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Towards a disaster free India.....

**National Workshop on
PHAILIN CYCLONE 2013: LESSONS LEARNT
PROCEEDINGS**



*Prepared By
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Organized by
National Institute of Disaster Management
(Ministry of Home Affairs, Government of India)
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BACKGROUND

Odisha a coastal State in India, situated in the eastern part of India, is vulnerable to multiple natural hazards. Due to its geo-climatic conditions and sub-tropical littoral location, the state is prone to various hydro-meteorological hazards such as tropical cyclones, storm surges and tsunamis. The State has long coastline of 480 km with high population density especially in the coastal areas as compared to the interior regions. As per census 2011, the population of Odisha the state was about 41 million with an average population density of 269 sq. km. The coastal plains form an extensive alluvial tract lying between the Eastern Ghat hill ranges and the coast. The large portion of the population is located on the plains of its river systems. In these plain areas, the river contain heavy sediment deposits, subsequently reduces the carrying capacity which further resulting in frequent floods and at times complicated by breaches of embankments. The east coast of India is one of the six most cyclone prone areas in the world. About 17% of the Indian eastern coast is occupied by coastline of Odisha state. But, it has been affected by 35% of the all cyclonic and severe cyclonic storms that have crossed the east coast and associated storm surges often inundated large tracts of coastal districts. Every year, approximately five to six tropical cyclones form in the Bay of Bengal, of which two to three are within the mild to severe range. Considering together the storms and severe storms, coastal Odisha is about twice as vulnerable as compared to the other eastern states. The state has two cyclone seasons, the first during the pre-monsoon period (April-May) and the second during the post-monsoon period (September-November).

In October 1831, the Very Severe Cyclonic Storm killed about 50,000 people. In October 1971, the Very Severe Cyclonic Storm killed around 10,000 persons. In October 1999 the cyclone that hit Odisha was classified as a 'Super Cyclone' due to its severity and magnitude of damage, which left the state completely paralyzed due to the destruction to its infrastructure and communication systems. The cyclone of 1999 affected 18 million people in 14 districts and killed nearly 10,000 people.

Andhra Pradesh, located in the southern region of India, is one of the highly populated states mainly due to the development and its sea coast. As per Census 2011, the state has a population of 84,665,533 with a population density of 308 per sq. km. Andhra Pradesh is exposed to cyclones, storm surges, floods and droughts. A moderate to severe intensity cyclone can be expected to make landfall every two to three years. About 44 percent of the state is vulnerable to tropical storms and related hazards. With a frequency of four cyclones per year, one of which usually becomes severe, the Bay of Bengal accounts for seven percent of the annual tropical cyclone activity worldwide. Along the Andhra coast, the section between Nizampatnam and Machilipatnam is the most prone to storm surges. Vulnerability to storm surges is not uniform along Indian coasts. The following segments of the east coast of India are most vulnerable to high surges.

- North Odisha, and West Bengal coasts
- Andhra Pradesh coast between Ongole and Machilipatnam
- Tamil Nadu coast, south of Nagapatnam

Once the cyclones enter the mainland, they give way to heavy rains which often translate into floods, as it was the case with the damaging cyclone-induced floods in the Godavari delta, in

August of 1986. In Andhra traditionally, the flood problem had been confined to the flooding of smaller rivers. But the drainage problem in the coastal delta zones has worsened, multiplying the destructive potential of cyclones and increasing flood hazards.

A Very Severe Cyclonic Storm (VSCS) '*Phailin*' originated from a remnant cyclonic circulation from the South China Sea and formed as a low pressure area over Tenasserim coast on 6th October 2013. On 7th October, it lay as a low pressure area over north Andaman Sea. Further, it concentrated into a depression over the same region on 8th October near latitude 12° N and longitude 96° E. It started moving towards west-northwest directions and then, it intensified into a deep depression on 9th morning. Afterwards, it turned into cyclonic storm (CS), '*Phailin*' in the same day evening. It started moving northwestwards, and further intensified into a severe cyclonic storm (SCS) in the morning of 10th October. By forenoon of 10th October, it then turned into a VSCS over east central Bay of Bengal. Very rapid intensification occurred on 11th October due to continuous organization of eye and spiral bands. The system continued to move northwestward direction, the VSCS, '*Phailin*' crossed Odisha & adjoining north Andhra Pradesh coast till landfall near Gopalpur, Odisha around 22:30 hrs IST of 12th October 2013 (Saturday) with a sustained maximum surface wind speed of 200-210 kmph gusting to 220 kmph.

On 12th October 2013, *Phailin* Cyclone crossed the coastline between 8.30 pm and 9.30 pm (local time), south of the city of Brahmapur in Odisha. The mean wind speeds taken from satellite observations were about 120 kt (222 km/hr). The weather station in Gopalpur observed a gust of 185 km/hr at the storms northern eye-wall. Satellite imagery and Doppler Weather Radar Imagery of the VSCS has been depicted in the figure 1 below. The observed tracks of VSCS *Phailin* during 8th – 14th October 2013 depicted in figure 2.

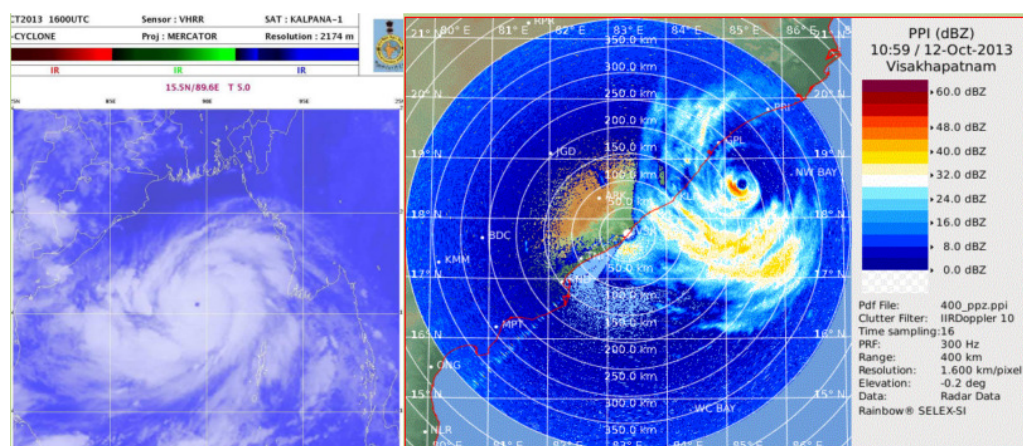


Figure 1: Satellite Imagery and Doppler Weather Radar Imagery of Very Severe Cyclonic Storm (VSCS) *Phailin*

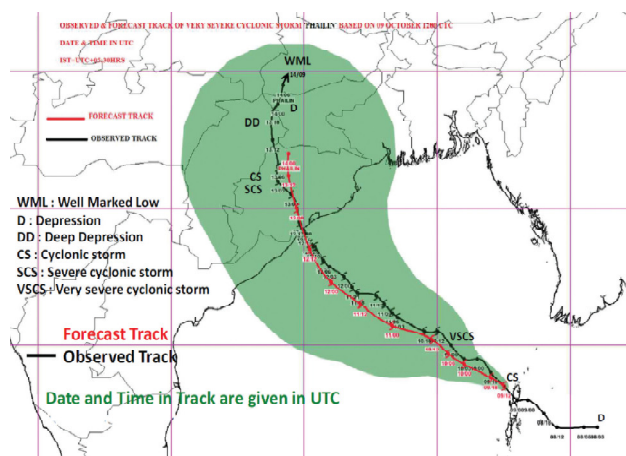


Figure 2: Observed tracks of VSCS *Phailin* during 8th – 14th October 2013

Monitoring of the system was mainly done by using half hourly Kalpana-1 imageries but satellite imageries of international geostationary satellites Meteosat-7 and MTSAT and microwave & high resolution images of polar orbiting satellites DMSP, NOAA series, TRMM, Metops were also considered. The series of typical satellite imageries of the system is presented in the following figure 3a, figure 3b and figure 3c (IMD, 2013).

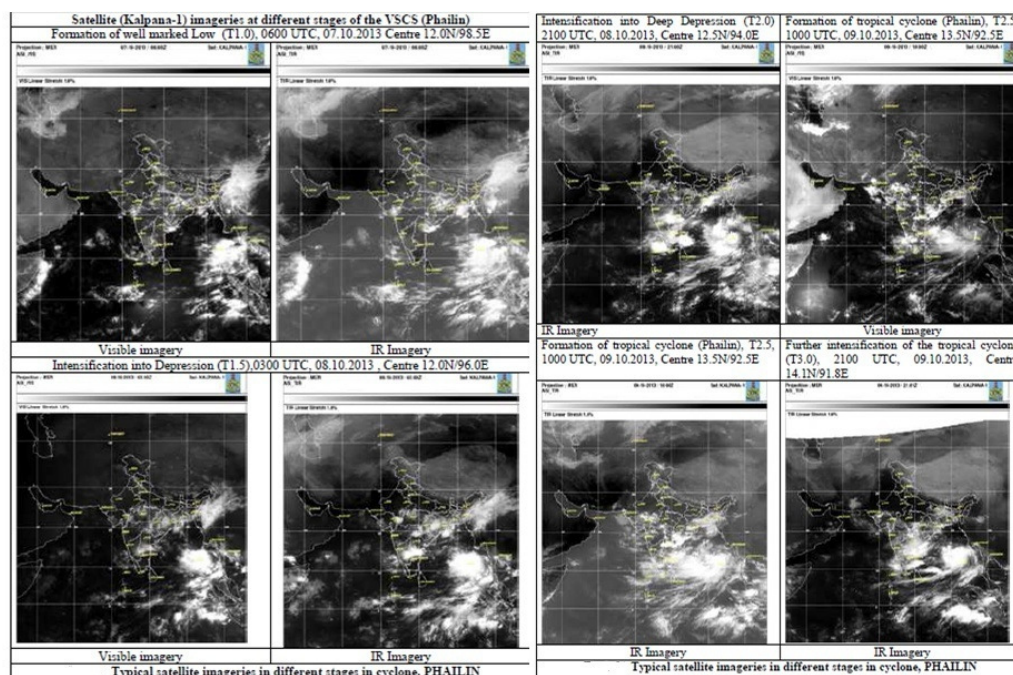


Figure 3a

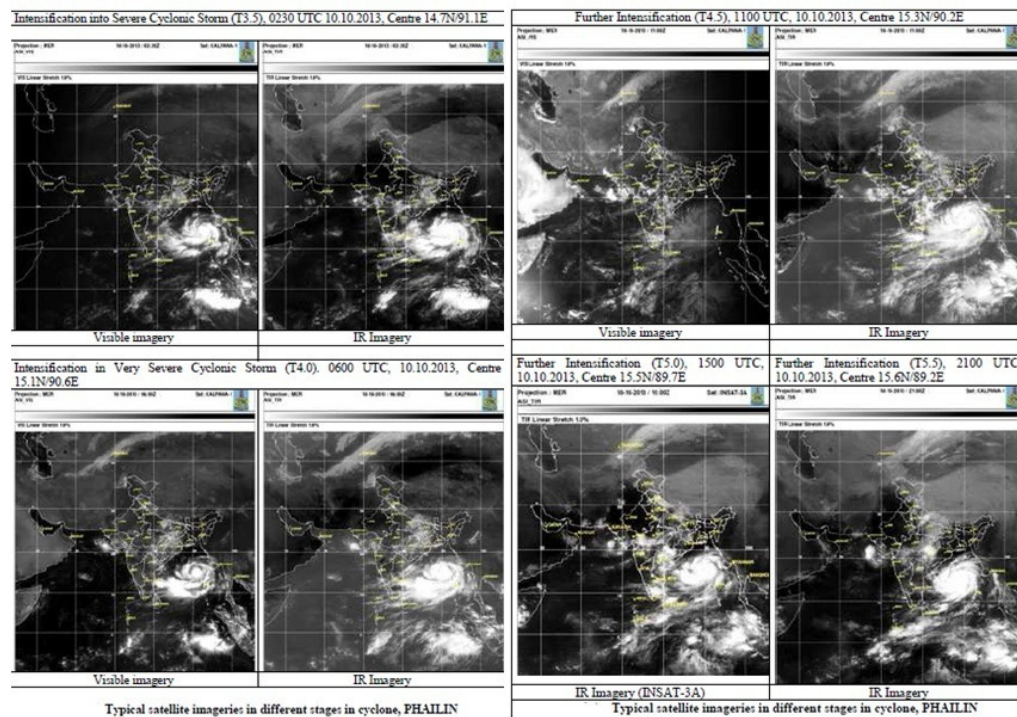


Figure 3b

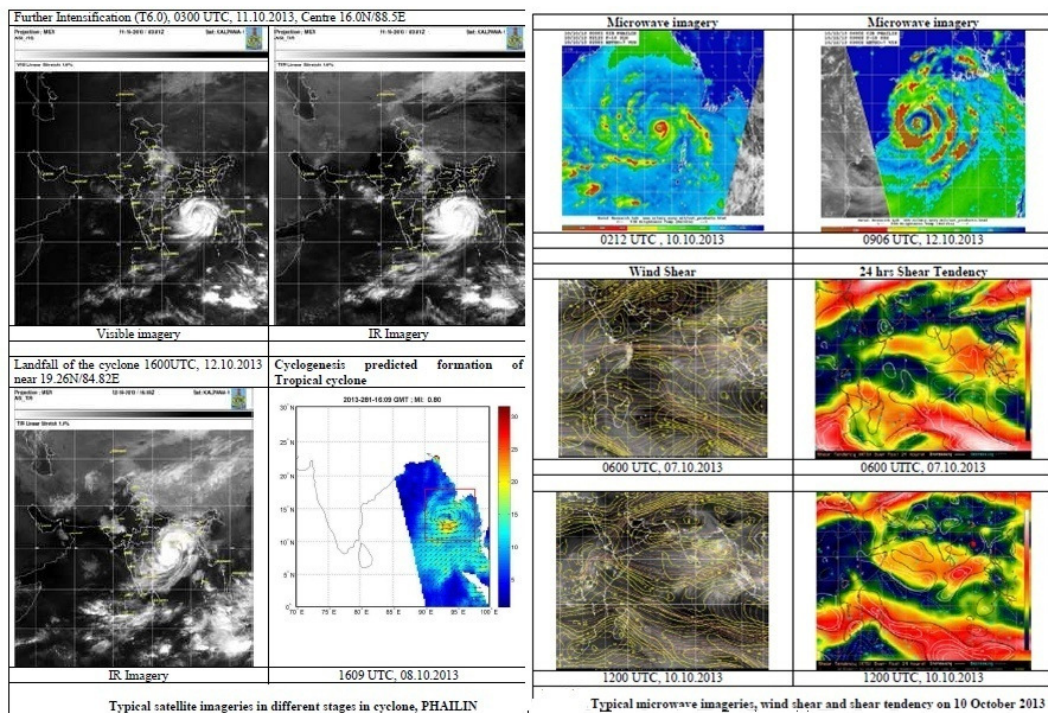


Figure 3c

Figure 3a, 3b & 3c: The typical satellite imageries in different stages in Cyclone *Phailin*

The VSCS, *Phailin* caused very heavy to extremely heavy rainfall over Andaman & Nicobar Islands, and Odisha and heavy to very heavy rainfall over **isolated parts of** North Coastal Andhra Pradesh, West Bengal, Jharkhand, Chhattisgarh and Sikkim. However, maximum rainfall occurred over Odisha. Further, the VSCS, *Phailin* generated a storm surge up to about 3.5 m above normal, inundating large low lying areas in the coastal districts of Ganjam, Puri, Khordha, and around Chilika lagoon.

On 8th October 2013, the Indian Meteorological Department reported about the formation of a depression. As the cyclone was expected to make a landfall on the 12th October, the states of Odisha and Andhra Pradesh witnessed the greatest evacuation in Indian history with over 13 lakh people evacuated before the disaster. The Army, Air Force, NDRF, ODRAF, CRPF, Public Works Department and local administration were prepared to work together for evacuation and quick rescue operations. Activists from political and social organizations were also involved in the rescue and management of relief centres. The national highways and other important roads were closed to regular traffic. Helicopters and various other alternate modes of transport were used to rescue people and take them to safe shelters. Dissemination of early warning information, effective disaster planning and preparation led to a minimal death toll in wake of one of the most severe cyclones to hit India in the last 14 years. It is a success story with minimal fatalities; the mitigation was not done over the course of a few days but with years of effective planning (since 1999).

In total there were 18 districts in Odisha and 3 districts in Andhra Pradesh were affected by the cyclone, though there was significant flooding in Jharkhand, Bihar and Chhattisgarh. While in the coastal areas, fierce winds and a storm surge were the main problem; torrential rainfall caused flooding. Due to the cyclone there were 21 deaths but the subsequent floods claimed 23 more lives in Odisha and 1 life in Andhra Pradesh. The tropical cyclone *Phailin* left enormous infrastructure, houses and properties damage in India. The immediate search, rescue, evacuation actions initiated as a part of pre-disaster response launched during the ***Cyclone Phailin*** should be considered as a success story in disaster management.

The unfolding tragedy in the states of Odisha and Andhra Pradesh has raised the inevitable question: how can we improve our preparedness. In order to share the learning experience from all the government and non-government organizations involved in the planning, preparedness, evacuation, rescue, relief and rehabilitation process, NIDM organized one day workshop on ***“Lessons Learnt from Cyclone Phailin”***.

The east coast with a high concentration of population is most prone to cyclones. The returns period of moderate to severe intensity cyclone is about 2-3 years. The impact of tropical cyclones is directly related to the magnitude and intensity of the cyclonic storm (*Cyclone Phailin* being termed as a very severe cyclonic storm by the IMD and based on the Saffir Simpson hurricane scale). Human and property exposure to cyclones is the key factor in turning potential hazards into disasters.

Two of the deadliest cyclonic storms were recorded by IMD during the year 1977 and 1999. The Andhra Pradesh Cyclone in 1977 hit Divi Seema, which generated winds exceeding 250 km per hour. The Super Cyclone of October 1999 generated a wind speed of 252 km/h with an ensuing surge of 7–9m close to Paradip in Orissa which caused unprecedented inland inundation up to 35 km from the coastline.

During the second week of October 2013, Cyclone *Phailin* swept over the Bay of Bengal and across the eastern coast of India, causing colossal loss of hundreds of millions of Rupees due to physical damages and affecting the livelihoods of the people in the area. The evacuation of more than 11 Lakh people in Odisha and more than 1 lakh people Andhra Pradesh in response to effective early warnings resulted in a much lower death toll in October 2013. But, a catastrophic cyclone of similar strength that struck earlier in the year 1999 left 10,000 people dead, which indicated non-availability of sophisticated early warning system, poor mitigation planning and meager preparedness. With advancement of science and technology and global efforts, today it became possible to organize dependable cyclone early warning services and minimize the loss of life and property by taking appropriate response actions of massive evacuation in advance before disaster event.

In Odisha, about 18 out of the 30 districts were affected by the VSCS and about 9,83,642 people evacuated due to the cyclone and 1,71,083 people evacuated due to subsequent flooding (Figure 4). In Coastal Andhra Pradesh, only 3 districts (i.e. Srikakulam, Vizainagram and Visakhapatnam) were affected by the cyclone and 1,34,426 people were evacuated. The evacuation in the two states was the largest ever evacuation perceived in Indian history to date. Mostly ground evacuations were carried out due to their proximity to cyclone shelters.



Figure 4: Showing inundated area caused by heavy rains

More than 12 lakhs people were evacuated within 36 hours of preceding the landfall of Cyclone *Phailin*, which is one of the largest emergency evacuations exercised within the limited timeframe in recorded history of Disaster Management in India. All these efforts of evacuation

strategy were conducted through well collaboration and coordination with the Central Govt., State Govt., District Authorities, Local Authorities, Odisha Disaster Rapid Action Force (ODRAF), National Disaster Response Force (NDRF), Central Reserve Police Force (CRPF), Odisha State Armed Police (OSAP), and the Indian Air Force (IAF), International NGOs and local NGOs.

In addition, the Odisha State Government opened 4,197 free kitchens centers from October 11 onwards. About 185 medical teams were mobilized and 338 medical relief centers were opened. The cyclone caused extensive devastation such as uprooting large number of trees, damaging roads, public buildings, houses (Figure 5 and Figure 6) and disrupting telecommunications and power lines. Due to the effective preparedness and pre-positioning of resources such as men, machinery and materials and the well coordination among Central, State, Districts level and Local agencies, could able to minimize the loss of human lives and also able to restore the dilapidated communication connectivity within short period of time.



Figure 5: House completely damaged due to the Phailin Cyclone



Figure 6: Showing uprooted roof and damaged house

Cyclone *Phailin* caused extensive damage to infrastructure and there were a few casualties. More than 13 million people have been affected by the cyclone *Phailin* in Odisha and Andhra Pradesh state respectively. More than 250,000 houses have been either partially or fully damaged, and countless trees have been uprooted. Crop areas with an accumulated size of more than 600,000 ha have been destroyed. *Phailin* caused widespread power outages and cut off water supply. Main highways have been affected by uprooted trees, eroded streets and congestion. **The railway infrastructure suffered severe damages and more than 165 trains were cancelled. Service at Biju Patnaik airport in Bhubaneswar was disrupted and the majority of flights were cancelled on 12 October (Muhr et. al., 2013).**

About 45 people died (44 in Odisha 23 due to flooding and 21 due to the cyclone, there only 1 reported death in Andhra Pradesh) - a significant but small number, compared to similarly strong events in the past. Due to one of the largest evacuations in Indian history the storm event did not cause major of fatalities. The Indian Meteorological Service (IMD) continuously tracked and issued warnings days ahead of *Phailin*'s landfall, so more than 1.5 million people were brought to safety in Odisha and Andhra Pradesh.

In total there were 3 districts affected by the cyclonic storm, Srikakulam, Vizainagaram and Viskhapatnam. There were 294 villages affected by the cyclone with only 1 casualty and 6,192 ha of paddy crop inundated. There were 134,426 people evacuated from these districts.

Odisha was much more severely affected than Andhra Pradesh with 18 districts affected, 44 people dead and a total population of 132, 35,981 affected.

Both Odisha and Andhra Pradesh States suffered several major disasters in the past (Table 1.1) including:

Table 1.1: Past major disaster in Odisha and Andhra Pradesh			
Sl No.	Month/Year	Event	State
1.	October, 1831	Very Severe Cyclonic Storm	Odisha
2.	September, 1885	Super Cyclone	Odisha
3.	October, 1971	Very Severe Cyclonic Storm during	Odisha
4.	November, 1977	Super cyclone	Odisha
5.	May, 1979	Cyclone in	Odisha
6.	May, 1979	Severe Cyclonic Storms/Heavy Rains/Floods disaster	Andhra Pradesh
7.	August, 1986	Heavy Rains/Floods	Andhra Pradesh
8.	November, 1987	Severe Cyclonic Storm	Andhra Pradesh
9.	July, 1989	Heavy Rains/Floods	Andhra Pradesh
10.	May, 1990	Cyclone in the year hit delta region	Odisha
11.	May, 1990	Severe Cyclonic Storm with core of hurricane winds	Andhra Pradesh
12.	October & November, 1991	Cyclonic Storm	Andhra Pradesh
13.	October & November, 1995	Heavy Rains/Floods	Andhra Pradesh
14.	June, 1996	Cyclonic Storm	Andhra Pradesh
15.	November, 1996	Cyclone	Odisha
16.	August & September, 1996	Heavy Rains/Floods	Andhra Pradesh
17.	October, 1996	Heavy Rains/Floods	Andhra Pradesh
18.	November, 1996	Severe Cyclonic Storm with core of hurricane winds	Andhra Pradesh
19.	September & October 1998	Heavy Rains/Floods	Andhra Pradesh
20.	October, 1999	Super Cyclone	Odisha
21.	August, 2000	Heavy Rains/Floods	Andhra Pradesh
22.	October, 2001	Heavy Rains/Floods	Andhra Pradesh
23.	September, 2005	Heavy Rains/Floods	Andhra Pradesh
24.	August, 2006	Cyclonic Storm/Floods	Andhra Pradesh
25.	July, 2006	Flood/Heavy rain	Odisha
26.	June, 2008	Flood	Odisha
27.	August, 2008	Heavy Rains/Floods	Andhra Pradesh
28.	July, 2009	Flood	Odisha
29.	October, 2013	Recent Super Cyclone and Floods	Odisha
30.	October, 2013	Recent Super Cyclone and Floods	Andhra Pradesh

In order to share the learning experience of all the organizations/stakeholders involved in the search, rescue, evacuation, relief, and rehabilitation, NIDM organized one day National Workshop on “**Phailin Cyclone 2013: Lessons Learnt**” on Friday, 30 May 2013 at its campus.

The objectives of the workshop were:

- To collate information and share knowledge/experiences about the impacts of the mega event
- To develop a document that includes lessons learnt by all stake holders
- To suggest future strategies for short and long term planning, preparedness, response, rehabilitation and reconstruction.
- To understand the shortfall and further improvement
- To understand comparison of preparedness specially during Phailin Cyclone 2013 and Super Cyclone 1999.
- To share the success story of achieving zero casualties for future disasters in other States

PROGRAMME		
National Workshop on PHAILIN CYCLONE 2013: LESSONS LEARNT On Friday, 30 May 2014 Venue: Ground Floor Conference Hall, NIDM, IIPA Campus, New Delhi – 110 002		
0900 – 1000	Registration	
1000 – 1040	Inaugural session	Welcome: Dr. Surya Parkash, NIDM Guest of Honour: Shri Sanjeev Marik, IPS, Spl DGP, Odisha Guest of Honour: Dr. P. K. Mishra, DG, GIDM Guest of Honour: Shri Anil K. Sinha, IAS, VC, BSDMA Chief Guest: Dr. K. Saleem Ali, Hon'ble Member NDMA Addressed and felicitation by: Dr. Satendra, ED, NIDM Vote of thanks: Dr. Surya Parkash, NIDM
1040 – 1100	High Tea/Coffee	
1100 – 1300	Session-1 Early Warning and Response	Chairperson: Shri K. M. Singh, Hon'ble Member, NDMA Co-Chair: Dr. L. S. Rathore, DG, IMD Rapporteur: Shri Ashok Sharma, NIDM and Shri Priyank Jindal, NIDM
	Presentations	1. Shri P. K. Mohapatra Spl RC, Odisha 2. Dr. T. M. Balakrishnan Nair, Scientist-F, INCOIS, Hyderabad 3. Shri S.K. Guleria, IPS, DIG, NDRF 4. Dr. M. Mohapatra, IMD, New Delhi 5. Dr. M. A. Atmanand, Director, NIOT, Chennai 6. Shri G Srinivasa Rao, Head, DMS Division, NRSC, Hyderabad
1300 – 1400	Lunch break	
1400 – 1600	Session-2 Coordination, Administrative and Community Issues	Chairperson: Prof. V. K. Sharma, VC, SSDMA Co-Chair: Shri G. V. V. Sarma, JS (DM), MHA Rapporteur: Shri T. K. Saha Roy, NIDM and Ms. Priyanka Chaudhary, NIDM
	Presentations	1. Shri Sanjeev Marik, IPS, Spl. DGP, Odisha 2. Shri Madhu Sudan Mishra, Collector & DM, Nayagarh 3. Shri Saurabh Gaur, IAS, DC, Srikakulam, A. P. 4. Shri S. K. Rath, Director, OPTCL, Odisha 5. Lt. Col. S. K. Rohilla, Indian Army, Gopalpur
1600 – 1615	High Tea	
1615 – 17:15	Session-3 The Way Ahead (Future Strategy)	Chairperson: Dr. H. K. Gupta, Hon'ble Member, NDMA and Dr. A. K. Pandey, IAS, DG SKIPA Co-Chair: Shri Anil K. Sinha, VC, BSDMA and Shri S. N. Mohanty, Secy, NDMA Rapporteur: Shri Neelay Srivastava, NIDM and Shri Rahul BhimraoGavhane, NIDM
	Panel discussions	1. Dr. SelviRajan, Chief Scientist & Head, SERC, Chennai 2. Dr. S. K. Roy Bhowmik, DDGM, IMD, New Delhi 3. Shri S. P. Vasudeva, Project Director NCRMP
17.15 – 17.30	Valedictory Session	Concluding Remarks: Dr. Surya Parkash, NIDM Chief Guest: Dr. H. K. Gupta, Hon'ble Member, NDMA Co-Chair: Shri Satya N. Mohanty, Secy, NDMA Vote of Thanks: Prof. Chandan Ghosh, NIDM
		List of Speakers and Delegates
		Photo Gallery

INAUGURAL SESSION

More than 130 participants from various government and non-government organisations attended the workshop (List enclosed - Annexure-I & II).



In the welcome address, **Dr. Surya Parkash, Associate Professor, NIDM** explained the importance of documentation of the *Phailin* cyclone. He informed that NIDM team visited *Phailin* cyclone affected areas in Odisha and collected valuable information. He expressed his view on learning from the past experience and how it has helped to get momentum and success in handling the recent disaster and planning for better strategy and more effective planning for future disaster which may not be prevented because of the human constraints in the available Science & technology. He appealed to all key stakeholders to provide their valuable input/feedback for inclusion in the documentation.



He stated that many organizations have actively participated and without their support such mega disaster could not be controlled and mitigated. He appreciated particularly the Early Warning provided by Indian Meteorological Department and its success to achieve the target of zero/minimal casualties with the support of various stakeholders. Many international organizations applauded all stakeholders who played directly and indirectly to achieve almost zero casualties in the *Phailin* cyclone and received global acclamation including UN agencies and World Bank for accurate Early Warning of landfall, preparedness and mitigation of the *Phailin* cyclone disaster. In fact, Early Warning was one of the stepping stones for successful management of *Phailin* cyclone disaster.

During the inaugural session, he introduced E-learning programme on Cyclone Risk mitigation in collaboration with C-DAC, Noida and also launched a DVD on a self-study programme on cyclone risk mitigation so that people in remote areas can access it.

Shri Sanjeev Marik, Spl DG of Police, Odisha, highlighted the response action force in Odisha. He was directly involved in Super cyclone in 1999 management failure and Cyclone *Phailin* 2013's successful risk management. He had the privileges of being involved in day to day development, preparation, situation, aftermath and administration and full coordination with other stakeholders. He had responsibility to maintain law and order situation, establishment and relief in the State. During Super Cyclone 1999, whole state was paralyzed and remained cut off for more than 20 hrs in which more than 1000 people died in Odisha (Paradip and Kendrapara severely affected), shortage of food, looting of grains, controlling of law & order in the state was really a herculean task. Failure in management of Super cyclone in 1999 necessitated better preparedness, arrangement of resources and deployments of NDRF, CRPF, Odisha police forces. About 3,990 personnel were deployed for law & order and 1,117 were deployed for relief. Communication was a primary issue for him this time which was not the case during 1999 super cyclone. He mentioned that within very short time span, it was ensured to bring back normalcy and nobody was affected by the severe *Phailin* cyclone in the Cuttack city. Block development offices and Tehsil offices were declared as the centre of relief activity and Odisha govt. and these centres were made accessible to people. Nearly 1,516 kms of blocked road was cleared in a very short span of time. All relief materials like food, medicine, other essential items, polythene bag and many other items were provided at relief camps.



Dr. P. K. Mishra, DG, GIDM, congratulated and complimented the officials in Odisha for successful accomplishment of *Phailin* cyclone disaster. He stated that disasters are always considered as surprises. He emphasized on four components namely, coordinated effort, mitigation systems, accurate Early Warning and information dissemination which were the backbone of the success which has become a classic case study. He appreciated the IMD for accurately providing early warning of landfall of *Phailin* cyclone, willingness of administration, coordination and stakeholders involved in the operation. Time of occurrence of events, availability of time for evacuation of people likely to be affected and attitude of administration were important elements for proactive response role played in mitigation of the *Phailin* Cyclone.



Shri Anil K. Sinha, IAS, VC, BSDMA said that he sincerely wanted to hear about management of the *Phailin* Cyclone and lessons learnt from the stakeholders. He compared the two disasters - one in Uttarakhand in June 2013, which was a collective failure due to mis-management and *Phailin* Cyclone in Odisha in October 2013, which has setup a global benchmark in best practices. Many other factors such as community training and community awareness

programmes, were helpful in management of *Phailin* and evacuation of more than 10 lakhs of people, with different challenges. He briefly recollected few major past disasters and discussed about the level of preparedness of state govt. administration. He mentioned that Odisha Govt. continuously worked towards mitigation since Super cyclone in 1999 and prepared itself to fight against cyclones. He said that information is an important parameter particularly during the event of any disaster. He further stressed upon the dissemination of information across the country and knowledge to be shared among all districts of India. Strengthening of information sharing has to be improved. He congratulated the stakeholders who actively participated and coordinated for the mass scale evacuation of people and shifting of people to safer places resulting in minimal loss of human lives.



Dr. K. Saleem Ali, Hon'ble Member, NDMA, differentiated types of disaster in 3 categories i.e. predictable, non-predictable and unavoidable. He expected that those which are un-predictable will have a science to be predictable in future. He emphasized on knowing the physiology of the disasters in advance so that one can prepare well before it happens. He emphasized on latent community awareness in planning aspect of disaster management. He laid importance on sensitizing community by putting signage and warning boards, which inform about the danger zone and make residents of a region aware.



He further stressed upon increasing bio-shields (such as trees which do not fall even during cyclones), which can be very effective during disasters. He said that forest management must be included in such activity and more bio-shields must be planted/ created. Further, he laid importance on the damage assessment prior to any disaster by preparing the inventory (assets and liabilities) in advance. This provides for accurate damage assessment, he added.

He also stressed upon the concept of disaster risk insurance and said that this concept is missing in India. But he expected that this concept must be worked upon, which will be very useful in post disaster redevelopment scenario. He also mentioned, in this regard, that families below poverty line must be assisted by the government and they must be provided insurance cover. He concluded with the hope to bring out best practices from this workshop and added to include some degree online program based on it so that people can be sensitized as well get benefited by the course.

Dr. Satendra, ED NIDM, offered mementos to all dignitaries during the inaugural session. He welcomed all the dignitaries and delegates who took pains to participate in the workshop. He emphasized on the importance of documentation of *Phailin* cyclone and lessons learnt. He expressed his gratitude towards the delegates from NDMA, MHA, Indian Army, Odisha and A. P. Govt. for sharing their experiences during the *Phailin* Cyclone and also extended his heartily thanks to all delegates who took pains to travel long distances to attend the workshop and share lessons learnt from *Phailin* Cyclone.



TECHNICAL SESSIONS

The workshop had three main sessions

- Session 1: Early Warning and Response
- Session 2: Coordination, Administrative and Community Issues
- Session 3: The Way Ahead (Future Strategy)

SESSION 1: Early Warning and Response

Chairperson: Shri K. M. Singh, Hon'ble Member, NDMA

Co- Chair: Dr. L. S. Rathore, DG, IMD

Rapporteur: Shri Ashok Sharma, NIDM and Shri Priyank Jindal

Speakers:

1. Govt. of Odisha – Shri P. K. Mohapatra Spl RC, Odisha
2. INCOIS – Dr. T. M. Balakrishnan Nair, Scientist-F
3. NDRF – Shri S.K. Guleria, IPS, DIG
4. IMD – Dr. M. Mohapatra, IMD, New Delhi
5. NIOT – Dr. M. A. Atmanand, Director
6. NRSC – Shri G.Srinivasa Rao, Head, DMS Division

The first session was chaired by **Shri K. M. Singh, Hon'ble Member, NDMA**, stated that states should be well prepared for disaster management otherwise, support from national level may not be utilized properly. He emphasized on the Disaster Management Act 2005, and focused on the three tier institutional setup for Disaster management such as National Disaster Management Authority (NDMA) at national level, State Disaster Management Authority (SDMA) at State level and District Disaster Management Authority (DDMA) at District level.



He mentioned that Odisha Disaster Rapid Action Force (ODRAF) has played an important and crucial role during cyclone. He also highlighted that cyclone shelters constructed in coastal belt of Odisha were of immense importance particularly for effective mitigation, evacuation and shifting of vulnerable people to safer place. He further mentioned that the National Cyclone Risk mitigation project provides continuous support for funding for construction of cyclone shelters in the coastal States.

He also stressed upon the community awareness programme that further become important tool towards the Disaster Risk Reduction (DRR). Regular mock exercises and sensitization among the coastal community would be helpful in reducing the risk.

Dr. L. S. Rathore, DG, IMD co-chaired the first session, and stressed upon the importance of user friendly information. Entire gamut of early warning and forecasts is actually very tedious tasks. Various data processing tools are developed to forecast an operational cyclone. He discussed the importance of a good forecast and timely dissemination of the information to competent authority. He further suggested that development & strengthening of three-tier system is very important to for sharing and dissemination of information to stakeholders. **He raised the some issues and difficulties related to the development of advance modeling and weather prediction techniques, falling of landfall and its impacts. In this context further, he suggested the development of some mechanism for interpretation of information at the end user level for effective and optimum utilization of forecasts related information is very important. He pointed out that confidence of the end user in the forecasts is of immense importance. Similarly, communication and coordination among various stakeholder i.e. operational and supporting agencies has played an important role.**



Shri P. K. Mohapatra, Spl, RC, Odisha, showed a documentary film involving all the stages of Cyclone '*Phailin*' management such as Early warning & Response, Preparedness, Rescue & Relief and Restoration & Rehabilitation. The documentary film highlighted the efforts put by government of Odisha in pre-disaster, during disaster and post-disaster stages to the objective '*Mission Zero Casualty*'. He also highlighted the hazard exposure of state of Odisha and disaster history, which reveals that in the last 15 years from year 1999 to 2013 except in year 2012, Odisha has



had to struggle with various disaster events in recent past. He mentioned about the lessons learnt from the Odisha super Cyclone in the year 1999 and how this helped in managing cyclone '*Phailin*'. He briefed about how government of Odisha pooled resources, built its capacity and became self-sufficient in providing food supplies and logistic support for effective and efficient disaster management. He also stated that Odisha is the first state to establish active and functional SDMA, soon after the Super Cyclone, 1999. He explained the importance of accurate forecasting, warning and dissemination of information from IMD for the cyclone '*Phailin*'. He provided details of how government of Odisha restored all important services within 72 hours except in a few blocks of 2 districts. He further added that Incident Command System is very important for seamless coordination and smooth functioning among state and national agencies.

Dr. T. M. Balakrishnan Nair, Scientist-F, INCOIS, shared information about Ocean State and Storm Surge Services from ESSO- INCOIS for VSCS '*PHAILIN*'. The ESSO-INCOIS has prepared Standard Operating Procedures (SOPs) for High Wave Warning & SOPs for Storm surge warning. He further informed about Ocean state forecast and High Wave alert issued during cyclone '*Phailin*'. He explained validation of significant wave height forecast during very severe cyclone *Phailin* using wave rider buoy and Moored buoy data. He also



mentioned about the INCOIS aid for search and rescue (SAR) operations during cyclone *Phailin* where model is forced with forecasted wind and current. He stated that INCOIS can predict the wave in an area with 7% error and has developed various models for prediction and forecast which gives confidence that their forecast is the most accurate among available forecasts. He shared details on cyclone warning dissemination system. He stated that in 480 villages *Phailin* advisories were disseminated through various digital communication systems such as local cable TVs in one coastal district of Andhra Pradesh and 3 coastal districts of Tamil Nadu, 67 helpline calls received in relation to '*Phailin*' cyclone, 54 *Phailin* advisories disseminated through voice SMS, Migrated fisher folk from East Godavari to Puri (Odisha) also alerted through voice SMS, INCOIS Marine Advisories in relation to "*Phailin*" reached 6233 of fisher folk by voice SMS, 30

minutes live phone programme conducted about the direction and wave height of “*Phailin*” cyclone in 98.8 FM Radio, Kakinada, East Godavari, Andhra Pradesh, 58 Flash news / bulletins screened during “*Phailin*” cyclone. He mentioned that information dissemination has been done in association with various Non-Government Organizations (NGO’s), Foundations, Trusts and various other mediums like Radio & T.V. channels, Newspaper agencies, Text messages on mobile etc. yielded effective results. He suggested that Ocean information, Cyclone information and weather services need to be provided not only during disasters but also during the non-disaster period. He suggested that information should be made available daily for the general interest of the public and awareness purpose. He also suggested that communities should be informed and involved for effective utilization of early warning system.

S. K. Guleria, DIG, NDRF, began with a motto of the NDRF i.e. ‘*Aapda Sewa Sadev*’ and gave brief introduction of cyclone ‘*Phailin*’ and impact of cyclone ‘*Phailin*’. He discussed the requirement of NDRF teams as requested by state governments where, state of Odisha had projected the requirement of 24 teams on 11th October, 2013 with the NDMA and state of Andhra Pradesh had projected demand of 15 teams on 11th October, 2013 with the NDMA. In response the HQ NDRF, mobilized one Senior Officer to perform as Operational Commander for NDRF teams who reported at Bhubaneswar by 11th October at 0900 hrs. OSOCC (On Site Operation Coordination Centre) was established at Police HQ, Cuttack on 11th October, 2013. Deployment of teams was discussed with the Special DG, Odisha Police.



Eight teams from 2nd Bn NDRF-Kolkata were mobilized by road/train and eight teams of 9th Bn NDRF-Patna were mobilized by air and reached at Bhubaneswar on 11th October, 2013. A total of 29 teams were put into action. 24 teams were deployed in cyclone affected areas and 2 teams each were kept as reserve at airport and one team Bn HQ NDRF at Bhubaneswar to meet any emergency. After reaching ground, NDRF team has established its communication system using VHF, OSOCC, and Satellite phones. Passing of IMD latest alert to all unit Commandants from time to time and coordinated with all stakeholders. NDRF conducted reconnaissance of the area by concerned team Commanders, identified vulnerable areas, location of the shelter house/relief camps, routes leading to these camps, made arrangement at each camp, massive forced evacuation of people from vulnerable areas.

Dr. M. Mohapatra, IMD, New Delhi, mentioned about the cyclone *Phailin* in 2013 and compared it with Super cyclone in 1999. It crossed land near Gopalpur with winds of 110 knots (215 kmph, 1 knot=1.95 Km) with an intensity of T6.0. He stated that rapid intensification of *Phailin* started from 10th October morning to 11th morning (wind speed increased from 45 knots to 115 knots). The Eye of cyclone was about 15 km diameter. He provided information about track and intensity forecast for cyclone *Phailin* on 8th October. Forecast indicated the movement of cyclone with intensification towards Odisha and North AP coast. On 9th October, he confidently depicted forecast for cyclone and its intensity upto wind speed of 175-185 kmph

gusting to 200 kmph with landfall between Kalingapatnam and Paradip, close to Gopalpur by night of 12th October.

He further added that the accuracy of model achieved through the up-gradation of Science and Technology such as improvements in observational network, satellite, Fast communication, Superior computational capabilities, Improved Numerical modeling capabilities, Skilled human resources, improved tools & techniques of forecasting, Excellent support and Inter-ministerial collaborations, international collaborations and Research & Development.



He also discussed about the limitations of the various models such as estimation of heavy rainfall, location specific rainfall forecast, location specific wind threat, inundation model and hydrological effects.

He also stressed upon the improvement in the MET stations and modeling aspects. He believed that still there are gaps in technology vis-à-vis capability; gaps in scientific understanding required for better forecasting such as detailed structure & dynamics of cyclones over the North Indian Ocean (NIO) unlike Atlantic and Pacific Oceans; Interaction between cyclone, Ocean, the surrounding environment; internal physical and dynamical processes in clouds; gaps in observational and modeling systems for forecasting with high spatial resolution; Development of an objective conceptual model; Creation of synthetic cyclone in NWP model for improved forecast by these models; interpretation of model guidance with experience and expertise, and many others.

He concluded that ocean & atmospheric technology plays a dominant role for an end-to-end Integrated Meteorological Services for cyclone DRR; IMD and MoES are continuously strengthening and upgrading their Early Warning System aiming at DRR based on State of Art Technology; there is need for investment for development of technology in various aspects.

Dr. M. A. Atmanand, Director, NIOT, Chennai, briefly introduced various dimensions of India's Ocean Observation Programme. These are a) Buoys provides Systematic time-series surface meteorological and oceanographic observations, b) Special underwater, marine and meteorological observational capability is required to improve Oceanographic services and predictive capability of short and long-term climate changes, c) Their importance in designing offshore structures capable of withstanding extreme events, d) similar observations for long periods is also required for shore



protection, and e) Development of system for validation of Satellite observations. He shared global scenario about Sea Surface Temperature, Height, and Vector Wind from Space. He also reflected upon nodes of Indian Ocean Observation Network, this also involves Argo, Met-ocean data buoys, ADCPs, drifters, RAMA buoys, current meter moorings, CODAR, Tsunami buoys, wave rider buoys. He explained about four observation system in Indian seas, which are Moored buoys, Tsunami systems, HF Radar, Drifter. He stated about importance and mechanism for weather forecasts, various types of Buoys, their effectiveness & kind of results they produce, and also various significant observations from Buoys, this includes seven cyclones since 2010. He also explained about the products produced during cyclone '*Phailin*' through OMNI Buoys. Last but not the least, he stated that "Observation network has improved considerably, enabling the modelers to utilize the same and come up with appropriate scientific solutions for shore protection, construction of offshore structures and the like in India and its neighboring countries".

Shri G Srinivasa Rao, Head, DMS Division, NRSC, Hyderabad, began with the introduction of ISRO DMS programme. The key activities of ISRO-DMS programme are Monitoring / Damage Assessment of natural disasters, Development of national database to facilitate emergency management (NDEM, VSAT based VPN for emergency communication, Strengthening of Early Warning Systems, this includes, Tsunami, Floods, Cyclone, Drought, Landslides etc. He



He further added the development efforts in the area of Airborne SAR, Communication Equipments, and Support to IOTWS. He also explained about international commitments and capacity building on DMS, this includes International charter on Space & Major Disasters, Spider, Sentinel Asia etc. and Exclusive Training programme for Capacity Building on DMS. He stated that Institutional mechanism is at the core of these activities of decisions centre (DSC) of ISRO-DMS programme. He further explained about Space Infrastructure of ISRO and dissemination – NDEM–VPN, this involves Hub, various monitoring nodes and primary nodes at NRSC, INCOIS, IMD, etc. and state control rooms. He also informed about linking of National Emergency Operations Centre with State Emergency Operation Center's (EOCs), Knowledge Institutions, and Key government offices, Expansion to Multi-Hazard-prone Districts, DM Authorities/NDRF Units.

He delivered a detailed introduction of Bhuvan portal with its role in visualization & information dissemination. He stated NRSC had played broad role in various ways during cyclone *Phailin*, such as, Early Impact Assessment of Cyclone '*Phailin*', Preparedness support for Odisha state - by providing information on areas inundated during 1999 super cyclone based on historic satellite data, daily monitoring of coastal districts, In addition, he highlighted additional information shared with Odisha State Disaster Management Authority, MHA, NDMA, CWC, IMD, which are - Inundation maps on daily basis, District-wise inundated area statistics, List of

villages inundated, Cumulative Inundation, Inundation layers in GIS format, Inundation during 12-16 October 2013, Inundation visualization through Bhuvan.

TECHNICAL SESSION 2: Coordination, Administrative and Community Issues

Chairperson: Shri Anil K. Sinha and Prof. V. K. Sharma, VC, SSDMA

Co-chair: Shri G. V. V. Sarma, JS (DM), MHA and Dr. Ajit Tyagi, Former DG IMD

Rapporteur: Shri T. K. Saha Roy, NIDM and Ms. Priyanka Chaudhary, NIDM

Speakers:

1. Shri Sanjeev Marik, IPS, Spl. DGP, Odisha
2. Shri Madhu Sudan Mishra, Collector & DM, Nayagarh
3. Shri Saurabh Gaur, IAS, DC, Srikakulam, A. P.
4. Shri S. K. Rath, Director, OPTCL, Odisha
5. Lt. Col. S. K. Rohilla, Indian Army, Gopalpur

Objective of the session: Analysis of role performed by various line departments of Government of Odisha including OSDMA, ODRAF, Odisha Police, NDRF, Indian Army, International NGOs, local NGOs, volunteers, Headquarter-Odisha and Inter Agency Group (IAG). This session was focused on Coordination, Administrative and Community issues during the cyclone *Phailin*, which was chaired by the Shri Anil K Sinha, IAS, VC, BSDMA, Prof. V.K. Sharma, Vice Chairman of Sikkim State Disaster Management Authority; and co-chaired by Shri G. V. V. Sarma, Joint Secretary (DM), MHA and Dr. Ajit Tyagi, Former DG, IMD. Five presentations were made during this session covering the armed forces, power sector and district administration.

Prof. V. K. Sharma, VC, SSDMA, stated that Odisha govt successfully managed the *Phailin* Cyclone and exhibited high level of coordination among the various workers, stakeholders, line departments, Central agencies, State Govt. agencies, NGOs, and local community. Odisha govt. prepositioned all human resources and deployed equipments at strategic locations. The state administrations were well prepared to face the the disastrous *Phailin* cyclone and managed it very well with minimal loss of life. The



administration, with its strategic efforts, achieved its objective of zero casualties. The State adopted best practices and put forward one of the best example of successfully managing this cyclone, which could have been catastrophic, in the absence of such well coordinated efforts. He commended the role of, not only the Police, but also NDRF and other forces who worked tirelessly to make this entire operation a success. He emphasized on the importance of coordination between all these forces, including fire services and civil defence, who work on

ground zero to minimize casualties and losses. The chairperson complemented Shri Madhu Sudan Mishra for such an elaborate collection of data and proper documentation of the event. He also encouraged the districts to go a little further with chronological listing of events, the intervention, gaps so that the districts have a detailed document of an important event for future reference. He also suggested that these form excellent case studies on disaster preparedness in the country, and could be included in further programmes on cyclones at NIDM.

Shri G. V. V. Sarma, JS (DM), MHA, praised Odisha Government for successfully managing the severe *Phailin* cyclone through well preparedness and co-ordination among the various stakeholders at multi-level who were worked together for the common goal. He appreciated Odisha Govt. authorities for rapid action taken based on the Early Warning provided by the IMD. He also congratulated the IMD for providing accurately warning about the *Phailin* cyclone couple of days before the actual landfall at Gopalpur on 12th October 2013. Odisha Govt authorities took immediate action, acted upon the warning, and initiated their pre-disaster response plan. A joint massive search, rescue, evacuation efforts started immediately which resulted in minimum casualty which was considered as biggest achievement in managing the major *Phailin* cyclon disaster in Odisha.



Shri Sanjeev Marik, IPS, Spl. DGP, Odisha, highlighted the daunting task taken up and accomplished by the police force in Odisha, to prepare for and tackle the cyclone and floods that followed immediately after the cyclone. He discussed about the strategic deployment of different forces, ready with necessary equipment, including the ODRAF, NDRF, CRPF, SAP in the affected areas. He emphasized on the efforts which were put in restoring and re-operationalizing the communication systems on priority, so that the relief could reach all the affected areas without any delay. The presentation apprised the audience of the scale of rescue efforts of the forces and tough conditions which they overcame to rescue the trapped people. He stated that about 18 districts in Odisha were affected by *Phailin* cyclone, whereas, 13 districts in Odisha were affected by subsequent floods. Food stuffs for 7 days, fuel and relief material were pre-positioned and pre-planned. During the entire process of evacuation, shelter and post disaster stay, food and drinking water arrangement was made. Satellite phones were provided as last line of communication. Many actions taken prior to *Phailin* cyclone such as Revenue and DM department issued notification regarding readiness at field level for cyclone, puja holidays cancelled, all govt. offices and field offices kept open, training officer were asked to return to duty, District administration asked to keep readiness to support men and material if required, OSDMA requested MHA to provide satellite phones, NRSC & ISRO requested to provide space based inputs for management of cyclones. He



highlighted that ODRAF has rescued and evacuated about 7,504 persons, cut/removed 3,984 uprooted trees, cleared 1,516 km of roads in the affected area, and distributed about 41,940kg of relief materials.

Shri Madhu Sudan Mishra, Collector & DM, Nayagarh, highlighted the administrative

preparedness, relief and response efforts in his district. Starting off with the vulnerability details of the district, he informed how efforts were put into preparedness and setting up Control rooms at district and block levels. He also told how no stone was left unturned in evacuation of the residents of the district by the officials before the landfall. The sectors that sustained significant damage in the district were agriculture, infrastructure and forestry. He highlighted the points that although in comparison with the Odisha super-cyclone of the year 1999, the death toll was very less, the impact on infrastructure and losses suffered were much higher this time.



Shri Saurabh Gaur, IAS, DC, Srikakulam, A. P., presented in detail about how the district tackled different challenges during the cyclone. To start off, the political situation at that time in Andhra Pradesh was one of the biggest challenges as most of the government officials including the transport department, were on strikes due to the same. This itself shot up the scale of the problem manifold. He then showed how strategies were developed to tackle the situation. Decentralization of operations was done, back-up systems for power and communication were put in place, cranes from various sources put on standby, ambulances were kept ready to deal with the response. The coordination with NGOs was taken care of by the administration for effective delegation of resources to affected areas. He also mentioned that use of mobile SMS became very effective in broadcasting DOs and DON'Ts etc, and it was carried out for the public awareness. He concluded with highlighting the importance of vulnerability and risk mapping based on not only the geological and geo-morphological features of the areas, but also based on the vulnerable sections of society and their habitation.



Shri S. K. Rath, Director, OPTCL, Odisha, played a very insightful documentary on the herculean task of restoring the power operations in Odisha. The documentary highlighted the sheer scale of impact sustained by the power sector, how quick needs assessment was done, strategies were made to engage and pool in resources from all possible sources, and to implement the tremendous amount of restoration efforts in record time. It also highlighted the lessons learnt by the organization and their forward strategy.



It was a very motivational clip which met with a huge round of applause by the audience. Restoration work of most critical infrastructure was carried out. The restoration of electricity and water supply completed within 24-48 hrs in capital and urban places. Ganjam district was worst hit by *Phailin* cyclone. Power was restored within 18 days in Berhampur and 45 days in rural places. Strong political will, bold leadership, leading role, excellent team work and coordination among State Govt., District Administration, Police, ULBs, OPTCL, DISCOMs, CPSUs, Tata Steel and L&T helped in accomplishing this huge task.

Lt. Col. S. K. Rohilla, Indian Army, Gopalpur, highlighted the role of the army in the relief and rescue operations in Odisha during Super cyclone in 1999 as well as in *Phailin* cyclone in 2013. Army people are basically experts in managing radars, missiles, and guns. He witnessed the severe super cyclone of 1999, and also got opportunity to work in *Phailin*. It was a War like situation.



Many govt. agencies, relief agencies, NGOs, and other line department all came together with common goal of winning the '*War like situation*' in the *Phailin* Cyclone. There were many defence installations near Gopalpur and Paradip coastal belt.

The Disaster management cell was setup by the Headquarters under the guideline of DGMO in liaison with Higher HQ, Civil Administration, Met department, and Coast Guards. The entire setup and entire situation was regularly monitored not only by the DGMO but also by the Army Chief. Existing communication system was activated, V-SAT was dismantled to prevent damage to antenna, INMARSAT and MSS activated, normal VHF Radio communication setup was made ready between Stations Cdr and Coln/ROPs. HF Radio was kept as back up by the Army.

Evacuation plans were prepared, pre-positioning of self-reliant, self-contained rescue materials at various locations was done, bulk SMS system provided by VSNL was extensively used to send advisories / spot messages. Next priority was to achieve zero casualties and to ensure of the military communication equipment, safety of training buildings and infrastructures, provide relief and rescue operation. Evacuation was done in villages situated upto 5 km from the coast and relief & rescue provided to neighbouring villages. These villagers are inhabited by mostly fishermen and they were very poor. Helipad was activated with pre-prepared FOL. The additional top priority was also to save all lives of personnel including military& their families and civilians.

Relief camp was setup within the Army camp and medical facility provided to victims. There was a psychological fear among the villagers regarding the *Phailin* Cyclone and Army personnel constantly boosted up their moral support. There was absolute disruption of communication system, roads, damages of buildings, water supply systems, falling of trees over the road, falling towers, damages of ecosystems and many more. There was no power in the night. Under inclement weather condition, army provided relief material include candles, food and other essential items.

Session 3: The Way Ahead (Future Strategy)

Chairperson: Dr. H. K. Gupta, Hon'ble Member, NDMA and Dr. A. K. Pandey, IAS, DG SKIPA

Co-Chair: Shri Anil K. Sinha, VC, BSDMA and Shri S. N. Mohanty, Secy, NDMA

Rapporteur: Shri Neelay Srivastava, NIDM and Shri Rahul Bhimrao Gavhane, NIDM

Speakers:

1. Dr. Selvi Rajan, Chief Scientist & Head, SERC, Chennai
2. Dr. S. K. Roy Bhowmik, DDGM, IMD, New Delhi
3. Shri S. P. Vasudeva, Project Director NCRMP

This session was the last session of the day which focused on driving national and state level strategy for future cyclone related risk management and how they can be better and effectively managed.

The Session began with the introductory remarks by **Dr. H. K. Gupta**, Hon'ble Member, NDMA. He acknowledged that despite our limited capacity, we did so well in managing *Phailin* 2013. He was very optimistic about looking forward what could be done in the future through learning lessons from *Phailin*. He believed that saving lives should be the top priority in any disaster and he has appreciated that various agencies collectively achieved the target of minimal casualties in Cyclone *Phailin*. The role played by the various institutions, agencies, state government, NDMA, NDRF and NIDM during *Phailin* was remarkable. He expected that similar type of management strategy should be replicated in future too.



Dr. A. K. Pandey, IAS, DG SKIPA, appreciated the Odisha administration for their preparedness, deployment of resources at various locations. Forecasting is a very important component in risk management and risk reduction. He sought example of forecasting of asteroid and tsunamis and its implications. He suggested looking beyond the forecasting and look ahead using the latest technology. He stated that it is the time to prepare ourselves for uncertainty and unfortunate scenarios and worst unpredictable events.



Dr. Selvi Rajan, Chief Scientist & Head, SERC, Chennai presented on “The Way Ahead (Future Strategy)-Structural Engineering Perspective”. She focused on the structural engineering perspective and mentioned that CSIR-SERC has been conducting post-cyclone disaster surveys for almost three and half decades and based on that, has come out with guidelines for cyclone resistant designs of (Dwellings/Houses, Industrial structures, Lattice



towers, buildings/structures) which are also on NDMA website. She revealed about the structural damage surveys and structural failure observations like rooftop tower and ground based transmission line towers damage. Based on past data (from 2006 to 2013), she summarized that cyclones, storm surge height, economic loss and fatalities have increased. This warrants web service based approach, in addition to the development of infrastructure. Based on the past post disaster survey they have already done work on non-engineered structures like sheet roof, tiles roof and even reinforced concrete roof which are tested and so to retrofit the existing structure. The future strategy, learnt out of this is to keep testing on locally available material. So there is a need to develop new retrofit measures for the existing structures or for the new structures. There is need to have multi-purpose cyclone shelters which can be used as shelters during cyclones, and also serve other purposes like that of a school. Need is to have a database based on micro-zoning with a power grid support to give transmission line tower to measure data at very close interval. They are establishing cyclone wind monitoring stations which are 30 meters tall and remotely acquiring data via internet. There is need to increase these stations and also have nodal centers to maintain these infrastructure. She briefed and highlighted about the guideline based on past experience. She mentioned about roof top tower not following the guidelines and that there is more need of study to anchor the roof top to stabilize during the cyclone. Future strategy needs to have a cloud environment for vulnerability assessment so that any person from any place, at any time, can access it, which actually is the web based approach in disaster mitigation.

She highlighted the following three major suggestions:

- Bring out guidelines on high wind speed proof structural design.
- Use latest techniques to find out vulnerability assessment.

Dr. S. K. Roy Bhowmik, DDG, IMD, New Delhi discussed about the early warning system of cyclone and highlighted about future plan. The reason behind why we were not good at Cyclone 1999 and did better on cyclone 2013, is because the focus system used in 1999 was an obsolete system- there was no model, method was very conventional method driven by observation only and forecast could be made in only 48 hours. But in 11th Five year plan, there was a massive up-gradation in the focus of IMD in terms of observation network, accompanying facilities, up-

gradation, data generation product, integration and dissemination of the forecast system etc. The major backbone of the forecast is a new model of prediction. IMD uses a number of models using global forecast system and tries to maximize data ingest of the Indian region so that forecast is good for the Indian region. Forecasting is based on real time weather condition, and it is very complex in nature. He mentioned the five forecasting components used in the model as follows:



- **Genesis:** to know initial stage based on past studies & global forecast model to generate which are the areas will be likely to be getting a cyclone storm after index crossing a particular threshold. The prediction can be made 7 days in advance.
- **Multi-Model Ensemble (MME) technique for cyclone track prediction** in the composite model derived from five operational NWP models giving individual models some weighted value. It is a more reliable model.
- **Cyclone intensity prediction: for predicting 12 hourly cyclone intensity (up to 72 hours)**
- **Rapid intensification - 36 hrs to 72 hrs forecasts.**
- **Decay Model**

He focused on improving the model for forecasting and considering different component like rainfall, oceanic component etc. Besides collaborations with USA counterpart and INCOIS, there are new areas where IMD is working for future forecast, besides also endeavor to reveal about numbers of cyclone to take place. He discussed about the challenge like deployment of Aircraft to collect data which can be used in models and observation for better forecasting.

Shri S. P. Vasudeva, Project Director, NCRMP

started stating about with future strategy in risk management for cyclone focusing on early warning systems and mitigation as proactive and systematic risk management effort to save lives& avert economic losses. He mentioned about National Cyclone Risk Mitigation Project (NCRMP) that has been has been drawn to address cyclone related risks in the vulnerable coastal States with World Bank assistance and it is focusing on ex-ante risk mitigation interventions as part of strategy to integrate disaster risk mitigation in to longer term national development process. The project was started on 14 January 2011 and will be ending on 31 October 2015. Phase I cover Andhra Pradesh and Orissa at the cost of Rs 1496.71 crores. It is Adaptable Programme loan i.e. through our experience; it will develop the programme further. Phase II is under preparation covering coastal states of Gujarat, Maharashtra, Kerala and West Bengal. It mentioned about the financial aspects of projects. The four project components are:-



Component – A. Early warning dissemination to coastal communities, including communities capacity building for operation of Early Warning and Dissemination System (EWDS).

Component – B. Cyclone Risk Mitigation Infrastructure, Multipurpose Cyclone Shelters, Evacuation Roads and Routes, Linking and Missing Bridges, Coastal Embankments.

Component – C. Technical assistance for Cyclone Hazard Risk Mitigation capacity building and knowledge creation.

Component – D. Project Management & Implementation Support, Unallocated contingency

He mentioned about the severity of cyclones and the level of destruction caused by it like loss of vegetation, human and animal loss, falling of power cables, damage to rural houses, especially blowing away of roofs, damage to coastal soil strata and falling of mobile telephone towers. The Future Strategy is Early Warning and Dissemination System, Risk Mitigation Intervention, Cyclone Hazard Risk Mitigation Capacity Building and Knowledge Creation.

Attempt to develop a web based system with multiple options of sending messages, including backup of satellite phones or other suitable technologies with multi gateways. Message dissemination all the stakeholders who will affect by the cyclone. Also tried to develop the project further through Risk Mitigation Intervention funded under NCRMP. World Bank funding to cover 60% of coastal areas and additional funding will fill all the gaps that exist in risk mitigation in coastal areas.

Multi-purpose cyclone shelters are being constructed 138 in Andhra Pradesh and 164 in Orissa. Road and bridge are being constructed so that there is uninterrupted communication in 10 km of radius of coastal area of both the states. He stated about protection of infrastructures, power line, livelihood and the inclusion of other financial institution like World Bank & ADB for mitigation measures including rural housing, shelter etc.

He mentioned about Odisha Disaster Recovery Project and Integrated Coastal Zone Management Project (ICZMP) of MOEF for erection of Bio-shields – Shelter belt and Mangrove Plantations. He mentioned about Cyclone Hazard Risk Mitigation Capacity Building and Knowledge Creation and development of Composite Risk Atlas that helps for dynamic risk assessment functionalities that will be taken up in NCRMP Phase II.

Preparation of short and long term Training and Capacity Building Strategy is being done by NIDM to assess capacity gaps of stakeholders in all phases of the disaster management cycle. It will cover all major disasters and conduct training need analysis and develop training designs and modules for all relevant stakeholders. Besides Post Disaster Needs Assessment (PDNA) Study also being done by NIDM to evolve a standardized methodology for damage, loss and need assessment relevant to India. It is to be noticed that focus should also be on implementation side.

The important future strategic issues discussed in the workshop are:

- Find out the current gaps in our understanding of the hazards of cyclone in the coastal region of the country and identify, try to reduce those gaps.

- Development and implementation of Early Warning Systems for all hydro-meteorological disasters at local community level.
- To develop permanent structure/plan for communication systems (Telephone/mobile towers, Tv/Radio channel, etc.) for improving dissemination of warnings before, during and after disaster.
- Find out the types and nature of vulnerabilities of the existing people in the coastal region.
- To reduce vulnerability of coastal communities by addressing the gap that exists in communication of EWD in a timely reliable and efficient manner.
- Developing a web based system with multiple options of sending messages including back up of satellite phones or other suitable technologies.
- Develop training designs and modules for all relevant stakeholders and also develop short and long term capacity building strategies.
- To make a guidelines/IS code for design of cyclone shelters and house shelters in cyclone prone areas.
- Establishment of cyclone wind monitoring stations at the coastal region.
- Development of design guidelines/policy for roof-top towers.
- To facilitate education and training of the future workforce in the field so that the growing competition in the global market is met through a cadre of well trained professionals and educators.

Valedictory Session

Chief Guest: Dr. H. K. Gupta, Hon'ble Member, NDMA

Co-Chair: Shri Satya N. Mohanty, Secy, NDMA

Concluding Remarks: Dr. Surya Parkash, NIDM

Vote of Thanks: Prof. Chandan Ghosh, NIDM

Chief Guest, Dr. H. K. Gupta, Hon'ble Member, NDMA, suggested that documentation is very important. He mentioned some major disasters such as Bhuj earthquake in 2001, Super cyclone in 1999 and many others. But, there is no well documented report available on disasters as case studies. He pointed out that a lot of information is available in bits and pieces. He suggested to prepare a good international report on *Phailin* Cyclone based on authentic sources and reliable reports.



Dr. Surya Parkash, NIDM, stated that the purpose of the workshop is to prepare document, receive information from various stakeholders, sharing information from affected States such as Odisha, Andhra Pradesh and Tamil Nadu and incorporate them in the report on *Phailin* Cyclone. In his concluding remarks, he mentioned that Dr. H. K. Gupta, Hon'ble member, NDMA who is looking after functions and guiding the NIDM. He also thanked Shri



S. N. Mohanty, Secy, NDMA for his gracious presence and also an important person for NIDM.

There were many dignitaries present in the inaugural session such as Chief Guest, Dr. K. Saleem Ali, Hon'ble Member, NDMA; Dr. P. K. Mishra, DG, GIDM; Shri Anil K. Sinha, IAS, VC, BSDMA; Shri Sanjeev Marik, IPS, Spl DGP of Odisha; representatives from A. P. State Disaster Management Authority & Odisha State Disaster Management Authority and many others.

Dr. K. Saleem Ali, Hon'ble member, NDMA suggested to have latent community awareness programme and insurance programme for Disaster Risk Reduction. In this occasion, NIDM has launched E-learning and Self Study programme program on Cyclone Risk Mitigation. NIDM has also prepared seven more courses on thematic disaster.

Spl DGP of Odisha stressed on the major issues related to law & order and security in Super cyclone in 1999. Whereas, during *Phailin* cyclone 2013, the issues related to law & order and security were well controlled.

In First session, DG IMD mentioned that 3 tier system (National, State and District level) adopted by IMD and it is not functioning well. They wanted to have 3 tier systems for dissemination, communication and forecasting up to ground level. IMD had MET centres at different places. IMD started atmospheric prediction, storm surge prediction, flood prediction and expected inundation prediction for better management of disaster and Disaster Risk reduction. He mentioned that forecasting and communication was well understood by administrations, which was the basis of success in case of managing *Phailin* cyclone.

He mentioned that Shri P. K. Mishra, Spl Relief Commissioner, Govt. of Odisha, discussed much in detail about managing of *Phailin* cyclone in his presentation. He emphasized that extra ordinary power was given to responsible persons and they were made accountable by the Odisha State Govt. for better administration, coordination, managing of resources internal & external resources, pooling of resources for successful management of *Phailin* cyclone. He also mentioned that implementation of IRS system has proved very much effective and efficient in managing the risk like *Phailin* cyclone.

There were good presentations from Deputy Commissioner of Nayagarh district in Odisha and Srikakulam district in Andhra Pradesh and mentioned that they have successfully managed *Phailin* cyclone in their district.

Dr Surya Parkash mentioned the important strategic role played by NDRF. They have carried out their operations based on IMD forecast and successfully managed the *Phailin* Cyclone. Basically, the success has come through the blend of Science & Technology and interactions with other factors such planning, operation, administration, coordination, resources, dedication, responses, systematic approach and implementation of IRS and many others.

A sectoral presentation was made from Odisha Power sector. One of the important tasks was to restore the power system immediately. Many towers fell down due to high wind speed of 220 kmph. Towers were designed to bear the wind speed of 180 kmph. In SERC presentation, it was discussed that one of the failure of power tower due to faulty design which cannot stand more than 180 kmph. SERC has all testing facility for towers & buildings with different wind speed. However, the faulty towers and buildings can be retrofitted to strengthening the buildings and

towers. SERC also try to develop lattice structure and structural mechanism to retrofit these buildings.

Dr. Satendra, ED, NIDM presented a token of mementos to all dignitaries and speakers for devoting precious time in sharing and disseminating information. Delegates from all over the country participated in the occasion. It is expected that participants have benefited and enriched themselves.

The workshop concluded with *vote of thanks* and with the following concluding remarks by **Prof. Chandan Ghosh, NIDM**. NIDM is thankful to IMD and NDRF for their magnificent presentation, sharing of information with the audience. He expressed thanks to DG, IMD & team of IMD and DG, NDRF & team of NDRF who made this workshop successful.



He expressed thanks for wonderful technical presentations, sharing of information, enthusiasm, delivering excellent lectures from SERC, NIOT, NRSC, INCOIS and many other organizations. Representation from State of Odisha has been important in this workshop and this gathering actually has been arranged for sharing their success story to other stakeholders so that the lessons learnt in the workshop may be carried away by the participants and later on the same may be implemented their own states to managing risk and Disaster Risk Reduction. Representative from Odisha shared the reason for failure in Super Cyclone in 1999 and success story behind the *Phailin* Cyclone 2013 and it has received global appreciations for their triumph.

NIDM is grateful to all participants for shown their enthusiasm, and participation in the workshop. Their presence indicates their love, affection and affiliations with the NIDM.

Dr. C. Ghosh mentioned about the NCRMP project in which NIDM is working on stage I and II, and additional work particularly on mitigation of cyclone will be taken up with Central Govt. and State Govt. Wonderful presentation from Shri S. P. Vasudeva for sharing overview of NCRMP project (National Cyclone Risk and Mitigation Project).

He expressed gratitude to ATIs and Union Territories for their participation in the workshop. NIDM is thankful to Jt. Secy MHA, Shri G. V. V. Sarma for good presentation.

The institute is thankful to Dr. P. K. Mishra, DG, GIDM, Shri Anil K. Sinha, IAS, BSDMA, Dr. V. K. Sharma, VC, SSDMA who always standby us and their associations keep us alive and keep our high spirit high.

Finally he expressed his gratitude for Dr. Satendra, ED, NIDM, who has taken interest, initiative and provided all kind of support and continuous guidance for not only for mere organizing the workshop but also for a grand success.

Key Recommendations

- Latent community awareness programme may be helpful in Disaster Risk Reduction
- Importance of Insurance in Disaster Risk Reduction
- Timely and accurate forecasting, dissemination of information to stakeholders plays an important role in successful risk reduction
- Effective coordination among different stakeholders plays an important role for successfully managing disaster risk.
- Implementation of IRS - Incident Response System proved to be effective in efficiently managing the *Phailin* cyclone.
- Failure in Super cyclone in Odisha during 1999 and lessons learnt from that disaster necessitated taking up initiatives towards preparedness and mitigation to reduce disaster risk.
- Preparations since the super cyclone in Odisha in 1999, made them manage the risk with minimum loss of lives in 2013 *Phailin* cyclone.
- Mitigation of cyclone risk through bio-shield arrangement may be helpful in reducing the risk from cyclone.
- Towers and buildings should be properly designed, tested and erected so that it can withstand high wind speed.
- Find out the current gaps in our understanding of the hazards of cyclone in the coastal region of the country and identify, try to reduce those gaps.
- Development and implementation of Early Warning Systems for all hydro-meteorological disasters at local community level.
- To develop permanent structure/plan for communication systems (Telephone/mobile towers, Tv/Radio channel, etc.) for improving dissemination of warnings before, during and after disaster.
- Find out the types and nature of vulnerabilities of the existing people in the coastal region.
- To reduce vulnerability of coastal communities by addressing the gap that exists in communication of EWD in a timely reliable and efficient manner.
- Developing a web based system with multiple options of sending messages including back up of satellite phones or other suitable technologies.
- Develop training designs and modules for all relevant stakeholders and also develop short and long term capacity building strategies.
- To make a guidelines/IS code for design of cyclone shelters and house shelters in cyclone prone areas.
- Establishment of cyclone wind monitoring stations at the coastal region.
- Development of design guidelines/policy for roof-top towers.
- To facilitate education and training of the future workforce in the field so that the growing competition in the global market is met through a cadre of well trained professionals and educators.

- Need for investment for up-gradation Technology in various aspects, especially Observational systems, Data communications, management and delivery systems, Models & software
- Development of mechanism such detailed planning/mitigation and emergency response decision support mechanism in identified vulnerable areas.
- There is need of creating awareness of cyclone safety skills among people living in coastal areas.
- The health services both for human and cattle were strengthened in the cyclone and flood affected areas for which there was no outbreak of epidemic.
- To construct more new flood shelters and cyclone shelters in prone areas.
- To develop Cyclone Hazard Risk Mitigation Capacity Building and Knowledge Creation.
- To construct underground cabling of power lines in cyclone areas.
- To facilitate education and training of the future workforce in the field so that the growing competition in the global market is met through a cadre of well trained professionals and educators.
- Warning communication provided to people on a continuous basis through different channels – Special bulletin by AIR and FM Channels every 15 minutes.
- Getting accurate technical information about the upcoming cyclone including likely wind speed, cyclone path for correct decision making at grass root level.
- To build disaster proof and resilient power system, infrastructures and buildings in future in the State
- To formulate draft Standard Operating Procedure (SoP) in terms of defining/developing systems, processes, responsibility matrix, damage estimate, data-based decision support etc.
- To make in-depth study on vulnerability analysis & the risk assessment for the Transmission & Distribution assets in power sector
- To formulate an over-arching Integrated disaster risk management framework exclusively for T&D sector
- Strengthen institutional mechanisms and capacity building across the sector and different stakeholders
- Constantly monitoring of critical infrastructures for safety standards in consonance with worldwide safety benchmarks and strengthened where deficient.

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Photo Gallery

Inaugural Session



Session-1: Early Warning and Response



Session-2: Coordination, Administrative and Community Issues



Session-3: The Way Ahead (Future Strategy)



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Location Map of NIDM



For suggestions please contact



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