9	14.8	49.7
10	Dhenkanal	18.3	29.5	47.8
11	Keonjhar	12.2	29.2	41.4
12	Nayagarh	18.5	0.7	19.2
13	Ganjam	7.3	0.4	7.7
14	Angul	5.7	1.5	7.2
15	Nuapada	3.7	0.0	3.7
16	Malkangiri	3.5	0.0	3.5
17	Gajapati	3.2	0.0	3.2
18	Kandhamal	0.8	0.0	0.8
19	Nawarangpur	0.6	0.0	0.6
20	Sundargarh	0.2	0.4	0.6
21	Balangir	0.2	0.0	0.2
Remaining 9 Districts		Nil		
State Average		20.2	13.8	34.0

RAINFALL STATUS OF THE TEN DISTRICTS FROM 20.05.2020 to 21.05.2020					
(Rainfall in mm.)					
Sl. No.	District	Block	Date		Total
			20.05.2020	21.05.2020	
Rainfall above 200 mm					
1	Puri	Kakatpur	161.0	56.0	217.0
2	Jagatsinghpur	Balikuda	179.0	30.0	209.0
3	Jagatsinghpur	Kujanga	159.0	49.0	208.0
4	Jagatsinghpur	Erasama	172.0	33.0	205.0
Rainfall between 100 mm and 200 mm					
1	Balasore	Bhograi	70.3	128.0	198.3
2	Jagatsinghpur	Naugaon	156.0	39.0	195.0
3	Mayurbhanj	Suliapada	70.0	116.2	186.2
4	Balasore	Baliapal	78.0	103.0	181.0
5	Mayurbhanj	Baripada	75.0	101.0	176.0
6	Cuttack	Niali	122.0	53.0	175.0
7	Mayurbhanj	Kuliana	37.3	137.4	174.7
8	Puri	Astarang	142.0	25.0	167.0
9	Mayurbhanj	Betanati	78.0	87.0	165.0
10	Balasore	Basta	69.0	80.0	149.0
11	Kendrapara	Marshaghai	88.0	57.0	145.0
12	Mayurbhanj	Morda	62.0	82.0	144.0
13	Kendrapara	Mohakalpara	112.0	30.0	142.0
14	Balasore	Nilagiri	88.0	52.0	140.0
15	Mayurbhanj	Bangriposi	33.8	105.2	139.0
16	Mayurbhanj	Rasgovindapur	52.4	84.0	136.4
17	Balasore	Jaleswar	16.0	120.0	136.0
18	Jagatsinghpur	Raghunathpur	92.0	43.0	135.0
19	Kendrapara	Garadapur	85.0	46.0	131.0
20	Mayurbhanj	Besoi	10.0	121.0	131.0
21	Cuttack	Kantapada	87.0	43.0	130.0
22	Kendrapara	Rajnagar	81.0	49.0	130.0
23	Jajpur	Binjharpur	75.2	53.6	128.8
24	Puri	Puri	82.2	45.0	127.2
25	Jajpur	Danagadi	56.0	71.0	127.0
26	Mayurbhanj	Samakhunta	38.0	87.0	125.0
27	Balasore	Balasore	60.0	64.0	124.0
28	Jajpur	Jajpur	70.0	53.0	123.0
29	Jagatsinghpur	Tirtol	77.0	45.0	122.0
30	Mayurbhanj	Kusumi	18.0	102.0	120.0
31	Jajpur	Dharmasala	43.0	75.0	118.0
32	Jajpur	Badachana	50.0	66.0	116.0
33	Jajpur	Bari	67.0	49.0	116.0

34	Bhadrak	Chandbali	70.6	43.6	114.2
35	Jajpur	Dasarathpur	72.0	41.8	113.8
36	Balasore	Bahanaga	80.0	33.0	113.0
37	Kendrapara	Rajkanika	78.0	35.0	113.0
38	Bhadrak	Tihidi	68.0	40.0	108.0
39	Puri	Satyabadi	75.0	32.0	107.0
40	Cuttack	Nischintakoili	71.2	32.0	103.2
41	Jagatsinghpur	Jagatsinghpur	78.0	25.0	103.0
42	Puri	Gop	82.2	20.2	102.4
Rainfall between 50 mm and 100 mm					
1	Bhadrak	Dhamnagar	70.0	26.0	96.0
2	Balasore	Soro	70.0	23.0	93.0
3	Bhadrak	Basudevpur	65.0	27.0	92.0
4	Khordha	Balianta	57.0	35.0	92.0
5	Mayurbhanj	Sarasakana	21.0	71.0	92.0
6	Kendrapara	Derabis	62.0	29.0	91.0
7	Mayurbhanj	Khunta	20.0	68.3	88.3
8	Mayurbhanj	Gopabandhunagar	20.0	68.3	88.3
9	Kendrapara	Kendrapara	53.0	35.0	88.0
10	Khordha	Bhubaneswar	49.4	38.2	87.6
11	Kendrapara	Pattamundai	53.0	34.0	87.0
12	Kendrapara	Aul	57.0	29.0	86.0
13	Balasore	Remuna	50.0	35.0	85.0
14	Khordha	Balipatna	54.6	26.4	81.0
15	Mayurbhanj	Badasahi	54.0	27.0	81.0
16	Bhadrak	Bhadrak	46.0	33.0	79.0
17	Keonjhar	Ghasipura	42.2	36.2	78.4
18	Mayurbhanj	Joshipur	5.0	73.0	78.0
19	Cuttack	Barang	35.0	42.0	77.0
20	Cuttack	Salepur	52.2	24.0	76.2
21	Mayurbhanj	Kaptipada	40.0	35.0	75.0
22	Balasore	Oupada	26.0	48.0	74.0
23	Mayurbhanj	Bahalda	10.6	61.6	72.2
24	Jajpur	Rasulpur	33.4	37.8	71.2
25	Jajpur	Korei	25.6	45.5	71.1
26	Keonjhar	Hatadihi	21.5	47.4	68.9
27	Mayurbhanj	Rairangapur	15.0	53.0	68.0
28	Cuttack	Mahanga	40.0	26.0	66.0
29	Jagatsinghpur	Biridi	42.0	24.0	66.0
30	Bhadrak	Bonth	24.0	40.0	64.0
31	Mayurbhanj	Jamda	15.0	49.0	64.0
32	Puri	Pipili	52.3	11.0	63.3
33	Cuttack	Cuttack Sadar	26.0	37.0	63.0
34	Mayurbhanj	Udala	35.0	27.8	62.8

35	Khordha	Jatani	40.0	22.0	62.0
36	Mayurbhanj	Bijatata	6.0	55.0	61.0
37	Puri	Brahmagiri	60.0	0.0	60.0
38	Mayurbhanj	Tiring	8.2	51.4	59.6
39	Cuttack	Tangi-Choudwar	28.0	31.0	59.0
40	Balasore	Simulia	38.0	18.0	56.0
41	Keonjhar	Jhumpura	6.2	47.8	54.0
42	Puri	Krushnaprasad	35.0	18.0	53.0
43	Bhadrak	Bhandaripokhari	41.0	11.5	52.5
44	Keonjhar	Keonjhar	6.2	44.6	50.8
45	Keonjhar	Ghatgaon	12.4	38.2	50.6
46	Khordha	Khordha	31.0	19.0	50.0
Rainfall below 50 mm					
1	Balasore	Khaira	5.0	43.0	48.0
2	Cuttack	Badamba	45.0	1.0	46.0
3	Puri	Nimapara	40.0	6.0	46.0
4	Keonjhar	Anandapur	22.5	20.2	42.7
5	Cuttack	Athagarh	15.0	27.0	42.0
6	Puri	Kanas	28.0	14.0	42.0
7	Keonjhar	Patna	15.2	26.2	41.4
8	Puri	Delang	25.0	15.0	40.0
9	Jajpur	Sukinda	9.3	29.4	38.7
10	Keonjhar	Champua	5.0	31.8	36.8
11	Mayurbhanj	Karanjia	9.0	26.0	35.0
12	Cuttack	Tigiria	16.0	18.0	34.0
13	Khordha	Begunia	27.0	7.0	34.0
14	Cuttack	Banki-Dampada	17.0	15.0	32.0
15	Mayurbhanj	Sukuruli	2.0	30.0	32.0
16	Keonjhar	Harichandanpur	10.2	17.8	28.0
17	Khordha	Tangi	27.4	0.0	27.4
18	Keonjhar	Saharpada	8.2	18.4	26.6
19	Keonjhar	Banspal	1.5	23.5	25.0
20	Khordha	Bolagarh	25.0	0.0	25.0
21	Keonjhar	Joda	4.4	19.8	24.2
22	Khordha	Chilika	23.0	0.0	23.0
23	Mayurbhanj	Thakurmunda	7.3	9.0	16.3
24	Khordha	Banapur	15.0	0.0	15.0
25	Mayurbhanj	Raruana	2.0	13.0	15.0
26	Keonjhar	Telkoi	3.0	8.3	11.3
27	Cuttack	Narasinghpur	11.0	0.0	11.0

CHAPTER – IV

Preparedness Measures Undertaken:

1. Concerned Departments of the Government and Collectors of 12 coastal and adjoining districts (Gajapati, Ganjam, Nayagarh, Puri, Khordha, Cuttack, Jagatsinghpur, Kendrapada, Jajpur, Bhadrak, Balasore and Mayurbhanj) were alerted and advised to undertake required preparedness measures to effectively handle the disaster.
2. The District Administration of vulnerable districts were directed to keep Multipurpose Cyclone Shelters (MCS) and Multipurpose Flood Shelters (MFS) in readiness and to identify other suitable RCC roofed public buildings for use as safe shelters in case of requirement.
 - 634 MCS/ MFS, excluding those being used as TMC for COVID-19, and 7092 other RCC buildings with cumulative capacity to accommodate more than 12 lakh people, maintaining social distancing norms, were kept ready in 12 districts.
 - It was also directed to arrange for Food, Drinking Water, Lighting, Sanitation and Health facility at each shelter and keep the Tower Light, and Chain Saw and other emergency equipment available in MCS/ MFS in readiness to meet any eventuality.
 - 486 no. of DG sets, 1513 no. of inflatable tower lights and 1497 no. of chain saws were kept in readiness at shelter level.
 - Arrangements were made to divert the inflatable tower lights available in Puri, Cuttack and Ganjam districts to Balasore, Bhadrak, Kendrapada and Jagatsinghpur districts.
3. Collectors of districts likely to be affected to assess the situation and identify the people living near the coast/ low lying areas, people living in vulnerable condition in hut or kutcha house & take steps to evacuate them to MCS/ MFS or other identified safe buildings and organise all basic needs like food, drinking water, lightning, sanitation and health facilities for them.

4. Collectors of Balasore, Bhadrak, Kendrapada and Jagatsinghpur were requested to take immediate steps to remove all hoardings in ULB areas and roadside hoardings put in rural areas.
5. 4 Senior IAS Officers were deputed to Balasore, Bhadrak, Kendrapara and Jagatsinghpur districts to provide guidance and support to the District Administrations in management of the Cyclone.
6. Besides, 4 Senior IPS Officers were deputed to above mentioned 4 districts to provide guidance and support to the District Superintendent of Police for management of the cyclone.
7. **Evacuation:** 2,00,346 people were evacuated to the safe shelters. As many as 1885 no. of pregnant women were shifted to the hospitals/ Maa Gruhas.

8. Deployment of Disaster response forces

- 20 NDRF teams, 16 ODRAF teams and 231 Fire Service team were deployed in 6 coastal and 6 nearby districts.
- 100 teams of OFDC were also deployed in 6 districts.
- Fire Officers and Deputy Fire Officers were deputed to each of the vulnerable districts for coordination among Fire Service Teams.
- Balance 4 ODRAF teams, 17 teams of Fire Service and 20 OFDC teams were kept in standby to be pressed into service.

Sl.	District	NDRF	ODRAF	Fire Services	OFDC Teams	Total Teams	Total Small Teams for Operation in Field
1	Ganjam	0	0	33	0	33	66
2	Khordha	0	2	17	0	19	40
3	Cuttack	0	1	21	0	22	45
4	Kendrapada	3	3	18	10	34	61
5	Jagatsinghpur	4	1	15	10	30	51
6	Jajpur	1	1	18	0	20	41
7	Puri	1	0	15	0	16	32

8	Bhadrak	4	3	18	10	35	63
9	Balasore	6	4	21	35	66	101
10	Mayurbhanj	1	1	32	10	44	79
11	Nayagarh	0	0	0	0	0	0
12	Gajapati	0	0	09	0	09	18
13	Keonjhar	0	0	14	25	39	53
	Total	20	16	231	100	367	650

9. Electricity:

- Advance action was taken Odisha Power Transmission Corporation Limited (OPTCL) and Distribution Companies (DISCOMs) for mobilizing technical gangs and materials to take up restoration immediately after the cyclone. Gangs with Gen Sets, gas cutters and vehicles were kept in readiness for immediate deployment.
- 340 no. of gangs, each comprising 10 work men, 4305 no. of poles, 365 km of conductors, 116 KM of AB Cable, 115 no. of DTR, 3850 no. of insulators were mobilized and prepositioned by CESU, NESCO and SOUTHCO.
- PGCIL and NTPC deputed 30 gangs each with necessary equipment for prepositioning in NESCO area.
- 17 nos. of ERS Towers were also mobilised to the affected areas.
- As power supply was likely to be shut down before the cyclone, the life line institutions including Government offices were asked to make power back up arrangement (Genset with sufficient fuel).
- 24X7 Control room was set up in OPTCL/ GRIDCO for sharing of information.
- District wise nodal officers were allotted for monitoring the situation.

10. Telecom: Meetings were held with all Telecom Service Providers (TSPs) for taking necessary preparedness measures to keep the Telecom/ Internet Service functional during cyclone situation and to restore the communication in case of any damage due to cyclone. The TSPs made necessary arrangements for functioning of all the DG sets with fuel reserve of 24 hours. Movable DG sets were kept ready at central locations for movement.

All the TSPs kept **Cell-on-Wheels** in readiness for deployment in case there is damage to mobile towers in district due to impact of AMPHAN. All the telecom operators were advised to be ready with adequate numbers of technical manpower for restoration of any affected telecom towers and Optical Fiber Cables (OFC).

11. Drinking water:

Panchayati Raj and Drinking Water (PR&DW) Department:

- 276 DG sets were kept ready for Rural Pipe Water Supply (PWS) projects in 12 districts for uninterrupted water supply in absence of electricity.
- 805 vehicles loaded with PVC tanks and 75 water tankers were in readiness for use.
- 199 mobile repair units (each comprising of two SEMs) and 106 local electricians were kept ready for taking up repair work on emergency basis.
- 2724 no. of overhead tanks were kept loaded with water.
- 1828 bags of bleaching powder were supplied for disinfection.

Housing & Urban Development Department:

- 113 DG sets, 95 tankers and 246 PVC tanks were arranged for deployment in the ULB areas of Balasore, Bhadrak, Kendrapada, Jagatsinghpur and Mayurbhanj districts for ensuring uninterrupted water supply.
- 20 storage reservoirs were kept for continuous pumping operation to ensure availability of adequate stock for 24 hours post cyclone.

12. Health preparedness:

- Mobile health teams were deployed in affected areas.
- Power back up arrangement was made in all hospitals with sufficient quantity of fuel.
- Sufficient stock of essential medicines, anti snake venom was kept.
- Arrangement was made for screening all migrant workers in Temporary Medical Centres (TMC) located within 3 km of the coastline and to send the COVID negative cases to home quarantine and positive cases to COVID facilities immediately.

- Nodal Officers were identified for districts and blocks for continuous monitoring of disaster response activities.
- Contingency plans were made for opening of Medical Relief Centers and providing treatment to the trauma patients at health facilities.
- Plans were made for shifting of pregnant women from interior areas to delivery point/ Maa Gruha.
- Contingency plan for sanitation was in place and stocking of bleaching power/ ORS/ Halogen tablets at PHC, CHC, DHHs and up to ASHA level was ensured.

13. Fishery and Animal Husbandry:

- Fishermen Warnings were issued to Collectors and fishermen were advised not to venture into sea. District Administration along with officials of Fisheries Department was in close coordination with the marine fishermen in the matter.
- All 4115 number of boats that had gone to sea for fishing returned to shore by 17th May and no boat was allowed enter into sea from 18th .
- 22,050 number of boats in 6 coastal districts and Chilika area of Khurdha district berthed in safe places like fishing harbour and fish landing centres.
- Awareness campaign on protection of animal resources from possible cyclone situation was launched in electronic as well as print media.
- Supply of required medicines and vaccines to the CDVOs for distribution to vulnerable areas was expedited.
- People were advised to shelter the cattle and domestic animals at safe places. They were advised to evacuate their cattle to the ground floor of the MCS/ MFS and other suitable buildings in case of necessity.

14. Agriculture:

- Agro based crop advisory, prepared by OUAT and Directorate of Agriculture for protection of matured and harvested paddy as well as non-paddy crops along with other crop protection practices was issued by the A&FE Department for wide circulation among the field functionaries and farmers.
- Crop advisories were disseminated through All India Radio, Community Radio Stations across the state and Door Darshan.

- Out of a crop coverage area of 2,65,800 hectares in north and south coastal districts 1,37,400 hectares were harvested in a week time.
- Awareness camps and mike announcements were done in different villages to take the harvested crops/ grains to a safer place and to cover the crops/ grains by polythene sheets.

15. Water Resources:

- 12 senior level Engineers were deputed to each of the identified 12 districts since 17.05.2020.
- All critically vulnerable and vulnerable locations of embankments were restored and sufficient flood fighting materials were kept in position.
- In view of anticipated rain fall, the major and medium reservoirs were depleted.
- The field Engineers were on high alert and in touch with District Administrations.
- 24x7 Control rooms in each Division, Circle and CE Office were operationalised.

16. Rural Development: Executive Engineers of vulnerable districts were instructed to take all precautionary measures with men, machine, roller, etc. in vulnerable locations of different roads, so as to avoid any dislocation in road communication system.

17. Communication: The Collectors, State Disaster Response Forces and other officers having Satellite Phones were directed to recharge and keep the phones ready for use. The Digital Mobile Radio installed in six coastal districts were also tested and kept ready for use for communication with Collectors, BDOs and others in case the telephone / cell phone networks are down due to cyclone. The V-sat communications at State HQ and in 3 districts (Khordha, Jajpur and Cuttack) were also in readiness.

18. Dissemination of Warnings:

- As many as 2.17 crore cyclone warning messages were sent through SMS to the mobile phone subscribers of the likely affected areas.

- Early warning voice messages were disseminated through Alert Siren Systems installed in coastal areas under Early Warning Dissemination System (EWDS).
- 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/ Chilika fishermen.
- All cyclone bulletins and warning messages of IMD were disseminated with key State Level Officers, Collectors and Media.
- Community Level Volunteers and Task Force Team members of Multipurpose Cyclone/ Flood Shelters were engaged for ensuring family preparedness, warning dissemination and expediting evacuation.
- Social Media platforms were effectively used not only for dissemination of warnings but also for sending vital information to the general public for safety and survival.

19. Review Meetings:

- The Hon'ble Chief Minister reviewed the preparedness through Video Conferencing (VC) on 16.05.2020 with the concerned Departments and Collectors of 12 vulnerable districts.
- The Chief Secretary reviewed the preparedness through VC on 19.05.2020 with the concerned Departments and Collectors of Bhadrak, Balasore, Kendrapada and Jagatsinghpur districts.
- Special Relief Commissioner & Additional Chief Secretary, Disaster Management reviewed through video conferencing with Collectors of Balasore, Bhadrak, Kendrapara, Jajpur, Jagatsinghpur, Cuttack, Puri, Khordha and Mayurbhanj regarding preparedness measures taken by them.
- Cabinet Secretary, Govt. of India discussed with the Chief Secretary & Special Relief Commissioner on 16.5.20 and 18.5.20 about preparedness.

The State Government in line with the principle of restoring the essential public services in least possible time to minimise hardship to the people took necessary steps well before the cyclone. A host of professionally skilled groups of manpower along with required equipment pertaining to key disaster response sectors like search & rescue/ evacuation, relief line/ tree cutting/ road clearance and energy restoration were prepositioned in strategic locations in the district jointly decided by Collector and SP of the districts to start working for restoration of the respective services immediately after the cyclone subsides. The manpower and equipment were mobilized from the districts which not likely to be affected due to the current cyclone and deployed in the 4 most vulnerable districts i.e., Balasore, Bhadrak, Kendrapada and Jagatsinghpur. This not only gave a high lead time to the District Administration for earliest restoration of the key services but also allowed planning for optimum utilization of the available skilled manpower at different places simultaneously. The detailed deployment of skilled human resources is indicated below:

Table

Sl. No.	Sector	No. of Teams/ Gangs deployed	No. of skilled manpower
1.	NDRF, ODRAF, Fire Service	550	2659
2.	OFDC (Tree Cutting Units)	100	400
3.	Restoration of electricity supply	374	3740
4	Restoration drinking water supply	215	604
	TOTAL	1239	7403

CHAPTER – V

Response

Evacuation/ Free Kitchen:

2,00,346 people were evacuated from vulnerable areas to 4314 shelters. They were provided with dry food, drinking water and free kitchen. Besides this, Chuda, Gud, Biscuits, matchbox and candle were also provided.

Sl. No.	District	No. of Shelters	No. of People Evacuated
1	Balasore	720	49564
2	Bhadrak	561	31017
3	Cuttack	428	10961
4	Gajapati	14	1547
5	Jagatsinghpur	299	16840
6	Jajpur	171	7140
7	Kendrapara	622	39864
8	Keonjhar	2	258
9	Khurdha	103	3172
10	Mayubhanj	1029	27216
11	Nayagarh	1	55
12	Puri	364	12712
	Total	4314	200346

Administration of Emergent Relief

Sl.	District	Rice in Qtl	Chuda in Qtl	Gur in Qtl	No. of Beneficiary
1	Balasore	85.80	278.00	44.50	2526
2	Bhadrak	0	12.40	2.46	31017
3	Kendrapara	0	1165.43	119.27	39864
4	Jagatsinghpur	0	95.87	20.04	13575
5	Cuttack	16.21	98.45	22.41	10961
6	Khordha	1.48	3.13	0.92	1189
7	Puri	0.0	26.65	5.32	2893
8	Mayurbhanj	150.0	206.0	45.0	3500
	Total	253.49	1885.93	259.92	105525

Aerial Survey by Hon'ble Chief Minister/ Prime Minister:

- Hon'ble Chief Minister made an aerial survey of the affected areas on 21.5.2020.
- Hon'ble Prime Minister along with Hon'ble Chief Minister visited the cyclone affected districts on 22.05.2020 by helicopter and took a review meeting with the Hon'ble Governor, Hon'ble Chief Minister and Senior Officers of the State Govt. about the damages and relief measures.

Repair/ Restoration Activities:

Clearance of Rural Roads:

All the roads blocked due to falling of trees and debris in Balasore, Bhadrak, Kendrapada, Jagatsinghpur and other affected districts were cleared within 24 hours with the help of NDRF, ODRAF, Fire Service and OFDC personnel.

Sl. No.	District	No. of Road Blocked	No. of Road Cleared	No. of trees removed
1	Balasore	59	59	108
2	Bhadrak	31	31	58
3	Kendrapara	132	132	2133
4	Jagatsinghpur	52	52	162
8	Puri	16	16	31
	Total	290	290	2592

Restoration of Power:

44,57,182 no. of consumers were affected in Balasore, Bhadrak, Jagatsinghpur and Jajapur, Mayurbhanj, Ganjam Districts. Power was restored in five days in all affected areas.

Disposal of carcasses:

17 dead animals/ carcasses were disposed in Kendrapara district.

Restoration of Water Supply:

Sl.	District	No. of Tube wells disinfected	No. of PWS affected	PWS operational zed through electrification
1	Balasore	2284	593	593
2	Bhadrak	4992	258	258
3	Kendrapara	2235	295	295
4	Jagatsinghpur	82	272	272
5	Mayurbhanj	1520	299	299
6	Jajpur	122	328	328
7	Cuttack	832	394	394
8	Puri	921	329	329
9	Khordha	102	447	447
Total		13090	3215	3215

Health Measures

Sl	District	No. of Medical Team Deployed	No. of Medical Center Opened	ORS pkt. Distributed	Halogen Tab. Distributed	Bleaching Powder Supplied (Bags)
1	Balasore	22	12	23116	56555	6550
2	Bhadrak	8				
3	Kendrapara	37				
4	Jagatsinghpur	16	26	28900	127000	104
5	Jajpur	36	15			
6	Khordha	21				
7	Puri	32	32			
8	Mayurbhanj	89				
Total		261	85	52016	183555	6654

Assistance to West Bengal

The Government of Odisha also extended support to the Govt. of West Bengal for mitigating the effects of cyclone AMPHAN which made landfall in that State.

- 10 Units of ODRAF and 300 Fire Service Personnel have been deployed with emergency equipment like inflatable tower light, cutter, power saw etc. to West Bengal for assisting the Government in search/ rescue and road clearance activities.
- 50,000 pieces of LDPE sheets of size (6mtr X 6 mtr) have been provided to the Government of West Bengal to assist the people affected due to Super Cyclonic storm 'AMPHAN'

CHAPTER – VI

Impact & Damages

The damages caused by the cyclone were mainly due to gusting action of wind and heavy rainfall. As per report received from Collectors, 45.26 lakh people in 9838 villages of 97 Blocks and 272 wards of 22 Urban Local Bodies in 10 Districts have been affected. 10726.18 hectares of agriculture/ horticulture crop have been damaged. The fishing communities have also been affected due to loss to their boats and nets. The handicraft artisans have lost their equipment, accessories and raw materials. Livestock and poultry farmers have also sustained loss. Besides, substantial damage has been caused to public properties.

Extent of Damages

Abstract of extent of damages due to super cyclonic storm "AMPHAN" is indicated below:

Sl. No.	Name of the district	Blocks Affected	GPs Affected	Villages Affected	ULBs Affected	Wards Affected	Population Affected
1	Balasore	12	231	2898	4	44	130000
2	Bhadrak	7	218	1373	4	80	750000
3	Cuttack	7	148	474	0	0	344077
4	Jagatsinghpur	8	198	1308	2	40	1136971
5	Jajpur	10	120	666	2	23	547526
6	Kendrapada	9	249	1592	2	41	1522901
7	Keonjhar	7	11	18	0	0	258
8	Khordha	5	36	62	2	8	3172
9	Mayurbhanj	21	216	983	2	15	49800
10	Puri	11	166	464	4	21	40857
	Total	97	1593	9838	22	272	4525562

House Damage

19 kutcha houses have been fully damaged, 39 pucca/ kutcha houses have been severely damaged due to the cyclone. Besides, 100 pucca houses and 4397 kutcha houses have been partially damaged. Similarly, 334 huts and 393 cowshed attached to houses have been damaged. The district-wise details are given under **Appendix-VII**.

Crop Damage

3393.50 hectare of agriculture, horticulture and perennial crops have sustained crop-loss to the extent of 33% and above due to cyclone associated with heavy rain. The details are given under **Appendix-IV & V**.

Sand Cast :

589 crop area have been sand cast in Kendrapara (478 hect) and Bhadrak (111 hect) districts.

Livestock affected

1903 livestock and 18875 poultry birds were affected due to cyclone & heavy rain. The district-wise figures of affected livestock are given in following table.

Sl. No.	District	Livestock affected			Poultry affected
		Large	Small	Total	
1	Balasore	1	4	5	1005
2	Bhadrak	5	2	7	
3	Cuttack	1232	633	1865	
4	Jagatsinghpur	2	6	8	870
5	Jajpur		1	1	17000
6	Kendrapada	9	8	17	
	Total	1249	654	1903	18875

Livestock Death:

17 nos. of large milch animals, 7 nos. of small milch animals and 14 nos. of small draught animals along with 4685 poultry birds have lost their lives due to Cyclone.

Loss of livelihood

Due to cyclone, 5040 traditional craftsmen have been affected causing damage to their equipments and raw materials.

SI No	District	No. of Artisans Affected
1	Balasore	1525
2	Bhadrak	215
3	Kendrapara	2350
4	Jagatsinghpur	350
5	Jajpur	600
	Total	5040

Damage to Energy Sector:

Damage in Physical Terms	Balasore	Bhadrak	Kendrapara	Jagatsinghpur	Jajpur	Cuttack	Puri	Mayurbhanj	Keonjhar
No. of feeder Transformer damaged	2	1	0	0	1	0	0	0	0
No. of 33KV poles damaged	710	632	96	61	190	5	12	281	29
Length of 33KV conductor damaged (in km)	128.54	104.75	32.1	29.8	29.046	3.2	4.5	50.831	5.253
No. of 11KV poles damaged	5056	4279	973	685	1290	48	128	1093	248
Length of 11KV conductor damaged (in KM)	1353.1	899.19	339.66	294.5	299.73	28.6	40.5	324.76	44.403
No. of DTs damaged	531	317	30	51	84	5	10	70	21
No. of LT line poles damaged	6374	5057	1281	1331	1745	50	65	1530	261
Length of LT line conductor damaged (in km)	656.7	536.8	530	461.8	214.5	126.6	116.5	159.06	19.03
33KV VCB (No)	11	10	0	0	2		0	3	0
11KV VCB (No)	31	20	0	0	5		0	11	1

Damage to Roads

Rural Roads

Sl.	District	Length of Road Damaged (in km)	No. of Breaches	No. of CDs Damaged
1	Puri	5.21	1	0
2	Kendrapara	70.73		1
3	Balasore	3.042	2	3
4	Mayubhanj	14.8	0	6
5	Jagatsinghpur	38.62	0	4
6	Keonjhar	0.20	0	2
7	Bhadrak	18.45	0	26
	Total	151.05	3	42

PWD Roads

Sl.	District	Length of Road Damaged (in km)	No. of Breaches	No. of CDs Damaged
1	Balasore	18.22	1	0
2	Bhadrak	58.80	0	1
3	Jagatsinghpur	12.53	0	1
4	Jajpur	39.85	0	1
5	Kendrapara	30.05	1	0
6	Khordha	0.69	0	0
7	Mayurbhanj	49.22	0	0
	Total	209.36	2	3

Damage to PWD Buildings

Sl.	District	No. of Buildings Damaged
1	Kendrapara	16
2	Bhadrak	4
3	Balasore	6
4	Jajpur	9
5	Khurdha	1
6	Jagatsinghpur	35
	Total	71

Damage to River/ Saline Embankments

Sl.	District	No. of Embankment Damaged	Length in KM damaged
1	Balasore	6	27.90
2	Bhadrak	8	13.10
3	Jagatsinghpur	53	22.03
4	Kendrapara	12	10.18
	Total	79	73.21

Damage to urban roads & drains

Sl.	District	Length of Drain Damaged (in km)	Length of road damaged (in km)	No. of culvert Damaged
1	Mayurbhanj	0.30	0.50	2
2	Balasore	0.78	0	1
3	Bhadrak	1.50	8.985	8
4	Kendrapara	0.20	6.10	0
5	Jagatsinghpur	0	0.25	0
6	Puri	0	0.968	0
	Total	2.78	16.78	11

Damage to Panchayati Raj Sector

Sl.	District	No. of Angan Wadi Center damaged	No. of Primary School Building damaged	No. of GP Building/ Community center damaged	No. of PS/ GP Road damaged	No. of Rural Water Supply project damaged
1	Balasore	24	168	30	420	159
2	Bhadrak	354	709	194	556	145
3	Jajpur	250	471	33	1054	66
4	Jagatsinghpur	0	0	0	0	84
5	Kendrapara	18	194	41	141	58
6	Mayrbhanj	0	10	0	0	105
	Total	646	1552	298	2171	617

Damage to Public Properties

Loss to public properties and requirement of fund for relief measures on account of Super Cyclonic Storm "AMPHAN"-2020			
Sl.	Departments	Quantity	Loss (Rs. in Lakh)
1	Energy Department		
	Feeder Transformer damaged	4 Nos.	273.44
	33KV pole damaged	2016 Nos.	80.64
	33KV conductor damaged	388.02 kms	194.01
	33KV VCB damaged	26 Nos.	153.4
	11KV poles damaged	13800 Nos.	552.00
	11KV conductor damaged	3624.443kms.	1812.22
	11KV VCB damaged	68 Nos.	224.40
	Distribution Transformer damaged	1119 Nos.	1119.00
	LT line pole damaged	17694 Nos.	707.76
	LT line conductor damaged	2821 kms.	1410.50
	Minor material damaged		172.00
	Civil Works		273.92
	Erection Charges		541.01
	Total		7514.30
2	Fisheries & Animal Resources Department		
	Damage to Infrastructure of ARD Sector	35 Nos.	138.00
	Damage to Infrastructure of Fisheries Sector	6 Nos.	22.40
		Total	
3	Forest & Environment Dept.		
	Avenue plantation damaged	55 RKM	20.00
	Nursery seeding/ infrastructure damaged		40.00
	Tree uprooted	4000 Nos.	25.00
	Infrastructure damaged		35.00
	Other plantation & infrastructure damaged in WL division		37.87
		Total	
4	Housing & Urban Development Department		
	Road damaged	16.78 kms.	157.74

	Culverts damaged	11 Nos.	31.00
	Drain damaged	2.78 kms.	74.00
	Debris cleared from roads/ drain	122.80 kms.	24.08
	Street Lights etc. damaged	484 Nos.	25.80
	Other infrastructure damaged		116.50
	Hiring of DG Set	351 Nos	171.15
	Hiring of Water Tanker	206 Nos.	21.88
	Total		622.15
5	Health & Family Welfare Dept.		
	Damage to CHC/ PHC/ Sub-Centre	128 Nos.	256.30
6	Panchayati Raj & DW Department		
	Anganwadi Center damaged	646 Nos.	1297.00
	Primary School Building damaged	1552 Nos.	3008.90
	GP/ PS Building & Community Hall damaged	298 Nos.	609.00
	GP/ PS road damaged	2171 Nos.	4996.00
	Rural Drinking Water Supply System damaged	3832 Nos.	1066.90
	Total		10977.80
7	Rural Development Department		
	Damage to rural roads including breaches	151.17 kms.	493.16
	Damage to CD/ Bridges	42 Nos.	232.5
	Debris cleared on roads/ public area	290 Nos.	50.92
	Secondary School building damaged	77 Nos.	226.01
	Other Hospital building damaged (Res. & non-res.)	12 Nos.	25.00
	RD Dept. building damaged	18 Nos.	65.30
	Revenue Dept. building damaged	23 Nos.	47.70
	ARD Dept building damaged	5 Nos.	10.50
	Home Dept. building damaged	6 Nos.	14.15
	Total		1165.24
8	Water Resources Department		
	Damage to rivers & saline embankment	73.21 kms.	131.77
9	Works Department		
	Damage to PWD Roads	209.36 Kms.	388.50
	Damage to CD/ Bridges	3 Nos.	5.50

	Damage to breaches of PWD	2 Nos.	91.00
	Debris cleared on roads/ public area	153.30 kms.	27.95
	Damage to secondary School Buildings	5 Nos.	8.45
	Damage of Hospital buildings other than PHC & CHC	2 Nos.	3.30
	Damage to Govt. Offices	34 Nos.	73.10
	Damage to flood light of Hockey Stadium, jajpur	1 No.	20.00
	Damage to Govt. Qtrs./ IBs/ Guest Houses/ Pantha Nivas	33 Nos.	62.20
	Damage to NHs maintained by State	1 No.	10.00
	Total		690.00
10	Cooperation Department		
	Damage to Buildings and Godowns	146 Nos.	420.30
	Total (Public Properties)		22096.13
11	Pure Relief Items		
	House Building Assistance	5228 Nos.	223.01
	Clothing & Utensils	392 Nos.	14.90
	Gratuitous Relief		78.48
	Cost of evacuation, search & rescue measure		23.00
	Temporary accommodation		208.25
	Agriculture input subsidy-SMF	3393.50 Ha.	456.82
	De-silting of Agriculture land	589 hect.	71.86
	Replacement of milch/ draught animals & poultry	4723 Nos.	8.20
	Disposal of carcasses	17 nos	0.08
	Assistance to fisherman	29 Nos.	1.24
	Assistance for Artisan-Traditional crafts & Handloom weavers	5040 Nos.	413.28
	Amount spent by Collectors on clearance of debris		73.12
	Total		1572.24
	Grand Total		23668.37

CHAPTER – VII

Assistance Sought For

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

392 families whose houses (fully/ severely) and hut have been damaged are to be provided with clothing and utensils as per the SDRF Norms. An amount of **Rs. 14.90 lakh** is required for the purpose.

Gratuitous Relief

253.49 quintals of rice, 1885.93 quintals of chuda and 259.92 quintals of gur have been provided to the affected people. An amount of **Rs.78.48 lakh** is required for the purpose.

De-silting of Agriculture land:

Rs.71.86 lakh is required for de-silting of 589 hect.of agriculture land which has been sand cast due to heavy rain.

Cost of Search, Rescue and Evacuation of affected people: - (Item 2(a) of SDRF norms)

20 units of ODRAF, 16 teams of NDRF, 231 Fire Service and 100 OFDC teams were deployed in the vulnerable/ affected areas for search & rescue operation and for post cyclone relief line clearance. 2.00 lakh people were evacuated and accommodated in cyclone/ flood shelters as well as earmarked safe pucca public buildings. An amount of **Rs.23.00 lakh** has been spent on deployment of response forces, use of vehicles and ancillary expenditure for evacuation of the people.

Provision for temporary accommodation, food, clothing and medical care:

[Item -3(a) of SDRF Norms]

a) 4321 nos. of relief camps were opened to accommodate 2.16 lakh people. An amount of Rs.208.25 lakh has been spent towards cost of providing temporary accommodation, food, clothing and medical cares in the relief camps. The district-wise detail is given in Appendix- III.

b) 4889 families whose houses have been damaged have been provided with polythene sheets for temporary shelter. The total amount spent for 4889 polythene sheets @ Rs.1600/- per family comes to **Rs.78.22 lakh**.

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

206 nos. of water tankers and 351 nos. of DG sets were hired and engaged for emergency supply of drinking water in the cyclone affected urban areas. An amount of **Rs.193.03 lakh** have been spent for the purpose.

Rural Water Supply: (Repair/restoration of drinking water sources)

617 nos. of rural piped Water Supply Systems have been damaged. 3215 nos. of mobile water tankers were arranged in rural area. An amount of **Rs. 1066.60 lakh** is required for immediate repair/ restoration of above damaged water supply systems and for emergency supply of drinking water in rural area.

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

An amount of **Rs.125.15 lakh** has been spent by the concerned departments and Collectors for clearance of debris from public places in the cyclone affected areas.

Agriculture input subsidy to Small and Marginal Farmers where crop loss is 33% and above: [Item -5(i)B of SDRF Norms]

Out of 10726.18 hectares of affected arable land, 3393.58 hectares of cropped area have sustained crop loss to the extent of 33% and above. An amount of **Rs.456.82 lakh** is required for providing agriculture input subsidy to the affected farmers.

The District wise requirement of funds is given under **Appendix- IV**.

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

17 nos. of large milch animals, 7 nos. of small milch animals and 14 nos. of small draught animals, and 4685 poultry birds have lost their lives due to Cyclone. The total expenditure for replacement of these animals along with poultry birds as

per the norms and guidelines of SDRF comes to **Rs.8.20 lakh**. The detailed calculation is given at **Appendix-VI**.

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

28 nos. of boats have been partially damaged and one boat fully damaged due to cyclone. An amount of **Rs.1.24 lakh** is required for providing assistance to the affected fishermen.

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

5040 handicrafts artisans have been affected due to cyclone. Extensive damages have been caused to their raw material/ finished goods and equipment. An amount of **Rs.413.28 lakh** is required for replacement of damaged tools/ equipment and purchase of raw materials as per the revised SDRF Norms.

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

19 kutcha houses have been fully damaged, 39 pucca/ kutcha houses have been severely damaged due to the cyclone. Besides, 100 pucca houses and 4397 kutcha houses have been partially damaged. Similarly, 334 huts and 393 cowshed attached to houses have been damaged. An amount of **Rs.223.01 lakh** is required for providing assistance for repair/ restoration of the damaged houses of affected people. The detailed requirement of fund as per SDRF/ NDRF Norms is given in **Appendix- VII**.

Repair/ restoration of immediate nature of the damaged infrastructure in eligible sectors: *-[Item-10 of SDRF Norms]*

Roads and bridges

An amount of **Rs.485.00 lakh** is required towards repair/ restoration of 209.36 Km of PWD roads, 3 nos. of CD/ bridges and 2 nos. of breaches. **Rs. 388.02 lakh** is required for repair/ restoration of 151.17 Km of rural roads including breaches & 242 nos. of CD/ bridges and Rs.10.00 lakh is required for repair of 1 no. of National Highway maintained by the State

Irrigation

73.21 km of river and saline embankments have been damaged by the calamity. An amount of **Rs.131.77 lakh** is required for immediate restoration of above infrastructure.

Community Assets owned by Panchayat

298 nos. of Community Assets like GP/PS buildings, Community halls etc. have been badly damaged due to this cyclone. An amount of **Rs.609.00 lakh** is required for repair/ restoration of the above buildings.

Primary/ Community Health Centres

128 nos. of CHC/ PHC have been damaged by cyclone. **Rs.256.00 lakh** is required for immediate repair and restoration of the same.

Anganwadi Centres

646 nos. of AWCs have been damaged by cyclone. **Rs. 1297.00 lakh** is required for immediate repair and restoration of the AWCs.

Primary & Secondary School Buildings

1552 nos. of primary & secondary school buildings have been damaged by current cyclone. **Rs.3017.35 lakh** is required for immediate repair of the above School buildings.

Repair and restoration of power supply

1119 nos. of distribution transformers, 6445.443 km of conductors, 31494 nos. of poles upto 11 KV have been damaged due to cyclone. **Rs.5601.48 lakh** is required for immediate restoration of power supply in the affected areas.

ASSISTANCE SOUGHT FOR

ABSTRACT

Sl. No.	Item	Amount required/ spent (Rs. in lakh)
1	House building assistance	223.01
2	Clothing & Utensils	14.90
3	Gratuitous Relief	78.48
4	Cost of evacuation, search & rescue measure	23.00
5	Temporary accommodation	208.25
6	Agriculture input subsidy-SMF	456.82
7	De-silting of Agriculture land	71.86
8	Temporary shelter	78.22
9	Replacement of milch/ draught animals	8.20
10	Assistance to fisherman	1.24
11	Assistance for Artisan-Traditional crafts	413.28
12	Emergence supply of drinking water in urban area	193.03
13	Clearance of debris from roads / public places	125.15
14	Repair of road/ drains & culverts in urban area	262.74
15	Repair of river & saline embankment	131.77
16	Repair of GP/PS roads	4996.00
17	Repair of Anganwadi Centers	1297.00
18	Repair of rural water Supply System	1066.90
19	Repair of GP/PS buildings & community assets	609.00
20	Repair of Primary School Buildings	3008.90
21	Repair of PHC/ CHC buildings	256.00
22	Repair of rural roads, CD/bridges & breaches	388.02
23	Repair of PWD roads, CD/bridges & breaches	485.00
24	Repair of NH maintained by State	10.00
25	Repair of Secondary School Buildings	162.45
26	Restoration of Power supply	5601.48
27	Street Light damaged	25.80
	Grand Total	20196.50

CHAPTER – VIII

STATE DISASTER RESPONSE FUND

Status of Expenditure from State Disaster Response Fund (SDRF) Account

(As on 30.05.2020)

Year – 2020-21

State – Odisha

(Rs. in crore)

Sl. No.	Item	Amount
	(I) Receipts	
1	Opening balance in SDRF account as on 1.4.2020 (Provisional figures)	*207.69
	SDRMF Releases made during instant financial year(Central and State share)	
2	(a) First instalment (SDRF)	
	(i) Central share	802.00
	(ii) State share	267.50
	(b) Total (i + ii)	1069.50
3	NDRF releases during the instant financial year, if any	500.00
4	Interest received on investments made	0.000
5	Total funds available in the SDRF account(1+2+3+4)	1777.190
	(II) Expenditure	
	Expenditure incurred as per norms on approved natural calamities as per the scheme of SDRF/NDRF(indicate calamity-wise expenditure)	
6	(a) Cyclone	9.322
	(b) Flood	0.039
	(c) Fire	1.198
	(d) State Specific disasters	28.490
	(e) Expenditure incurred on Capacity building activities	0.092
	(f) Expenditure incurred on procurement of search and rescue equipment etc.(as per extant approved items)	0.051
	(g) Expenditure towards combating COVID-19 outbreak	**112.693
7	Total expenditure incurred (a+ b+ c+ d+ e+ f + g)	151.885
8	Balance available in the SDRF account of the instant calamity (5-7)	1625.305

N.B:- * The figure includes the amount of Rs.179.64 Crore released by Government of India out of NDRF on 27.03.2020 towards Cyclone BULBUL.

** Another committed expenditure of Rs.400.00 Crore towards combating COVID-19 outbreak is being released shortly.

CHAPTER – IX

MITIGATION MEASURES

Energy Sector

Cyclone Resilient Power Infrastructures in Amphan affected Districts (Balasore, Bhadrak, Kendrapada and Jagatsinghpur) of Odisha

Impact of Cyclone Amphan on Odisha's Power Infrastructure:

The very recent Cyclone AMPHAN hit Odisha on 20.05.2020 which resulted in serious damage and disruption of critical services and infrastructures in 9 coastal and adjoining districts of Odisha out of which four districts were badly affected. The wind speed was reported to be more than 120 km per hour along with heavy rainfall. The distribution infrastructure, particularly 33 KV, 11 KV & LT lines and Distribution Transformers suffered heavy damage. 274 no. of 33 KV feeders, 1627 no of 11KV feeders, 1,26,540 no. of DTRs, and around 44.57 Lakh consumers were affected including 13 Lakh consumers severely affected.

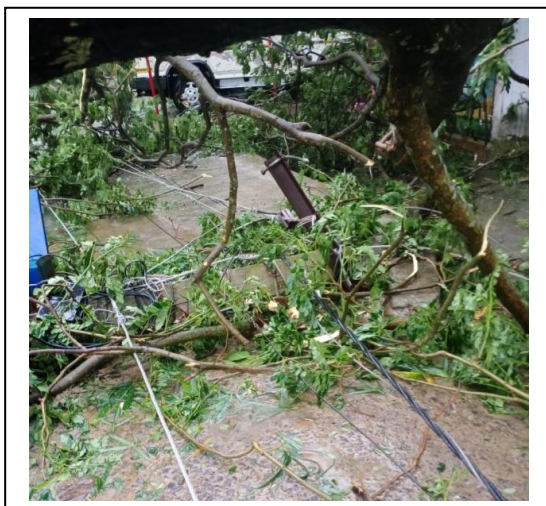
As a preparedness measure, the Energy Department mobilized manpower and materials to the districts likely to be affected to ensure prompt restoration of power supply as a result of which 99% of electricity supply restoration was completed by 25.05.2020.

The impact of the cyclone brought into focus the need for disaster and climate resilient power infrastructure systems in Odisha and also India as a whole. This represents another pointer highlighting the imperative to build back better and more resilient infrastructure.

In a world that relies increasingly on electricity services, building the resilience of power systems is critical to provide reliable and sustainable services, energy security, economic wellbeing, and quality of life. In this context, enhancing resilience refers to "strengthening the ability of a system and its component parts to anticipate, prepare for, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through the

preservation, restoration, or improvement of its basic structures and functions” (IPCC 2012).

Snapshots of damaged distribution network during Amphan:



Existing Design Practice:

For better safety of structures, the IS code 875 (Part3) 2015 presents the cyclonic importance factor (k factor) according to the importance level of structure with a maximum value of 1.30 for post cyclonic importance structures category. This factor is recommended in static and dynamic analysis of wind load computations. This is the additional wind speed multiplication factor besides the offshore wind velocity multiplication factor of 1.15 that has been retained in the revised wind code 2015 version for coastal areas up to 200 Km.

Existing Design Practice											
Sl. No.	Lines	Conductor sizes	Type of Support	Span Length (m)	Pole Height (m)	Weight of the Support	Pole Size (mm)	Resiliency for wind speeds (km/hr)			
1	33KV Lines	232 mm ²	NBLS	200	13	4ton	NA	200			
		100 mm ²	Rail Pole	80-100	11	120 Lbs/Yrd	NA	216			
		80 mm ²									
		55 mm ²									
		100 mm ²	Joist Pole	80-100	11	308 kg/m	200x100	140			
		80 mm ²				275 kg/m					
		55 mm ²				150X150					
		55 mm ²	PSC DP	80-100	9	300 kg/m	NA	180			
2	11KV Lines	100 mm ²	Joist Pole	60	9	225 kg/m	150X150	198			
		80 mm ²									
		55 mm ²							162 kg/m	100X116	180
		34 mm ²									
		100 mm ²	Rail Pole	60	9 & 8	90Lbs/Yrd.	NA	198			
		80 mm ²									
		55 mm ²									
		34 mm ²									
		80 mm ²	PSC Pole	60	9 & 8	300 kg/m	NA	180			
		55 mm ²				200 kg/m					
34 mm ²											
3	LT Lines	95/50sqm mABC	Joist Pole	40-50	8 & 7.5	162 kg/m	100X116	180			

Existing Design Practice								
Sl. No.	Lines	Conductor sizes	Type of Support	Span Length (m)	Pole Height (m)	Weight of the Support	Pole Size (mm)	Resiliency for wind speeds (km/hr)
		55 mm ²						
		34 mm ²						
		21 mm ²						
		95/50mm ² ABC	Rail Pole	40-50	8 & 7.5	55 Lbs/Yrd	NA	180
		55 mm ²						
		34 mm ²						
		21 mm ²						
		95/50mm ² ABC	PSC Pole	40-50	8 & 7.5	200 kg/m	NA	180
		55 mm ²						
		34 mm ²						
		21 mm ²						

Even it is designed for a particular level of resilience, the constant wear and tear due to saline effects in the coastal districts, frequent whirlwinds and floods make the infrastructure very weak to withstand any kind of disasters for a long time.

Cyclone Resilient Power Infrastructure: Distribution

In Odisha the density of the electricity network is higher in the coastal belt and in industrial areas. As a result, the chance of disruption is higher in the coastal zone. It is evident that the low tension (voltage) lines and DTRs (distribution transformers), 11KV, 33KV, 33KV/11KV substations, within a distance of up to 80 km from the coastal zone are at higher risk. Four districts affected in Amphan are within that range from the sea coast. Hence, it is important to build Resilient Power Infrastructure to avoid or minimize the chances of failure and disruptions of the lives of people as well as for continuity of emergency services.

- **Upgrading poles and structures** – The most common practice for cyclone resilience is replacing the utility poles with poles made of galvanised steel, concrete, or a composite material and upgrading

transmission & distribution towers to galvanized-steel lattice. Besides, increase in the number of poles per kilometre of line is also adopted. Such measures are all intended to allow the pole, tower or other structure to better withstand wind storms, including cyclones. Structural designs of such poles and towers have been made.

- **Changes in distribution system design** - The power distribution system can be made more resilient with changes in the existing network. It may be advantageous to split up the large network into smaller circuits, and to re-examine the circuit arrangements to enhance the speed of repair. This also enhances the reliability of supply system.
- **Conversion of OH lines to UG Cabling System:**
Placing utility lines underground eliminates their susceptibility to lightning and wind damage. Plan is to restrict the overhead network to non-coastal areas and underground cables in the major part of the coastal areas.
- **Elevating substations & Control rooms:** Renovation of existing substation switchyards and making them cyclone resilient is also one of the prime objectives. Outdoor structures need to be strengthened with resilient structures and equipment. Also, the most prevalent cause of damage to substations being flooding from storm surge and rains, common practice is elevating substations. This reduces the supply disruption and facilitates restoration of supply immediately after flood. A defined flood level (DFL) has been taken into account while providing structural designs for elevating substations.
- **Acquiring mobile T&D equipment, special tools and tackles**— Mobile transformers and substations can be used to temporarily replace substation transformers in the low and medium power range that are damaged by a cyclone. Day-to-day operations at a substation, for example, are much more difficult when the entire apparatus is raised off the ground. For situations like these, risk can be mitigated by acquiring/arranging in advance for spare equipment and materials, so that they are prepared to make rapid repairs when a cyclone does hit.

- **SCADA/DMS:** Electric utilities rely on SCADA systems to monitor and control their transmission & distribution grid. These systems operate continuously and play a key role in cyclone response and recovery by enabling utility controllers to identify damaged assets and dispatch repair crews quickly and efficiently. Substation automation uses computer-based control and monitoring technology to create highly reliable, self-healing power systems that can rapidly respond to real-time events. They can work in combination with SCADA systems or independently. (*This proposal is not included in this report and are taken up in other schemes of Govt.*)
- **Renewable generation** – Renewable generation in the form of solar PV power generation, if located close to the load would be an attractive option particularly when these sources are not available in the area. (*This proposal is not included in this report, however separate initiatives are being taken as per various schemes of GoI and GoO*).

Design of special structures & foundations for 33 KV overhead lines & Substations

In accordance with IS: 875 (Part-3), the subject area falls under the wind Zone V with a basic wind speed of 50 m/sec. Based on this criteria, 33KV and 11KV lines need to be upgraded by mixture of Galvanized H-Poles and NBLS towers.

However, on occurrence of the super cyclone with a wind velocity of approximately 250 kmph, the H-Pole structures carrying the 11 KV and 33 KV lines as well as the Lattice structure carrying the 33 KV lines fell short in terms of the design wind load & the actually applied wind load.

Thus, as a primary step towards building a cyclone resilient distribution system, the H-Pole structures & foundations have been designed with consideration of the maximum actual applied wind load of approximately 300 to 350 kmph for 11KV & 33KV line support structures.

For the same reason as detailed above, use of Narrow Base Lattice Structures (NBLS) for 33KV network which is also being designed with the same applied wind load. Accordingly, NBLS towers and special H-Poles have been specified for certain feeders and sections of the overhead lines in those areas to take care of the cyclone & flood resilience.

Specific sections / Stretches where the NBLS & H-poles are to be erected:

33KV Lines: Since 33KV lines are the backbone of distribution system, the supporting structures are to be selected based on the wind speed. Three categories of 33KV lines are proposed to be adopted to create the cyclone resilient infrastructure. 33KV lines which emanate from the 132KV/33KV Grid Stations and connecting to 33/11KV Substations are proposed to be replaced either by UG cabling or by NBLS towers based on the availability of RoW. 33KV lines in the cities are to be completely converted to UG Cabling system. Other 33KV lines shall be replaced by GI H-Type Poles.

a. NBLS Towers:



Narrow Based Lattice Structures are robust in design and can withstand wind speed upto 300 kmph. Such type of towers require less space 2mx2m (Approx.) with either panther or dog conductors to erect in any critical areas. The line can be constructed with double circuits at the emerging points near Grid Stations. Basically there are two different types of NBLS towers are used for 33KV lines i.e., Hx and Hzz type. Typical weight of Hx and Htype NBLS Tower: NBLS

D/C tower (Hx type) : Hx type tower (Unit Weight 1.05 MT) , Hardware Fittings : (Unit Weight 0.054 MT), STUB (Unit Weight 0.131 MT). NBLS D/C tower (Hz type): Hz type tower (Unit Weight 2.58 MT), Hardware Fittings for Hz type (Unit Weight 0.149 MT) , Hardware Fittings for extension (Unit Weight 0.024 MT) , STUB (Unit Weight 0.526 MT)

H-Type Galvanized Structure: One of the most cost effective structures which can withstand wind speed upto 300kmph and reliable to use. It can be constructed at any congested area and requires very less space to erect. Two Galvanized GI channels are rigidly embedded in each other to form a Single structure. The structure is robust and can withstand wind speed upto 300kmph. 33KV D/C lines with H poles can be designed with Panther or Dog conductors.



b. 33KV UG Cabling System: All 33KV feeders in urban areas shall be converted to UG Cabling system. Most of the trunk lines will be connected between two sources for alternate power supply during exigencies. Normally, 33KV, 400 sqmm, single core, XLPE, corrugated Aluminium sheath UG cable is preferred for use. Cable trench can be either direct buried or through prefabricated half cut hume pipes depending on the availability of RoW.



11 KV System improvements/ augmentations: 11KV trunk lines are either to be converted to UG cabling system or replaced with H-Type joist poles depending on the availability of RoW. All 11KV lines inside cities are to be converted to UG Cabling system. All spur lines are to be replaced with H-Type Joist poles. Following proposal is made for strengthening the distribution system in order to be cyclone resilient and for better reliability. Similar to 33KV lines, special designs have been proposed for the 11 KV poles associated with the 11 KV overhead lines to take care of the extreme wind conditions in the area.

Proposal of OH 11KV line:

Following proposal is made for strengthening the distribution system in order to be cyclone resilient and for better reliability. Similar to 33KV lines, special designs have been proposed for the 11 KV poles associated with the 11 KV overhead lines to take care of the extreme wind conditions in the project area. Special H-Poles are recommended for 11 KV feeders and sections of the overhead lines in the areas to take care of the cyclone resilience. Specific sections/ Stretches where the H-poles are to be erected are mentioned subsequently.

- a. The OH lines are to be erected on H type pole using polymer insulators and with 100sqmm AAAC conductor to withstand the cyclone.
- b. The span length of the feeders is proposed to be 40-50 meter in the urban areas.

- c. The design of H-Pole structures and foundations are made considering the wind speed experienced during last cyclone in the subject area.

Proposal for 11KV UG cabling System.

11KV UG Cabling is proposed in the urban areas of the four districts.

- a. Some of the important areas, main roads and crowded areas are proposed to be fed through Underground cable in Urban areas
- b. Main UG cable of 400/300 sq.mm, XLPE, 3C is to be used for direct connection between main RMUs and new parallel feeder for feeder bifurcation purpose. DTCs and spur lines are connected through loop 240 sqmm cables
- c. Loop UG cable of 240sqm, XLPE, 3C is to be used for looping between Main RMUs containing load point i.e. DTCs and spur line loads.
- d. 3-GOS arrangement is recommended for cable loop in-out for existing DTCs.
- e. 3 Way RMU's are proposed for cable looping between main cable line and by lanes.
- f. The Main RMU's are proposed for linking of other 11KV feeders for better reliability and alternate supply during exigencies.

11KV Ring Main Units (RMU): This is one of the most important cyclone resilient equipment which ensures uninterrupted power supply to the region even during exigencies. 11KV RMUs are combination of SF6 Circuit Breakers and Load break switches. Provision of operating with at least two incoming sources in the circuit. The no of LBS and Circuit breakers is designed as per the distribution schemes with provision of SCADA automation in future.



Conversion/renovation of LT Lines: LT lines depending on the site conditions are to be replaced by AB Cables. Selected areas are to be converted to LT AB cable and if required defective poles to be replaced. Intermittent poles may be required to reduce span length. Some of the existing poles are required to be properly erected with copping. Damaged poles/eroded poles need to be replaced. LT lines

inside cities are to be converted to UG cabling system with Feeder Pillar Box arrangements. LT lines in the Rural areas are to be replaced either by H-Type joist poles or only joist poles depending on the site conditions. LT lines if required may be bifurcated for balanced load.

Cyclone resilient Distribution substations

Plinth Mounted Prefabricated Foundation:

DP mounted or Plinth mounted distribution substations are more vulnerable to cyclone. DP mounted substations such as 16KV, 25KV, 63KV, 100KV, 250KVA and 500KVA substations are to be renovated with prefabricated foundations with other accessories. Existing DTs are either pole mounted or Plinth mounted. Some of the substations need to be renovated or converted to prefabricated foundation with other accessories. DPs, replacement of AB switches, installation of LA, HG fuse, LT panel, LT Cable, Earthing setc are to be renovated.



Compact Secondary Substation: Compact type secondary substations are proposed at urban areas in the UG cabling system. CSS are housed with Transformer, 11KV RMU and LT distribution panel with FRTU for SCADA automation. These DTs are fully protected from outer forces and safe to operate remotely and locally. Different sizes of CSS can be designed at specific locations mostly at higher capacity substations are advisable. Alternatively for small DTs, existing DT can be placed on Prefabricated foundation with single LBS and LT panel and can be controlled in group.



CSS



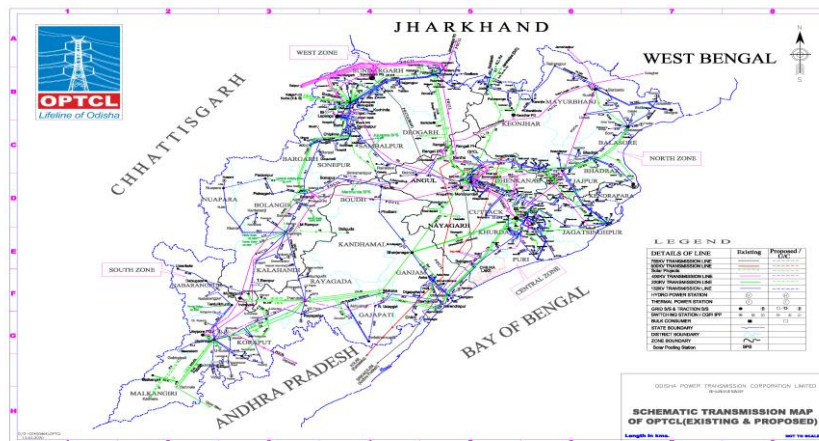
Single LBS with DT

33/11KV Substation renovation: Outdoor substations are vulnerable to cyclone and flood and hence need to be renovated with respect to wind zone and its severity. It is proposed to convert the outdoor joist pole structures to H-Type pole structures with replacement of isolators and other accessories. Plinth of the transformers needs to be increased beyond the DFL in the particular area. It has also been observed that few substation switch yards were inundated totally under flood water up to approximately 2.00 m. average height. Thus, for the substation equipment structures & foundations, measures shall have to be adopted to take care of both increased wind velocity of approximately 300 to 350 kmph and the HFL condition as well. Thus the lattice structures have been designed for two conditions as follows;

- To withstand the actual increased wind velocity for areas never inundated by flood water,
- To withstand the actual increased wind velocity for areas inundated by flood water up to approximately 2.00 m. average height.

Building a Resilient Power Infrastructure (Transmission).

The Power transmission map of Odisha is presented below.



In the coastal districts of Jagatsinghpur, Kendrapara, Bhadrak and Balasore, the transmission system consists of 3 nos. 220/132/33KV AIS grid substations, 12 nos.- 132/33KV AIS grid substations, one no 132/33KV GIS grid substation, 350Km 220KV lines and 904 Km – 132KV transmission line. The transmission lines, owing to their height, are highly vulnerable to cyclones. These lines are vulnerable to falling trees in forest areas. The current design of equipment does not optimize the factor of safety. Furthermore, the span length of the wire and base design of the towers are varying across the state. In addition, low laying substations are prone to flooding, following a cyclone. Moreover, the quick supply of towers and accessibility to remote locations remain a challenge for the T&D organisations.

The power systems are to be resilient and withstand high wind speeds and heavy rains, for which the following approaches for recovery could be adopted:

- (i) An immediate approach to use the existing design systems with proper foundations and reduced spans. This may be cost efficient but may not be long-lasting.
- (ii) Gradual changeover of Transmission lines with same ROW, for Disaster vulnerable areas, stable towers / monopoles @ smaller span to withstand wind speeds of up to 250 kmph.

The tentative Estimate for Disaster Resilient Transmission System (OPTCL)
Conversion of old system to Resilient Transmission system 132 KV and above system.

Sl.No	Lines	Qty	Rate (Cr)	Amount (Cr)
1	132KV with lattice tower	900	1.3	1170
2	220KV with lattice towers	350	1.7	595
				1765

Material Banks: Availability of materials and advanced positioning of men & materials at strategic locations resulted in quick restoration of electricity supply to the consumers during the cyclone Amphan. From the above experience, restoration of supply of electricity in the affected areas in the shortest possible time with the

existing infrastructure need to keep an emergency stock of materials to meet the future contingencies. Based on the experience and requirement of the material for quick start of restoration, the estimated requirement of materials and funds are proposed.

Institutional set up for disaster response to Distribution network

The tools & implements not limited to following and capacity building exercise may be kept in the scope of work

- Mechanized Tools and Equipment: Each of the Supply Circle in the state shall have one Disaster Management Cell (DMC). The DMC shall have the emergency supply restoration equipment such as pole mounting tractors, Mobile substations, Emergency restoration system for HT line, Hydraulic jacks, Hydraulic pulling machine, Cable jointing tools, gas cutters, power cutters, Trifor, Tripod and single derricks, chain pulley block, Pulley, manila/ PP rope, welding machine, drilling, insulation mugger, earth tester, Tongue Tester, spanner sets, portable 5KVa generator sets, etc. The number of equipment shall commensurate with the size of the division.
- Skilled manpower: Adequate number of staff (linemen, helper and officers) shall be identified and trained to meet the exigency during disaster time.
- Mock drill: Mock drill shall be done mostly in the month of June as preparedness exercise.

Conclusion:

Major scope includes:

- Renovation/reconstruction/conversion of 33KV lines with NBLs / H-Type GI poles.
- Conversion of 33KV, 11KV and LT Overhead lines to UG cabling system in urban areas with provision of 11KV RMUs and CSS in UG cabling System.

- Renovation/reconstruction/conversion of 11KV lines with H-Type GI poles.
- Renovation/reconstruction/conversion of LT lines with AB Cables.
- Renovation with retrofitting of DTs and 33/11KV Substations
- Material Banks for preparedness during Cyclone
- Disaster response equipment
- Renovation/reconstruction/conversion of 220KV and 132KV EHT lines

The proposed network design is being implemented almost across the country and is a proven technology. This has many advantageous over the conventional design apart from cyclone resilience.

- The proposed resilient power infra will ensure power supply restoration within very less time immediately after such type of disaster in future.
- The designed infrastructures are fully robust and highly resilient to any extreme climate and wind pressure during cyclones.
- Since the equipment are to be installed near coastal region, deterioration due to saline effect is a prime concern. This is being taken care while designing specifications of the equipment.
- The proposed network not only ensures reliability during exigencies but also will meet demand growth up to next 10 years.
- **Huge loss of public property due such repeated cyclones in the region especially in the power sector will be very negligible after this one time investment.**
- T&D loss will be reduced and hence improves the quality power in the region.
- This new system will ensure safety to life and property and zero accident.
- Urban areas will become wireless and will improve public conveniences and less disruption besides aesthetic values.
- The overall improvement in electricity supply reliability will enable the continuity of other emergency services during or immediate post disaster situation.

ABSTRACT OF ESTIMATE (In Crore Rs.)

Scope of work	NESCO	TPCODL	OPTCL	Total (Cr)
33KV and 11KV Lines and DT	3997.36	2609.35	0.00	6606.71
Material Bank	75.03.00	85.20	79.39	239.62
UG Cabling	1523.00	633.00		2156.00
Substation renovation	118.00	74.00		192.00
132KV and 220KV Lines	0.00	0.00	1765.00	1765.00
Disaster response equipments	0.00	0.00		154.35
Grand Total	5713.39	3401.55	1844.39	11,113.68

- Total Estimated Cost is **Rs.11,113.68** Core

The details of the requirement of funds are at **Appendix- X, XI, XII, XIII, XIV and XIV.**

Rural Housing Sector (Panchayati Raj & DW Department)

Damage to Kutcha houses during the Severe Cyclonic Storm "AMPHAN"

- The coastal Odisha is frequently affected by cyclonic disturbances originating from the Bay of Bengal which is adversely affecting the dwelling units of the poor people.
- The Districts of Balasore, Bhadrak, Jagatsinghpur and Kendrapara which have been badly affected by the recent cyclone AMPHAN have 1,66,090 kutcha houses. It is highly required to provide augmented financial support for building disaster resilient dwelling units for these poor people staying in above vulnerable districts.
- CSIR-CBRI, Roorkee has estimated unit cost of a cyclone resilient house of 25 Sq. Mtr. plinth area to be Rs. 2.5 Lakh. The requirement of funds for providing pucca houses to the 1,66,090 families comes to Rs. 4152 Crore, which may be considered under PMAY(G) Special.

Water Resources Sector

Mitigation proposal for restoration, protection, raising & strengthening of Saline Embankments to protect coastal and adjoining area from storm surge in 4 Districts affected by AMPHAN during 18-20 May 2020.

Super Cyclone Amphan passed along the coast of Odisha on 19-20 May 2020 buffeting the coastal and adjoining districts with strong winds and heavy rains. Among others, 4 coastal Districts i.e. Balasore, Bhadrakh, Kendrapara and Jagatsinghpur were more severely affected. Storm surge of 3.70 m to 4.00 m RL was observed along the shoreline of the above 4 Districts. Overtopping and breaches in the saline embankments could be averted by timely precautionary measures taken by the Department of Water Resources. But the saline embankments were damaged due to strong impact of storm surge.

Quick technical analysis of the damage revealed that during the cyclone, the entire stretch of Saline Embankments in the above-mentioned 4 Districts were not having minimum free board and in many places, the storm surge level remained at par with the Top Bank Level (TBL) except stretches of nearly 40 Km length of Saline Embankments in Kendrapara & Jagatsinghpur Districts, which were appropriately raised and strengthened under National Cyclone Risk Mitigation Project (NCRMP) to tackle a critical cyclonic event.

In view of climate change scenario, extreme events are likely to occur frequently and it is pertinent that during cyclonic storms, the high surge from sea would always pose challenge to overtop the embankments and inundate a wide swath of coastal area adjacent to shoreline. It is imperative that the Saline Embankments need to be raised and strengthened appropriately, to prevent overtopping by the surge and to protect inundation of the vast agricultural land and human habitations. .

The height of possible storm surge during various return periods of 10 years, 50 years and 100 years with 7% Climate change (Year 2050) and 11% Climate change (Year 2100) scenario are computed by modeling by Experts for entire stretch

of 480 km of coastline at an interval of 6 Km. Taking the most reasonable combination of 10 Years return period under 7% climate change, the embankments status are evaluated and compared with level of possible surge during a critical cyclone.

For mitigating the effects of ever increasing cyclonic events in the Bay of Bengal the following activities are suggested to make the coastal Odisha more disaster resilient:

1. Raising and strengthening of embankments with Top Bank Level fixed at 1.5 metre above the computed high surge level. The top width of embankment to be kept at 4.50 metre, so that vehicle can comfortably ply over the same.
2. Protection of sea-side slope of the embankment using stone filled metallic gabion boxes in the location where the coastline is 200 metre or less distant from the embankment
3. Construction of new gated sluices in place of damaged sluices.
4. An amount of **Rs.767.15 crore** required for the proposed activates.

Proposed Mitigation Activities

SI No	District	Length of coast in km	Length of saline embankment in km	Length of the embankments proposed for improvement in Km	Amount Rs in Lakhs	Population to be benefitted In Nos	Agricultural Land to be protected in Ha
1	Balasore	87.96	128	88.60	13500.00	26,300	5170.00
2	Bhadrakh	52.61	148	94.90	11645.00	35,470	25,100
3	Kendrapara	83.55	508	134.88	22780.00	1,08,040	9,490
4	Jagatsinghpur	58.95	264	58.50	28790.00	1,17,684	9,684
	TOTAL	283.07	1048	376.88	76715.00	2,87,494	49,444

The detailed proposal is given under **Appendix-XVI**.

CHAPTER – X

CONCLUSION

The State took advance preparedness based on accurate early warning by IMD for management of cyclone AMPHAN. Nearly 10,000 professionally skilled manpower with required equipment were prepositioned at strategic locations to respond the cyclone AMPHAN. As a result of this planning, the road communication, electricity supply and drinking water supply were restored in record time.

As per the assessment made by different departments and affected districts, the requirement of funds towards different relief measures and immediate repair and restoration of damaged infrastructure in admissible sectors as per the extant norms of SDRF/NDRF comes to **Rs.201.97 crore**.

The coastal Odisha is frequently affected by cyclonic disturbances originating from the Bay of Bengal which is adversely affecting the livelihood of the people and burdening the State with huge cost for restoration of the damaged infrastructure. The energy sector takes the maximum brunt of the cyclones and norwesters which requires frequent and high capital investment from the State exchequer detrimentally affecting the wage and means position of the State. The State Government feels that more support is required from the Central Government for building resilience to the public infrastructure like energy and dwelling units of the poor people staying in vulnerable coastal area of the State. The saline embankments along the coastline also need to be raised and strengthened for preventing damage to agricultural fields and habitations from surge.

The State Government has submitted proposals amounting to **Rs.16032.83 crore** for resilient energy infrastructure, disaster resilient houses for the poor and strengthening of saline embankment in the four districts affected by cyclone AMPHAN.

The Government of India may consider supporting the State Government for taking up the above disaster resilient activities.

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Appendix - I

District-wise rainfall data

DISTRICT AVERAGE RAINFALL				
(Rainfall in mm)				
Sl. No.	District	20.05.2020	21.05.2020	Total
1	Jagatsinghpur	119.4	36.0	155.4
2	Balasore	54.2	62.3	116.5
3	Kendrapara	74.3	38.2	112.5
4	Jajpur	50.2	52.2	102.4
5	Mayurbhanj	28.6	67.0	95.6
6	Puri	71.2	22.0	93.2
7	Bhadrak	54.9	31.6	86.5
8	Cuttack	43.5	26.8	70.3
9	Khordha	34.9	14.8	49.7
10	Dhenkanal	18.3	29.5	47.8
11	Keonjhar	12.2	29.2	41.4
12	Nayagarh	18.5	0.7	19.2
13	Ganjam	7.3	0.4	7.7
14	Angul	5.7	1.5	7.2
15	Nuapada	3.7	0.0	3.7
16	Malkanagiri	3.5	0.0	3.5
17	Gajapati	3.2	0.0	3.2
18	Kandhamal	0.8	0.0	0.8
19	Nawarangpur	0.6	0.0	0.6
20	Sundargarh	0.2	0.4	0.6
21	Balangir	0.2	0.0	0.2
Remaining 9 Districts		Nil		
State Average		20.2	13.8	34.0

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

RAINFALL STATUS OF THE TEN DISTRICTS FROM 20.05.2020 to 21.05.2020					
(Rainfall in mm.)					
Sl. No.	District	Block	Date		Total
			20.05.2020	21.05.2020	
Rainfall above 200 mm					
1	Puri	Kakatpur	161.0	56.0	217.0
2	Jagatsinghpur	Balikuda	179.0	30.0	209.0
3	Jagatsinghpur	Kujanga	159.0	49.0	208.0
4	Jagatsinghpur	Erasama	172.0	33.0	205.0
Rainfall between 100 mm and 200 mm					
1	Balasore	Bhograi	70.3	128.0	198.3
2	Jagatsinghpur	Naugaon	156.0	39.0	195.0
3	Mayurbhanj	Suliapada	70.0	116.2	186.2
4	Balasore	Baliapal	78.0	103.0	181.0
5	Mayurbhanj	Baripada	75.0	101.0	176.0
6	Cuttack	Niali	122.0	53.0	175.0
7	Mayurbhanj	Kuliana	37.3	137.4	174.7
8	Puri	Astarang	142.0	25.0	167.0
9	Mayurbhanj	Betanati	78.0	87.0	165.0
10	Balasore	Basta	69.0	80.0	149.0
11	Kendrapara	Marshaghai	88.0	57.0	145.0
12	Mayurbhanj	Morda	62.0	82.0	144.0
13	Kendrapara	Mohakalpara	112.0	30.0	142.0
14	Balasore	Nilagiri	88.0	52.0	140.0
15	Mayurbhanj	Bangriposi	33.8	105.2	139.0
16	Mayurbhanj	Rasgovindapur	52.4	84.0	136.4
17	Balasore	Jaleswar	16.0	120.0	136.0
18	Jagatsinghpur	Raghunathpur	92.0	43.0	135.0
19	Kendrapara	Garadapur	85.0	46.0	131.0
20	Mayurbhanj	Besoi	10.0	121.0	131.0
21	Cuttack	Kantapada	87.0	43.0	130.0
22	Kendrapara	Rajnagar	81.0	49.0	130.0
23	Jajpur	Binjharpur	75.2	53.6	128.8
24	Puri	Puri	82.2	45.0	127.2
25	Jajpur	Danagadi	56.0	71.0	127.0
26	Mayurbhanj	Samakhunta	38.0	87.0	125.0
27	Balasore	Balasore	60.0	64.0	124.0
28	Jajpur	Jajpur	70.0	53.0	123.0
29	Jagatsinghpur	Tirtol	77.0	45.0	122.0
30	Mayurbhanj	Kusumi	18.0	102.0	120.0
31	Jajpur	Dharmasala	43.0	75.0	118.0
32	Jajpur	Badachana	50.0	66.0	116.0

33	Jajpur	Bari	67.0	49.0	116.0
34	Bhadrak	Chandbali	70.6	43.6	114.2
35	Jajpur	Dasarathpur	72.0	41.8	113.8
36	Balasore	Bahanaga	80.0	33.0	113.0
37	Kendrapara	Rajkanika	78.0	35.0	113.0
38	Bhadrak	Tihidi	68.0	40.0	108.0
39	Puri	Satyabadi	75.0	32.0	107.0
40	Cuttack	Nischintakoili	71.2	32.0	103.2
41	Jagatsinghpur	Jagatsinghpur	78.0	25.0	103.0
42	Puri	Gop	82.2	20.2	102.4
Rainfall between 50 mm and 100 mm					
1	Bhadrak	Dhamnagar	70.0	26.0	96.0
2	Balasore	Soro	70.0	23.0	93.0
3	Bhadrak	Basudevpur	65.0	27.0	92.0
4	Khordha	Balianta	57.0	35.0	92.0
5	Mayurbhanj	Sarasakana	21.0	71.0	92.0
6	Kendrapara	Derabis	62.0	29.0	91.0
7	Mayurbhanj	Khunta	20.0	68.3	88.3
8	Mayurbhanj	Gopabandhunagar	20.0	68.3	88.3
9	Kendrapara	Kendrapara	53.0	35.0	88.0
10	Khordha	Bhubaneswar	49.4	38.2	87.6
11	Kendrapara	Pattamundai	53.0	34.0	87.0
12	Kendrapara	Aul	57.0	29.0	86.0
13	Balasore	Remuna	50.0	35.0	85.0
14	Khordha	Balipatna	54.6	26.4	81.0
15	Mayurbhanj	Badasahi	54.0	27.0	81.0
16	Bhadrak	Bhadrak	46.0	33.0	79.0
17	Keonjhar	Ghasipura	42.2	36.2	78.4
18	Mayurbhanj	Joshiapur	5.0	73.0	78.0
19	Cuttack	Barang	35.0	42.0	77.0
20	Cuttack	Salepur	52.2	24.0	76.2
21	Mayurbhanj	Kaptipada	40.0	35.0	75.0
22	Balasore	Oupada	26.0	48.0	74.0
23	Mayurbhanj	Bahalda	10.6	61.6	72.2
24	Jajpur	Rasulpur	33.4	37.8	71.2
25	Jajpur	Korei	25.6	45.5	71.1
26	Keonjhar	Hatadihi	21.5	47.4	68.9
27	Mayurbhanj	Rairangapur	15.0	53.0	68.0
28	Cuttack	Mahanga	40.0	26.0	66.0
29	Jagatsinghpur	Biridi	42.0	24.0	66.0
30	Bhadrak	Bonth	24.0	40.0	64.0
31	Mayurbhanj	Jamda	15.0	49.0	64.0
32	Puri	Pipili	52.3	11.0	63.3

33	Cuttack	Cuttack Sadar	26.0	37.0	63.0
34	Mayurbhanj	Udala	35.0	27.8	62.8
35	Khordha	Jatani	40.0	22.0	62.0
36	Mayurbhanj	Bijatata	6.0	55.0	61.0
37	Puri	Brahmagiri	60.0	0.0	60.0
38	Mayurbhanj	Tiring	8.2	51.4	59.6
39	Cuttack	Tangi-Choudwar	28.0	31.0	59.0
40	Balasore	Simulia	38.0	18.0	56.0
41	Keonjhar	Jhumpura	6.2	47.8	54.0
42	Puri	Krushnaprasad	35.0	18.0	53.0
43	Bhadrak	Bhandaripokhari	41.0	11.5	52.5
44	Keonjhar	Keonjhar	6.2	44.6	50.8
45	Keonjhar	Ghatgaon	12.4	38.2	50.6
46	Khordha	Khordha	31.0	19.0	50.0
Rainfall below 50 mm					
1	Balasore	Khaira	5.0	43.0	48.0
2	Cuttack	Badamba	45.0	1.0	46.0
3	Puri	Nimapara	40.0	6.0	46.0
4	Keonjhar	Anandapur	22.5	20.2	42.7
5	Cuttack	Athagarh	15.0	27.0	42.0
6	Puri	Kanas	28.0	14.0	42.0
7	Keonjhar	Patna	15.2	26.2	41.4
8	Puri	Delang	25.0	15.0	40.0
9	Jajpur	Sukinda	9.3	29.4	38.7
10	Keonjhar	Champua	5.0	31.8	36.8
11	Mayurbhanj	Karanjia	9.0	26.0	35.0
12	Cuttack	Tigiria	16.0	18.0	34.0
13	Khordha	Begunia	27.0	7.0	34.0
14	Cuttack	Banki-Dampada	17.0	15.0	32.0
15	Mayurbhanj	Sukuruli	2.0	30.0	32.0
16	Keonjhar	Harichandanpur	10.2	17.8	28.0
17	Khordha	Tangi	27.4	0.0	27.4
18	Keonjhar	Saharpada	8.2	18.4	26.6
19	Keonjhar	Banspal	1.5	23.5	25.0
20	Khordha	Bolagarh	25.0	0.0	25.0
21	Keonjhar	Joda	4.4	19.8	24.2
22	Khordha	Chilika	23.0	0.0	23.0
23	Mayurbhanj	Thakurmunda	7.3	9.0	16.3
24	Khordha	Banapur	15.0	0.0	15.0
25	Mayurbhanj	Raruana	2.0	13.0	15.0
26	Keonjhar	Telkoi	3.0	8.3	11.3
27	Cuttack	Narasinghpur	11.0	0.0	11.0

Appendix-II
Extent of damage due to Super Cyclone "AMPHAN"
State-Odisha

Sl. No.	Item	Total
1	Total number of districts in the State	30
2	Number and names of districts affected	10 (Balasore, Bhadrak, Kendrapara, Jagatsinghpur, Jajpur, Cuttack, Khordha, Puri, Mayurbhanj & Keonjhar)
3	Total number of Blocks in the Districts	120
4	Number and names of Blocks affected	97
5	Number of villages affected	9838
6	Population affected (in lakh)	45.26
7	Total land area affected (in lakh ha.)	
8	Cropped area affected (in lakh ha)	
	i) Total cropped area affected	10726.18 Ha.
	ii) Estimated loss to crops (Rs. in lakh)	3115.00
	iii) Area where cropped damage was more than 33%	3393.58 Ha.
9	Percentage of area held by SMF	
	i) In the State as a whole	
	ii) In the affected districts	
10	House damaged	
	a) No. of houses damaged	
	i) Fully damaged pucca houses	0
	ii) Fully damaged kutch houses	19
	iii) Severely damaged pucca houses	1

	iv) Severely damaged kutcha houses	38
	v) Partly damaged houses (pucca + kutcha)	4497
	vi) No. of huts damaged	334
	b) Estimated value of damage to houses (Rs. in lakh)	214.76
11	No. of human lives lost	0
	No. of persons with grievous injuries	1
	No. of persons with minor injuries	1
12	Animals lost	1913
	a) No. of big animals lost	17
	b) No. of small animals lost	21
	c) No. of poultry (birds) lost	4685
13	Damage to public proprieties:-	
	(a) In physical terms (sector wise details should be given – e.g. length of State roads damaged, length of district roads damaged, length of village roads damaged, No. of bridges damaged, No. of culverts damaged, No. of school buildings damaged etc.)	Details given under Chapter-V
	(b) Estimated value of the damage to public properties (Rs. in lakh)	22096.13
14	Estimated total damage to houses, crops and public properties (Rs. in lakh)	25425.89

Appendix-III

Assistance for provision of temporary accommodation, food, clothing medical care etc. of the people affected/ evacuated due to Super Cyclonic Storm "AMPHAN" - 2020 (Operation of Relief Camps)

Sl. No.	Name of the block/ ULB	Total no. of relief camps opened	Average no. (in a day) of relief camps	Average duration of operation of relief camps	Average no. of People accommodated per day in the relief camps	Expenditure incurred on (Rs. In Lakhs)					
						Temporary accommodation	Food	Clothing	Medical care	Other essential items (to be specified)	Total
1	2	3	5	6	7	8	9	10	11	12	13
1	Balasore	922	922	1	66613	0.000	44.870			7.830	52.700
2	Bhadrak	561	561	1	31017		33.498			5.650	39.148
3	Cuttack	428	428	2	10961		5.035				5.035
4	Jagatsinghpur	314	314	1	16945	0.067	6.095	0.478	0.000	0.431	7.071
5	Jajpur	171	171	1	7140		0.098			0.003	0.100
6	Kendrapara	622	622	2	39864		45.694			46.983	92.677
7	Keonjhar	6	6	1	274	0.000	0.000	0.000	0.000	0.000	0.000
8	Khordha	103	103	1	1075		0.593				0.593
9	Mayurbhanj	830	830	1	29588	0.400	10.039	0.000	0.000	0.483	10.922
10	Puri	364	364	1	12712	0.000	0.000	0.000	0.000	0.000	0.000
Total		4321	4321	1	216189	0.467	145.923	0.478	0.000	61.379	208.247

Appendix-IV

Agriculture/ Horticulture crop loss and fund required for input subsidy due to Super Cyclonic Storm "AMPHAN" - 2020											
Sl. No.	Name of the block/ ULB	Total agriculture/ horticulture crop area affected (in Ha.)	Total agriculture/ horticulture crop area where crop loss is >33% (in Ha.)	Total area under crop loss of 33% & above (area in Ha.)				Agriculture input subsidy required in Rs.			
				Rainfed	Irrigated	Perennial	Total	Rainfed @ 6800/- per Hect.	Irrigated @13500/- per Hect.	Perennial @ 18000/- Per Hect.	Total fund required in Rs.
1	2	3	4	5	6	7	8	9	10	11	12
1	Balasore	6789.00	2987.77	97.00	2749.50	141.27	2987.77	659600.00	37118250.00	2542860.00	40320710.00
2	Bhadrak	111.00	111.00		111.00		111.00		1498500.00		1498500.00
3	Cuttack	12.74	12.74			12.74	12.74			229320.00	229320.00
4	Jagatsinghpur	10.74	69.32		50.54	18.78	69.32		682290.00	338040.00	1020330.00
5	Kendrapara	478.00	43.10		38.90	4.12	43.02		525150.00	74160.00	599310.00
6	Keonjhar	11.00	11.00	11.00			11.00	74800.00			74800.00
7	Khordha	5.70	5.70		5.70		5.70		76906.80		76906.80
8	Mayurbhanj	394.00	125.15	41.42	83.73		125.15	281656.00	1130355.00		1412011.00
9	Puri	118.00	27.80		11.11	16.69	27.80		149985.00	300420.00	450405.00
Total		10726.18	3393.58	149.42	3050.48	193.60	3393.50	1016056.00	41181436.80	3484800.00	45682292.80

Appendix-VI

Assistance required towards replacement of animals lost due to Super Cyclonic Storm "AMPHAN" - 2020																
Sl. No.	Name of the Block/ ULB	No of Livestock / Birds lost					No of animals qualifying for relief grant (i.e., subject to ceiling of 3 large milch animal or 30 small milch animals or 3 large draught animal or 6 small draught animal per household)				Expenditure incurred (Milch animals- @ Rs.30000 for large animal , Rs.3000 for small animals & Draught animals- @ Rs 25,000 for large animal, Rs. 16000 for small animals)				Poultry @ 50/- per bird subject to a ceiling of assistance of Rs.5000/- per beneficiary household.	Total fund required in Rs.
		Milch Animal		Draught Animal		Poultry Birds	Milch Animal		Draught Animal		Milch Animal		Draught Animal		Amount required	(12+13+14+15+16)
		Buffalo/ Cow	Sheep/ Goat	Camel/ Horse/ Bullock	Calf/ Donkey/ Pony		Buffalo/ Cow	Sheep/ Goat	Camel/ Horse/ Bullock	Calf/ Donkey/ Pony	Buffalo/ Cow	Sheep/ Goat	Camel/ Horse/ Bullock	Calf/ Donkey/ Pony		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Balasore	1	2		2	1005	1	2		2	30000	6000		32000	20000	88000
2	Bhadrak	5			2		5	0		2	150000			32000		182000
3	Jagatsinghpur	2	4		2	870	2	4		2	60000	12000		32000	15000	119000
4	Jajpur				1	2810				1				16000	30000	46000
5	Kendrapara	9	1		7		9	1		7	270000	3000		112000		385000
Total		17	7	0	14	4685	17	7	0	14	510000	21000		224000	65000	820000

Appendix-VII

Assistance required towards repair /restoration of damaged houses (in Rs.) due to Super Cyclonic Storm "AMPHAN" - 2020																		
Sl. No	Name of the Block./ ULB	Fully damaged		Severely damaged		Total fully/ Severely damaged pucca/ kutcha house		Partially damaged				Hut damaged		Total		Cow shed damaged		Grand total
		Kutcha house	Pucca house	Kutcha house	No. of house damaged	Fund required @ Rs.95100/- or Rs.101900/- per house	Pucca house	Funds required @ Rs.5200/- per house	Kutcha house	Funds required @ Rs.3200/- per house	No. of hut	Funds required @ Rs.4100/- per hut	No. of house damaged (7+9+11+13)	Funds required (8+10+12+14)	No. of cow shed	Cow Shed Damaged @ Rs.2100/- per cowshed	Funds required (16+18)	
		No.	No.	No.	No.	Amount	No.	Amount	No.	Amount	No.	Amount	No	Amount	No.	Amount	Amount	
1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	Balasore	8		1	9	855900	18	93600	1738	5561600	118	483800	1883	6994900	32	67200	7062100	
2	Bhadrak	2			2	190200	37	192400	195	624000	7	28700	241	1035300	22	46200	1081500	
3	Jagatsinghpur						9	46800	378	1209600	2	8200	389	1264600	75	157500	1422100	
4	Jajpur								171	547200	2	8200	173	555400			555400	
5	Kendrapara			2	2	190200	20	104000	1112	3558400	130	533000	1264	4385600	187	392700	4778300	
6	Keonjhar			1	1	95100			13	41600			14	136700			136700	
7	Mayurbhanj	9	1	32	42	3994200	16	83200	731	2339200	75	307500	864	6724100	73	153300	6877400	
8	Puri			2	2	190200			59	188800			61	379000	4	8400	387400	
Total		19	1	38	58	5515800	100	520000	4397	14070400	334	1369400	4889	21475600	393	825300	22300900	

Appendix-VIII

Format for working out the requirements under the head of repair of damaged infrastructure of immediate nature.

(Rs.in Lakh)

Sector	Damage in physical terms	Requirement of funds for repair of immediate nature	Out of (3), amount available from annual maintenance budget	Out of (3), amount available from related Schemes/ programmes / other sources	Out of (3), amount proposed to be met from SDRF/ NDRF in accordance with list of works indicated in the Appendix to the revised items and norms
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Details given under Chapter-VI					

Appendix-IX

**DIVISION WISE LIST OF RESTORATION, PROTECTION & RAISING AND
STRENGTHENING OF EXISTING SALINE EMBANKMENTS TO PROTECT THE
ADJOINING AREA FROM STORM SURGE UNDER CHIEF ENGINEER FC & BM, LMB**

Amount in Lakhs

Sl. No	Name of the Division	Length in Km.	District	Amount Rs in Lakhs	Benefits to be rendered to	
					Population (No)	Agricultural land in Ha.
1	Mahanadi South Division	30.00	Jagatsinghpur	10090.00	30500	184.00
2	Jagatsinghpur Irrigation Division	28.50	Jagatsinghpur	18700.00	87184	9500.00
	Sub Total (Jagatsinghpur Dist) :	58.50		28790.00	117684	9684.00
3	Balasore Irrigation Division	88.60	Balasore	13500.00	26300	5170.00
4	Salandi Canal Division	94.90	Bhadrak	11645.00	35470	25100.00
5	Aul Embankment Division	134.88	Kendrapara	22780.00	108040	9490.00
	Grand Total:	376.88		76715.00	287494	49444.00

Appendix-X

Estimate for probable damage of electrical network due to Cyclone & Other Natural Calamities

33 KV and 11 KV Lines and DT

Scope	33 kV Line									
	Jagatsinghpur	Kendrapada	Balasore	Bhadrak	Total	Rate (L)	TPCODL	NESCO	Total (Lakh)	
Total 33kV Line Length (kM)	350	370	564	330	1614					
Conversion of 33 kV OH line to OH with NBLs Tower (kM)	150	90	250	117	607	105	25200	38535	63735	
Conversion of 33 kV OH line to OH with H-Type GI Pole (kM)	200	280	314	213	1007	22	10560	11594	22154	
11 kV Line										
Total 11kV Line Legth (kM)	4460	5325	8435	3896	22116					
Conversion of 11 kV OH line to OH with H-Type GI Pole (kM)	4460	5325	8435	3896	22116	20	195700	246620	442320	
LT Line										
Total LT Line Legth (kM)	3210	2990	11838	6589	24627					
Conversion Bare LT Conductor to AB Cable	3210	2990	11838	6589	24627	4	24800	73708	98508	
DTR Retrofitting										
Total DTR (Nos)	2210	2465	17639	11640	33954					
Renovation Required(Nos)	2210	2465	17639	11640	33954	1	4675	29279	33954	
Grand Total								260935	399736	660671
									6606.7 Crores	

Appendix-XI

Material Bank for TPCODL (Kendrapada & Jagatsinghpur):

SI No	Material Description Specification	Unit	Quantity	Rate(Rs)	Total cost (Lakh)
1	9Mtr 300kg PSC Pole	no	6000	3000	180
2	150*150 RS Joist (13 mtr) 34.6kg/Mtr	no	4000	29237	1169
3	116*100 mm RS Joist 11 mtr(23kg/meter)	no	5000	16445	822
4	80 mm2 Conductor AAAC	Km	5000	43000	2150
5	100 mm2 Conductor AAAC	Km	600	55000	330
6	LT XLPE ABC 3X50+1X35 MM2	KM	2000	130000	2600
9	LT PVC Cable 3.5CX240 mm2 PVC	KM	20	808000	162
10	63KVA 11/0.4KV AL Transformer	no	300	86500	260
11	100KVA 11/0.4KV AL Transformer	no	200	117000	234
12	Power Transformer, 33/11kv, 5MVA	no	5	4315500	216
13	Power Transformer, 33/11kv, 8MVA	no	3	5700000	171
14	AB Switch, 11kv 400amp, 3 pole	no	500	11850	59
15	Lightning Arrester, 12KV, 10KA	no	1000	3550	36
16	33kv Pin Insulator polymer	no	3000	480	14.4
17	11kv pin Insulator Polymer	no	5000	200	10
18	Disc Insulator, B&S, 90 KN	no	5000	360	18
	Hard Ware Fitting (B&S)	Nos	5000	390	20
19	50X50X6mm GI Angle, 100x50x6mm GI channel	kg	20000	65	13
20	33kv V cross arm 16.8kg GI	Kg	5000	1240	62

21	11kv V cross arm 10.2kg each	kg	5000	1410	71
22	LT Distribution Box with MCCB for 63kva	no	300	18322	55
23	LT Distribution Box with MCCB for 100kva	no	200	24419	49
	TOTAL				8520
				Or Say	85.20 r

Material Bank Proposal for NESCO (Balasore & Bhadrak):

Sl No	Material Description Specification	Unit	Quantity	Rate(Rs)	Total cost(Lakhs)
1	9Mtr 300kg PSC Pole	no	5000	3000	150
2	150*150 RS Joist (10 mtr) 34.6kg/Mtr	no	3500	22490	787
3	116*100 mm RS Joist 11 mtr(23kg/meter)	no	3000	16445	493
4	80 mm ² Conductor AAAC	Km	250	43000	108
5	100 mm ² Conductor AAAC	Km	500	55000	275
6	LT XLPE ABC 3X50+1X35 MM ²	KM	600	130000	780
7	LT XLPE ABC (3X95+1X70+1x16) MM ²	KM	1200	243000	2916
8	11KV 3X95 mm ² XLPE AB Cable	KM	0	673000	0
9	11KV 3X185 mm ² XLPE AB Cable	Km	20	855000	171
10	3CX185mm ² 33kv XLPE Cable armoured	km	10	1366000	137
11	3CX300 mm ² 33kv XLPE Cable armoured	Km	10	1756000	176
12	LT PVC Cable 3.5CX240 mm ² PVC	KM	20	808000	162
13	63KVA 11/0.4KV AL Transformer	no	110	86500	95
14	100KVA 11/0.4KV AL Transformer	no	220	117000	257
15	Power Transformer, 33/11kv, 5MVA	no	9	4315500	388
16	Power Transformer, 33/11kv, 8MVA	no	6	5700000	342
17	AB Switch, 11kv 400amp, 3 pole	no	300	11850	36
18	Lightning Arrester, 12KV, 10KA	no	700	3550	25
19	33kv Pin Insulator polymer	no	3800	480	18
20	11kv pin Insulator Polymer	no	6500	200	13
21	Disc Insulator, B&S, 90 KN	no	2500	360	9
22	50X50X6mm GI Angle, 100x50x6mm GI channel	kg	7000	65	5
23	33kv V cross arm 16.8kg GI	Kg	4000	1240	50
24	11kv V cross arm 10.2kg each	kg	2700	1410	38

25	LT Distribution Box with MCCB for 63kva	no	110	18322	20
26	LT Distribution Box with MCCB for 100kva	no	220	24419	54
	TOTAL				7503
				Or Say	75.03 Cr

Material Bank for the Transmission requirements (OPTCL)

Sl. No.	ITEM DESCRIPTION	UNIT	QTY	Unit Cost (Rs.)	Amount(Lakh)
A	Line Equipment				
1	Conductor				
i	ACSR Panther	km	200	200218	400.44
ii	ACSR Zebra	km	100	358208	358.21
iii	ACSR Moose	km	70	398633	279.04
iv	AAAC Zebra	km	15	359777	53.97
v	AAAC Moose	km	15	398633	59.79
vi	7/3.15 G.I Earth Wire	km	15	32221	4.83
2	OPGW 24 fiber	KM	50	300000	150.00
3	Insulator				
v	90 kN L/R Poecelain Insulator (132 kV)	Nos.	600	7000	42.00
vi	120 kN L/R Poecelain Insulator (132 kV)	Nos.	400	8500	34.00
vii	90 kN L/R Poecelain Insulator (220 kV)	Nos.	400	8900	35.60
viii	160 kN L/R Poecelain Insulator(220KV)	Nos.	300	9500	28.50
4	Conductor accessories				42.34
5	ERS towes				
i	ERS towes	Sets	30	7500000	2,250.00
ii	Spare and consumables of existing ERS tower	Lot			200.00
6	Tower-Structure				
6.1	220KV (OA,OB,OC)	MT	659		
6.2	132KV(PA,PB,PC)	MT	490		
6.3	Total	MT	1149	82400	946.78
6.4	Spare Cross Arms and tower members	Tons	405	82400	333.72
6.5	Nuts & Bolts	Tons	27	131268.55	35.44
7	Hardware fittings for different type conductors	LS			214.47
B	Substation Equipment				
	Substation and equipment Structure	MT	90	82400	74.16
	Nuts & Bolts	Tons	9	131268.55	11.81
8	Circuit Breaker				0.00
i	220kV	Nos.	3	1731591.79	51.95
i	132kV	Nos.	6	790656.43	47.44
i	33kV	Nos.	15	262046.13	39.31
i	SF-6 Gas Cylinders (50 kg.)	Nos.	15	68824.76	10.32
9	C.T.				0.00
i	220kV (0.2class) CT	Nos.	15	475749.27	71.36
i	132kV (0.2class) CT	Nos.	30	182820.85	54.85
d)	33kV(0.2s class)	Nos.	36	54320	19.56
10	P.T. / CVT (0.2Class)				
ii	220kV PT	Nos.	3	564754.59	16.94
iii	220kV CVT	Nos.	6	278612.27	16.72
iv	132kV PT	Nos.	6	253010.06	15.18

v	132kV CVT	Nos.	12	201805.64	24.22
vi	33kV PT (0.2s class)	Nos.	15	29819.04	4.47
11	Clamp and connectors for each type of equipment and flexible & rigid conductors	Lot	6	1500000	90.00
12	CT/PT CONSOLE BOX	Nos.	6	52507.12	3.15
13	BAY MARSHALLING KIOSK	Nos.	3	175024.22	5.25
14	A.C DISTRIBUTION BOARD	Nos.	3	437561.32	13.13
15	D.C DISTRIBUTION BOARD	Nos.	3	437561.32	13.13
16	Wave Trap				
i	Wave trap (220kv,1200A /1mh)	Nos.	3	598956	17.97
ii	Wave Trap (132kv,1200A/1mh)	Nos.	3	350049.96	10.50
17	Surge Arrestor				
ii	220kV	Nos.	12	56475.46	6.78
iii	132kV	Nos.	15	37650.31	5.65
iv	33kV	Nos.	30	12048.1	3.61
18	Post Insulator				0.00
i	Single Stack PI for 132 KV	Nos.	15	11851	1.78
ii	Single Stack PI for 33KV	Nos.	30	2020	0.61
iii	SingleStack PI for 220KV	Nos.	12	28279	3.39
19	Isolator				
i	220 KV Isolators	Nos.	8	383115	30.65
iv	132KV Isolators	Nos.	18	358313	64.50
xi	33KV Isolators	Nos.	36	174615	62.86
20	Different type Relays				29.18306
21	Control Cable & Power cable				510.2622
22	Station Transformer				
i	250 kVA	Nos.	6	695572.84	41.73
ii	500 kVA	Nos.	3	879931	26.40
iii	1 MVA	Nos.	3	1495000	44.85
23	Station DG Set				
	DG Set-80KVA (Medium to Large 132kV Grid S/S)	Set	3	1200000	36.00
	DG Set-150KVA(Medium to Large 220/132/33kV Grid S/S)		5	200000	100.00
24	Light Fittings	LS			15.00
25	T&P for Disaster Response				574.80
26	Construction of Store and platform for proper storing of Material with fencing				300.00
	TOTAL				7,938.59
Or say					79.39 Crore

Appendix-XII

Conversion Overhead lines to UG Cabling System in Urban areas

UG cabling Proposal							
Name of Districts	Townns	33kV Line @ 60L/kM		11kV line with CSS and RMU @ 150L/kM		LT line FPB @ 30L/kM	
		Qty (kM)	Amount (Lakh)	Qty (kM)	Amount (Lakh)	Qty (kM)	Amount (Lakh)
Jagatsinghpur	Jagatsinghpur	6	360	131	19650	328	9825
	Paradeep	15.5	930	20	3000	50	1500
Kendrapada	Kendrapada	4.5	270	62	9300	155	4650
	Pattamundei	2	120	61	9150	153	4575
Balesore	Balasore	27.6	1656	205	30750	513	15375
	Nilgiri	22	1320	21	3150	52.5	1575
	Soro	11	660	52	7800	130	3900
	Jaleswar	0.7	42	50	7500	125	3750
Bhadrak	Bhadrak	6	360	182	27300	455	13650
	Basudevapur	0	0	45	6750	113	3375
	Chandabali	7	420	60	9000	150	4500
	Dhamnagar	46.3	2778	30	4500	75	2250
Total		148.6	8916	919	137850	2298	68925

N:BTtotal 33kV UG cabling -148.6kM,11kV UG Cabling-919kM and LT UG Cabling-2298kM

Appendix-XIII

Renovation of 33/11kV substation

33/11kV Substation Renovation				
District	Total Substation	Renovation required	Rate(Lakh)	Amount(Lakh)
Jagatsinghpur	23	15	200	3000.00
Kendrapara	28	22	200	4400.00
Balesore	57	39	200	7800.00
Bhadrak	30	20	200	4000.00
Total	138	96		19200.00
			Or Say	192.00 Cr

Appendix-XIV

Conversion of existing lines to Resilient Transmission system:

Sl.No	Lines	Qty	Rate (Cr)	Amount (Cr)
1	132kV with lattice tower	900	1.3	1170.00
2	220kV with lattice towers	350	1.7	595.00
	Total			1765.00

Appendix-XV

Estimate for Institutional set up for Disaster Response Centers

SL. NO.	ITEMS	Qty	UNITS RATE (Lakhs)	Total (Lakh)
1	Portable DG Set - 5 kva	284	1.65	468.60
2	Mobile Substations 250 kva	284	14.00	3,976.00
3	Emergency restoration system (ERS) tower- HT line	71	85.00	6,035.00
4	Hydolic pulling machine	1065	1.50	1,597.50
5	Hydraulic jags	2130	0.12	255.60
6	Cable Crimping tools	3195	0.04	127.80
7	Gas cutters	355	0.10	35.50
8	Power cutters	710	0.08	56.80
9	Trifor (Hock chuck)	1065	0.21	223.65
10	Tripoid	1065	0.30	319.50
11	single derricks	1065	0.10	106.50
12	Chain pulley block (5 T Capacity)	2130	0.11	234.30
13	Lift Pully (2T, 5T)	2130	0.15	319.50
14	Manila / P.P.Rope (kg)	71000	0.01	710.00
15	Welding Machine	284	0.30	85.20
16	Drill Machine	284	0.35	99.40
17	Insulation Megger	2130	0.04	85.20
18	Earth tester	2130	0.05	106.50
19	Tounge Tester	3195	0.03	95.85
20	spanner sets	7100	0.07	497.00
21	Pole mounting Tractors	24	12.00	288.00
	TOTAL			15,435.40
			Or Say	154.35 Crore

Appendix-XVI

RESTORATION, PROTECTION & RAISING AND STRENGTHENING OF EXISTING SALINE EMBANKMENTS TO PROTECT THE ADJOINING AREA OF SHORELINE FROM STORM SURGE IN 4 DISTRICTS AFFECTED IN SUPER CYCLONE AMPHAN								
Sl. No	Name of the work	Length in Km.	District	Block	Assembly constituency	Amount Rs in Lakhs	Amount Rs in Lakhs	
							Benefits to be rendered	
							Population (No)	Agricultural land in Ha
Mahanadi South Division								
1	Raising & Strengthening of Saline Embkt. Harishpur East with Structure	1.10	Jagatsinghpur	Erasama	Balikuda-Erasama	900.00	2000	18
2	Raising & Strengthening of Saline Embkt. Harishpur East from Kalabedi to Siali with Structure	3.00	Jagatsinghpur	Erasama	Balikuda-Erasama	2425.00	6000	22
3	Raising & Strengthening of Saline Embkt. Harishpur East from Siali to Ramtara with Structure	4.00	Jagatsinghpur	Erasama	Balikuda-Erasama	3450.00	5000	20
4	Raising & Strengthening of Irribina -Nuaratnapur Saline Embkt. from RD 6.90 Km to 14.200 Km. with Structure	7.30	Jagatsinghpur	Erasama	Balikuda-Erasama	1482.00	5000	35
5	Raising & Strengthening of Japabhuyan-Dhobei Saline Embkt. from RD 11.500 Km to 19.000 Km. With Structure	7.50	Jagatsinghpur	Erasama	Balikuda-Erasama	1523.00	7000	42
6	Raising & Strengthening of Joker Gherry from RD 2.400 Km to 4.500 Km with Structure	2.10	Jagatsinghpur	Erasama	Balikuda-Erasama	210.00	4500	30
7	Raising & Strengthening of Bhuyanpala Gherry from RD 0.00 Km to 5.000 Km with Structure	5.00	Jagatsinghpur	Erasama	Balikuda-Erasama	100.00	1000.00	17
Sub Total:		30.00				10090.00	30500.00	184

Jagatsinghpur Irrigation Division								
1	Raising and Strengthening of Saline Embankment of Baruan Right Embankment From RD 24.8km to to RD36.5km	11.70	Jagatsinghpur	Balikuda	Balikuda Ersama	9200.00	35000	4500
2	Restoration of Saline Embankment From RD12.0km to 24.8km with renovation of Kathagadi Sluice at Rd 24.7km	12.80	Jagatsinghpur	Balikuda	Balikuda Ersama	4500.00	40184	2000
3	Raising And Strengthening of Saline Embankment of Alaka Right From Basanta Sluice to Patapur with Renovation Of Basanta Sluice and Guneimuhana Sluice	4.00	Jagatsinghpur	Balikuda	Balikuda Ersama	5000.00	12000	3000
Sub Total:		28.50				18700.00	87184.00	9500
Balasore Irrigation Division								
1	Raising & strengthening of Dhamara Bansada Saline Embankment	15.500	Bhadrak	Chandbali	Chandbali	4000.00	6500	1200
2	Raising & strengthening of Adhua Mohanpur Saline Embankment	4.000	Bhadrak	Basudevapur	Basudevapur	700.00	3000	500
3	Raising & strengthening of Suan TRE	12.000	Bhadrak	Basudevapur	Basudevapur	1500.00	1800	320
4	Raising & strengthening of Kirtania Bhusandeswar Saline Embankment	3.500	Balasore	Bhograi	Bhograi	400.00	1500	300
5	Raising & strengthening of Chandrabali Kirtania Saline Embankment	2.000	Balasore	Bhograi	Bhograi	300.00	1200	250
6	Raising & strengthening of Bhangamuhan Saline Embankment	6.000	Balasore	Bhograi	Bhograi	900.00	1700	430
7	Raising & strengthening of Matikencha Saline Embankment	3.000	Balasore	Bhograi	Bhograi	400.00	1000	220
8	Raising & strengthening of Mahasaya Saline Embankment	3.000	Balasore	Bhograi	Bhograi	400.00	1200	230

9	Raising & strengthening of Bhograi Capital Embankment	23.500	Balasore	Bhograi	Bhograi	2500.00	3000	800
10	Raising & strengthening of Parikhi Saline Embankment	2.000	Balasore	Balasore	Balasore	300.00	1100	230
11	Raising & strengthening of Chaulti Saline Embankment	3.500	Balasore	Baliapal	Basta	500.00	1500	240
12	Raising & strengthening of Solpata Bahabalpur Saline Embankment	10.600	Balasore	Balasore	Balasore	1600.00	2800	450
	Sub Total:	88.60				13500.00	26300	5170
Salandi Canal Division								
1	Raising & strengthening of Paramanandapur-Charadia Saline Embankment	14.75	Bhadrak	Chandabali	Chandabali	1848.00	5900	4400
2	Raising & strengthening of Chandabali-Charadia Saline Embankment	15.25	Bhadrak	Chandabali	Chandabali	1645.00	5400	3050
3	Raising & strengthening of Galia Guide bank left	4.00	Bhadrak	Chandabali	Chandabali	375.00	1000	1200
4	Raising & strengthening of Galia Guide bank right	4.00	Bhadrak	Chandabali	Chandabali	475.00	1000	1200
5	Raising & strengthening of Jantuali Biradia Saline Embankment	7.00	Bhadrak	Chandabali	Chandabali	1007.00	2450	2150
6	Raising & strengthening of Bahuharipur saline embankment on Baitarani Left	11.00	Bhadrak	Chandabali	Chandabali	1645.00	3600	2750
7	Raising & strengthening of Kandha Neduali saline embankment on Baitarani Left	9.90	Bhadrak	Chandabali	Chandabali	1487.00	3670	3000
8	Raising & strengthening of Pirahat Hengupati embankment.	3.00	Bhadrak	Chandabali	Chandabali	346.00	1250	850
9	Raising & strengthening of Chandabali Hengupati T.R. Embankment on left bank of Salandi & Baitarani	26.00	Bhadrak	Chandabali	Chandabali	2817.00	11200	6500
	Sub Total:	94.90				11645.00	35470	25100

Aul Embankment Division								
1	Raising & Strengthening of Keredagada Alalnaga Saline Embankment from RD 7.00km to 14.00Km including bank protection work on Hansua Right.	7.00	Kendrapara	Rajnagar	Rajnagar	1800.00	14000	350
2	Slope protection to Nalitapatia Talchua Saline Embankment on Brahmani right from RD 7.00km to 12.50km	5.50	Kendrapara	Rajnagar	Rajnagar	1500.00	22000	180
3	Raising & Strengthening of Padini Padmanavpur Saline Embankment from RD 00km to 4.00km on Hansua Right	4.00	Kendrapara	Rajnagar	Rajnagar	430.00	1400	120
4	Raising & Strengthening of Rajnagar Gopalpur Saline Embankment from RD 19.00km to 21.00km	2.00	Kendrapara	Rajnagar	Rajnagar	380.00	1100	110
5	Bank Protection of Rajnagar-Gopalpur Saline Embankment near village Gobardhanpur & Praharajpur on Hansua Left	1.10	Kendrapara	Rajnagar	Rajnagar	1200.00	1140	45
6	Construction of new embankment from Balungapatia to Gumura ghat in Rajnagar Block	2.70	Kendrapara	Rajnagar	Rajnagar	330.00	600	125
7	Raising & Strengthening of Bagapatia Saline Embankment from RD 5.00km to 10.00km	5.00	Kendrapara	Rajnagar	Rajnagar	700.00	1200	1200
8	Raising & Strengthening & Bank Protection of Baragaon Saline Embankment from RD 3.50Km to 8.50Km including bank protection at Brahmani Right	5.00	Kendrapara	Rajnagar	Rajnagar	1200.00	4000	300
9	Bank Protection to river Patasala left near village Purusottampur from RD 7.60km to 8.30Km	0.70	Kendrapara	Rajnagar	Rajnagar	550.00	200	80

10	Bank Protection to river Brahmani right near village Junagadi	0.90	Kendrapara	Rajnagar	Rajnagar	1200.00	1200	50
11	Construction of new saline embankment from Bagagahan to Tarapada Ghat from RD 3.900km to 13.000km & Raising & Strengthening from RD 00km to 3.900km	13.00	Kendrapara	Mahakalpada	Mahakalpada	2200.00	4500	300
12	Construction of new saline embankment from Badatubi to Nipania from RD 4.890km to 12.000km & Raising & Strengthening from RD 00km to 4.890km	12.00	Kendrapara	Mahakalpada	Mahakalpada	1880.00	3200	200
13	Improvement to Radhia Kansar Saline Embankment includes Bank Protection work on Gobari left	8.00	Kendrapara	Mahakalpada	Mahakalpada	1900.00	2000	120
14	Raising & Strengthening of Hariabanka Saline Embankment from RD 00km to 6.600km	6.60	Kendrapara	Mahakalpada	Mahakalpada	730.00	600	80
15	Raising & Strengthening of 12Nos Saline Embankment from RD 00km to 1.38km	1.38	Kendrapara	Mahakalpada	Mahakalpada	120.00	800	40
16	Raising & Strengthening of Kharinashi Saline Embankment from RD 5.500km to 9.500Km	4.00	Kendrapara	Mahakalpada	Mahakalpada	490.00	450	220
17	Construction of new saline embankment at Bahakuda-Ramnagar Saline Embankment from RD 00km to 0.40km	0.40	Kendrapara	Mahakalpada	Mahakalpada	320.00	200	80
18	Raising & Strengthening of Mahakalpada Chhapali Saline Embankment & Construction of protection wall in between RD 00km to 18.500Km	18.50	Kendrapara	Mahakalpada	Mahakalpada	1600.00	6000	1000

19	Construction of new saline embankment at Hariabanka to Kharinashi Saline Embankment from RD 0500km to 3.00km & Raising and Strengthening from RD 00km to .500Km	3.00	Kendrapara	Mahakalpada	Mahakalpada	320.00	450	90
20	Raising & Strengthening of Sunity Saline Embankment from RD 00km to 5.08Km	5.08	Kendrapara	Mahakalpada	Mahakalpada	600.00	700	180
21	Raising & Strengthening & Bank Protection lanching of Keredagada Alatanga Saline Embankment from RD 14.480km to 17.00Km	2.22	Kendrapara	Mahakalpada	Mahakalpada	1200.00	800	120
22	Raising & Strengthening & Bank Protection of Rajnagar Gopalpur Saline Embankment from RD 00Km to 19.50Km	19.50	Kendrapara	Rajnagar	Rajnagar	1100.00	40000	3100
23	Raising & Strengthening of Chasisava Saline Embankment from RD 00km to 4.00Km	4.00	Kendrapara	Rajnagar	Rajnagar	350.00	600	200
24	Raising & Strengthening & Bank Protection to Sasanpeta Saline Embankment from RD 00km to 3.30Km	3.30	Kendrapara	Mahakalpada	Mahakalpada	680.00	900	1200
	Sub Total:	134.88				22780.00	108040	9490
	G. Total:	376.88				76715.00	287494	49444