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Getting Climate Smart For Disasters

**Integrating CSDRM in National
Guidelines, State level Plans,
Policies and Projects**

**Draft Report
February 2014**

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Abbreviation

IMG	Inter-Ministerial Group
NDMA	National Disaster Management Authority
SDMA	State Disaster Management Authority
DDMA	Districts Disaster Management Authority
DM	Disaster Management
SAPCC	State Action Plan on Climate Change
NCRMP	National Cyclone Risk Mitigation Project
OSAPCC	Odisha State Action Plan on Climate Change
IDKN	India Disaster Knowledge Network
CSDRM	Climate Smart Disaster Risk Management
DRR	Disaster risk reduction
CCA	Climate Change Adaptation
DRM	Disaster Risk Management
NGO	Non-Governmental Organization
OSDMA	Orissa State Disaster Management Authority
WORLP	Western Orissa Rural Livelihood Programme
MHA	Ministry of Home Affairs
LMC	Last Mile Connectivity
ODRAF	Orissa Disaster Rapid Action Force
VHF	Very High Frequency
NDRF	National Disaster Response Force
NIDM	National Institute of Disaster Management
NEC	National Executive Committee
SEC	State Executive Committee
ULB	Urban Local Bodies
PRI	Panchayati Raj Institution
NCFF	National Calamity Contingency Fund
NDRF	National Disaster Response Force
NIDM	National Institute of Disaster Management
RCDC	Regional Centre for Development Cooperation
ICAR	Indian Council of Agricultural Research
MoEF	Ministry of Environment and Forests

DMC	Disaster Management Centres
IDKN	India Disaster Knowledge Network
ODRAF	Orissa Disaster Rapid Action Force
IEC	Interactive Electronic Communication
SRO	Special Relief Organization
CAP	Climate Action Plan
CSMMC	Cyclone Shelter Management and Maintenance Committee
IMD	Indian Meteorological Department
ORSAC	Orissa Space Applications Center
GIS	Geographical Information System
DDMP	District Disaster Management Plan
ESMF	Environmental and Social Management Framework
NREGA	National Rural Employment Guarantee Act
SARS	State remote Sensing Agency

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6. Background

Hydrometrological disasters have played havoc with the people's lives, their livelihoods and infrastructure in India leading to heavy damages, in spite of the fact that elaborate disaster recovery mechanisms are in place. The reason is mostly because, the exposure and hence the risk of impacts is high and response is becoming increasingly difficult, as 269.3 million people of India are still poor and do not have the wherewithal to prepare themselves to withstand the impacts. Odisha alone accounts for 138.53 lakhs of people i.e 33% of the population of the state is below poverty line. Further, with projections of heavier precipitation events, higher wind speed of tropical cyclones, more intense droughts, and increase in heavy precipitation leading to heavier floods etc., disaster recovery is likely to become an uphill task unless the climate change concerns are integrated in the present disaster management plans in the country for a planned approach towards minimising disaster risk.

Initially, disaster management in India was handled by the Inter-Ministerial Group (IMG) till the Disaster Management Act came into being in 2005. The act envisions effective disaster management at the national, state, district and local levels and prescribes the coordination mechanism between the various institutions that would need to be involved in such an exercise and also provides the institutional framework that would need to be in place for effective disaster management. The National Disaster Management Authority (NDMA), which is responsible for coordination between various institutions at the national level, was an outcome of this act. Similarly, the state level and district level disaster management are implemented by the State Disaster Management Authority (SDMA) and Districts Disaster Management Authority (DDMA) respectively.

The NDMA has prepared Guidelines for the Management of Cyclones (2008), to assist ministries and departments of Government of India and state governments to enable them to prepare their disaster management (DM) plans related to cyclones. While the cyclone guideline (<http://ndma.gov.in/ndma/guidelines/Cyclones.pdf>) acknowledges that climate change and the resultant sea-level rise can significantly increase the vulnerability of the coastal population, however, it is not reflected in the recent Odisha State Disaster Management Plan (OSDMP), released in august 2013.

In this document, an attempt has been made to identify the entry points and define actions that can address climate change uncertainties, enhance adaptation and reduce vulnerability and hence poverty within the guidance provided by the NDMA on managing CYCLONES related disasters with specific focus of Odisha. The framework used is the Climate Smart Disaster Management (CSDRM) Approach. It is expected that this approach can lead to the development of a holistic State specific and Cyclone prone district specific Climate Smart Disaster Management Guidelines for Cyclones.

7. Trends of Cyclones across East Coast of India

India is highly vulnerable to natural hazards, particularly earthquakes, floods, droughts, cyclones and landslides. Studies indicate that natural disaster losses equate up to 2 percent of India's GDP and up to 12 percent of federal government revenues. India has a coastline of about 7,516 km of which 5,400 km is along the mainland. The entire coast is affected by cyclones with varying frequency and intensity. Approximately 40% of India's population lives within 100 km of the coastline. Although the North Indian Ocean (the Bay of Bengal and Arabian Sea) generates only about 7% of the world's cyclones (5 to 6 TC's per year) their impact is comparatively high and devastating, especially when they strike the coasts bordering the North Bay of Bengal. As per the EM DAT, the international disaster database, India has witnessed 99 tropical storm between the year 1900 to 2013 which has impacted about 87712126 people and killed about 159217. The loss in terms of private, community and public assets has been astronomical. Thirteen coastal states and Union Territories (UTs) in the country are affected by tropical cyclones. Four states (Tamil Nadu, Andhra Pradesh, Orissa and West Bengal) and one UT (Puducherry) on the east coast and one state (Gujarat) on the west coast are more vulnerable to cyclone hazards.

As per the analysis done by the India Meteorological department, the frequency of cyclonic storms is decreasing over the eastern coast but there is a distinct increase in frequency of cyclones between the period 1901-2010 (see figure below).

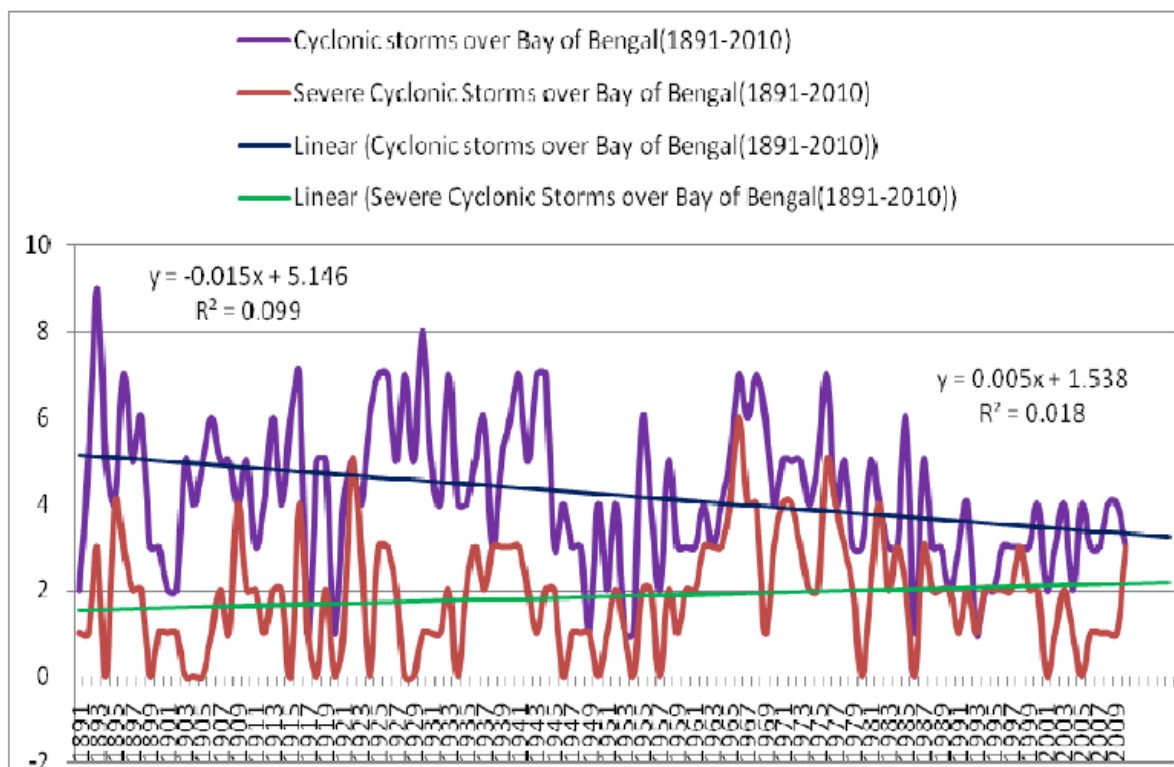


Figure 1: Cyclone frequency and intensities across East coast of India between 1901-2010

Source : IMD

Between 1901 and 2010, maximum number of cyclone have hit the coast off the state of Orissa, as compared to other states along the east coast in India (see figure 2). In 2013, it was struck by

cyclone Phailin, another severe cyclone. Of these about 21 cyclones have been severe cyclonic storms with wind speeds ranging above 48 knots. The recent Super-cyclone in 1999 and cyclone Phailin hitting the Odisha coast in October 2013, had wind speeds in excess of 107 knots or 200 km/hr. Extensive casualties resulted during Supercyclone 1999, however, state preparedness has improved since then, and less than 25 lives have been lost. However, disaster recovery is still a matter of concern for the state.

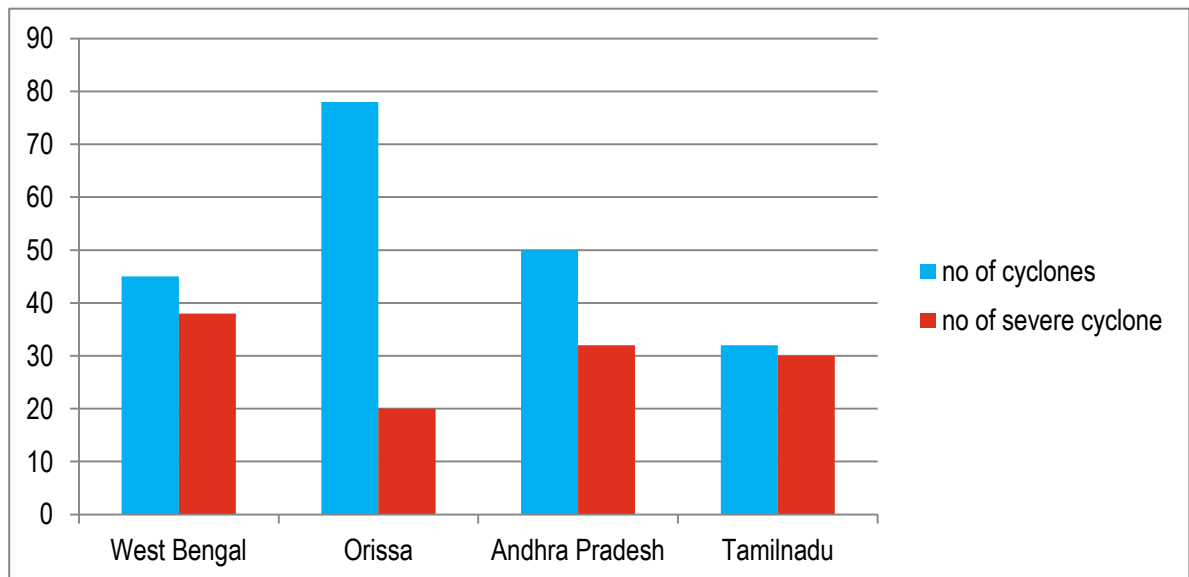


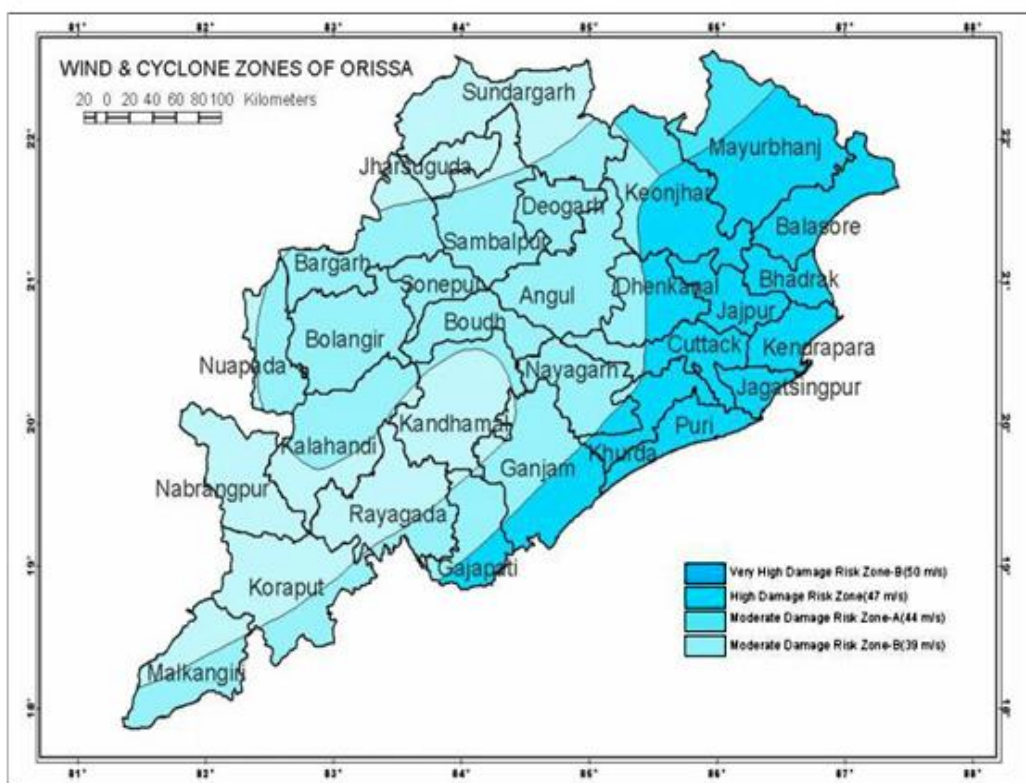
Figure 2: Number of cyclones hitting the east coast of India between 1901-2010

Source, IMD

8. Vulnerability of Odisha

Orissa is a state lying along the eastern coastline of India, located between 17°49' and 22°36' North latitudes and between 81°36' and 87°18' East longitudes. It spreads over an area of 1,55,707 sq km. and is broadly divided into four geographical regions, i.e. Northern Plateau, Central River Basins, Eastern Hills and Coastal Plains. It has a 480 km coastline. Its population is 4.2 crore as per the 2011 census. Administratively, the state is divided into 30 districts, 58 sub-divisions, 314 blocks (administrative units in descending order of geographical area and population) and 103 urban local bodies. The average density of population is 236 per sq km. with significantly higher density in the coastal areas compared to the interior parts. Due to its sub-tropical littoral location, the state is prone to tropical cyclones, storm surges and tsunamis. The state is designated under Category I hazards: Higher vulnerability States in India. The cyclone prone districts of Odisha are indicated in the table below.

Details	Districts
Coastal districts touching Ocean (NDMA)	Baleshwar , Bhadrak , Ganjam, Jagatsinghpur , Kendrapara , Khordha , Puri
Coastal Districts not touching Ocean, but within about 100 km from the coast (NDMA)	Mayurbhanj , Jajpur , Keonjhar , Dhenkanal, Cuttack , Nayagarh , Gajapati
coastal districts susceptible to cyclones as per warning bulletins issued by IMD	Baleshwar , Bhadrak , Gajapati , Ganjam, Jagatsinghpur , Kendrapara , Khordha , Puri
List of Vulnerable Districts for Cyclone Wind and Coastal/Inland Flooding (Cyclone Hazard Prone Districts of India, NDMA)	Cuttack, Ganjam , Jagatsinghpur , Kendrapara , Khordha , Puri, Baleshwar , Bhadrak , Jajpur, Navagadh, Dhenkanal
Coastal districts covered under National Cyclone Risk Mitigation Project (NCRMP)	Balasore, Bhadrak, Ganjam, Jagatsinghpur, Kendrapada , Puri



Ref. : OSDMA

In last 15 years Orissa was ravaged by two major calamities, the Super cyclone in 1999 and Phailin in 2013. The Super cyclone in 1999 was experienced in 14 coastal districts with wind speeds as high as 300 km/h. The damage caused was enormous with a death toll of 9894 people and about 4, 50,000 cattle. 2 million houses were destroyed and 23,000 schools were damaged. Power supply was disrupted in 19,062 villages and all means of communication was paralysed for a few days.

CYCLONE PHAILIN

In recent past (early October 2013) cyclone Phailin, the strongest storm to hit India in over a decade, causing low fatalities (about 21 in cyclone and 15 in flood), but affecting 13686368 number of population, 43 ULBs, 17674 villeges in 17 districts of Odisha, such as Angul, Balasore, Bhadrak, Cuttack, Gajapati, Ganjam, Jagatsinghpur, Jajpur, Kandhamal, Kendrapara, Keonjhar, Khurda, Nayagarh, Puri, Bolangir, Mayurbhanj and Koraput. Phailin landfall was at Gopalpur in Ganjam district of Odisha with wind speeds that went up to 220kmph.

The cyclone has impacted the sectors like road (national highways, state highways as well as major district roads), energy infrastructure (such as feeders, sub stations, LT Line conductors, electric poles, villeges/ town power supply system), houses and drinking water supply. Crops spread over 500,000 hectares of agricultural land have been damaged. In Ganjam district alone, where the cyclone made the landfall, 224,000 houses were damaged. It is believed that the winter-sown crop may be affected because of inundation with saline water from the sea following the cyclone.

TORNADO

However, there are examples of other events such as tornado in between. A tornado accompanied with wind speed of about 250 kmph, thunderstorm, rainfall and hailstorm affected Rajkanika Block of Kendrapara district in March, 2009. 15 human lives were lost and several persons were injured along with damages to the road infrastructure .

9. Purpose and Objective of the Study

As intensities of the cyclones are increasing over the years (refer to figure 1), it is expected that this will lead to greater damages to infrastructure, agriculture, and livelihoods, affecting more and more inland areas due to ensuing high wind speeds, flooding due to deeper inland ingress of sea water as storm surge heights increase, and due to increase in intensity of rainfall. Therefore, an integrated approach is required that looks into preparedness in a holistic manner to ensure sustainable livelihoods and income to tide over such calamities in the future. The elements of such an integrated approach therefore needs to include (i) Long term Coastal protection, management and planning keeping in view the climate change projections and climate variability's, (ii) Advance accurate forecasting and dissemination, and (iii) Policy approaches and governance for effective implementation of management plans and quick disaster recovery.

Based on the context above, there is a need to integrate the two existing systems, one for Cyclone management and the other, which is Climate change adaptation related issues. Climate Smart Disaster Risk Management (CSDRM) approach is an established and tested approach that aims to tackle disasters, poverty and adaptation in an integrated manner¹.

This study attempts to revisit the cyclone management guidelines prepared by The NDMA to achieve the convergence of DRR and CCA in the context of sustainable development, poverty and vulnerability reduction.

The specific objectives of the study are:

- To study the elements of the National Cyclone guideline and how it can be made Climate smart through the CSDRM approach in the Odisha context
- ✓ Tackling changing Disaster risk and uncertainties
- ✓ Enhance adaptive capacities
- ✓ Address poverty and vulnerability vis a vis their structural causes
- Suggest steps towards making Odisha a Cyclone resilient state
- Develop a framework for M&E for implementation of CSDRM in policy and projects

The use of the CSDRM approach will be extended to support the institutions to help identify their own priorities for integration across the three silos of climate change, development and cyclone management and support them to develop their own actions plans.

The outcome will be an enhanced capacity of the relevant institutions towards disaster risk reduction and management in a climate change and development context, thereby reducing exposure and hence vulnerability due to projected enhanced intensities of tropical cyclones.

¹ The Climate Smart Disaster Risk Management (CSDRM) approach was developed through a consortium which included IDS, Plan International and Christian Aid, working in African countries and ten Asian countries including India.

10. Cyclone Disaster Risk Management in India and Odisha

5.1 National Level

National Disaster Management Authority (NDMA) is the national level authority designate to manage disasters in the country. NDMA, as an apex body under Ministry of Home Affairs, GOI, and has the central responsibility of prevention, preparedness, mitigation, rehabilitation, reconstruction and recovery. It is also responsible for formulation of appropriate policies and guidelines for effective and synergised national disaster response and relief. It also coordinates the enforcement and implementation of policies and plans.

The **National executive committee (NEC)** of NDMA, is mandated to assist NDMA in the discharge of its functions and also ensure compliance of the directions issued by the central government for the purposes of DM. NEC has been mandated to appraise the projects and release the required funds from National Calamity Contingency Fund (NCCF).

The DM Act 2005 has mandated the constitution of the **National Disaster Response Force (NDRF)** for the purpose of specialised response to a threatening disaster situation or disaster. The general superintendence, direction and control of the force is vested in, and exercised by, NDMA and the command and supervision of this force is vested in the Director General of NDRF. Presently, NDRF comprises eight battalions. Each battalion will have three to four Regional Response Centres (RRCs) at high vulnerability locations. NDRF has also been mandated with role in community awareness and capacity building.

The arrangements for managing cyclone under the NDMA are multi-tiered and rely on multi stage guidance and controls. The following diagram indicates the institutional arrangements for managing the cyclone disaster at the national, state, district and local level.

The knowledge network development and institutional capacity development comes under purview of the National Institute of Disaster Management (NIDM).

5.2 Odisha State Level

Revenue and Disaster Management Department at the state level in Odisha shoulders the responsibility of providing immediate relief to the people affected by various calamities such as floods, droughts, cyclones, hailstorms, earthquakes, fire accidents, etc. It also takes initiatives for relief, rescue, rehabilitation and restoration work.

The Special Relief Organisation conducts relief and rescue operation during and after occurrence of various natural calamities. Also is responsible for prevention, mitigation, preparedness, response, relief and rehabilitation in connection with natural disasters. It coordinates with districts/departments for quick relief and rescue operation, reconstruction and rehabilitation work. It also promotes disaster preparedness at all levels in the State with the assistance of Odisha State Disaster Management Authority (OSDMA). The Organisation is headed by the Special Relief Commissioner (SRC). During any natural disaster, the office functions round the clock in an emergency mode.

Recently, **the State Emergency Operation Centre** has been made operational with state of the art communication net-work. The State EOC at Bhubaneswar functions round the clock throughout the year under the SRO headed by the Special Relief Commissioner (SRC). He is assisted by a group of experienced officers and staff.

The **Odisha State Disaster Management Authority (OSDMA)** headed by the Chief Minister, is the authority which lays down and implements the policies and plans for DM in the state. The OSDMA was set up by the Government of Odisha as an autonomous organization vide Finance Department Resolution No. IFC- 74/99-51779/F dated the 28th December 1999 in the intermediate aftermath of the Super cyclone in 1999. The Department of Revenue is the administrative department of OSDMA. The Authority and its Executive committee was further empowered through the National Disaster Management Act 2005 and now has the following responsibilities:

- Laying down policies and plans for disaster management
- Implementing the National Plan and the State Plan and act as coordinating and monitoring body for management of disasters in the State
- Manage the **State Disaster Response Fund**
- Take up the mitigation activities but also the relief, restoration, reconstruction and other measures.
- Coordinate with the line departments involved in reconstruction,
- Coordinate with bilateral and multi-lateral aid agencies, UN Agencies, International, National and State-level NGOs and
- Network with similar and relevant organizations for disaster management.

5.3 District Level

The District level, the **District Disaster Management Authority (DDMA)** has the mandate to prepare a district plan for managing disasters including that of cyclones. The district plans will have inputs from the respective local authorities such as panchayati raj institutes (PRI), urban local bodies, district and cantonment boards and planning authorities in form of a local DM plan. DDMA's have been constituted in all districts by the State Government as per the provisions of the Disaster Management Act 2005. The Collector is the Chairperson of DDMA where as the Chairman, Zilla Parishad is the Co-Chairperson. Superintendent of Police, the Chief District Medical Officer and Executive Engineers in charge of embankments are other members of DDMA.

5.4 Administrative arrangement at State and District Level

The Department of Revenue and Disaster Management is the administrative department for management of disasters. Special Relief Commissioner (SRC) is in charge of response phase of disasters, whereas, Odisha State Disaster Management Authority (OSDMA) deals with preparedness and mitigation aspects.

OSDMA provides support to SRC during response phase. At the district level, Collector is the District Relief Officer and Disaster Manager. Block is the lowest unit of relief administration. Block Development Officer and Tahasildars jointly manage relief administration at the lowest level. A State level Natural Calamity Committee functions under the chairmanship of the Chief Minister for overall supervision and monitoring at the state level. At the district level, District Natural Calamity Committee along with DDMA functions with representation from district level

officers and peoples representatives under the chairmanship of the district Collector for supervision and monitoring. Block Disaster Management Committees (under the chairmanship of the Chairperson, Panchayat Samiti), G.P. Disaster Management Committees (under the chairmanship of the Sarpanch) and Village level Task Force Committees have been constituted in 16 districts for day-to-day management of disasters and risk reduction measures.

5.5 Role of NGOs

NGOs are involved in Community Based Cyclone Shelter Management and Maintenance Committees (CSMMCs). Over the years NGOs have also come together through networks, coalitions and alliances so as to offer value added humanitarian services, notable examples being Voluntary Health Association of India (VHAI), Voluntary Action Network India (VANI), Sphere India, Alliance for Adaptation and Disaster Risk Reduction (AADRR), and Confederation of Voluntary Associations (COVA). However, the institutional arrangements between the government and NGO need to be made in order to collaborate in developing the roadmap for short, medium and long term operational strategies and plans.

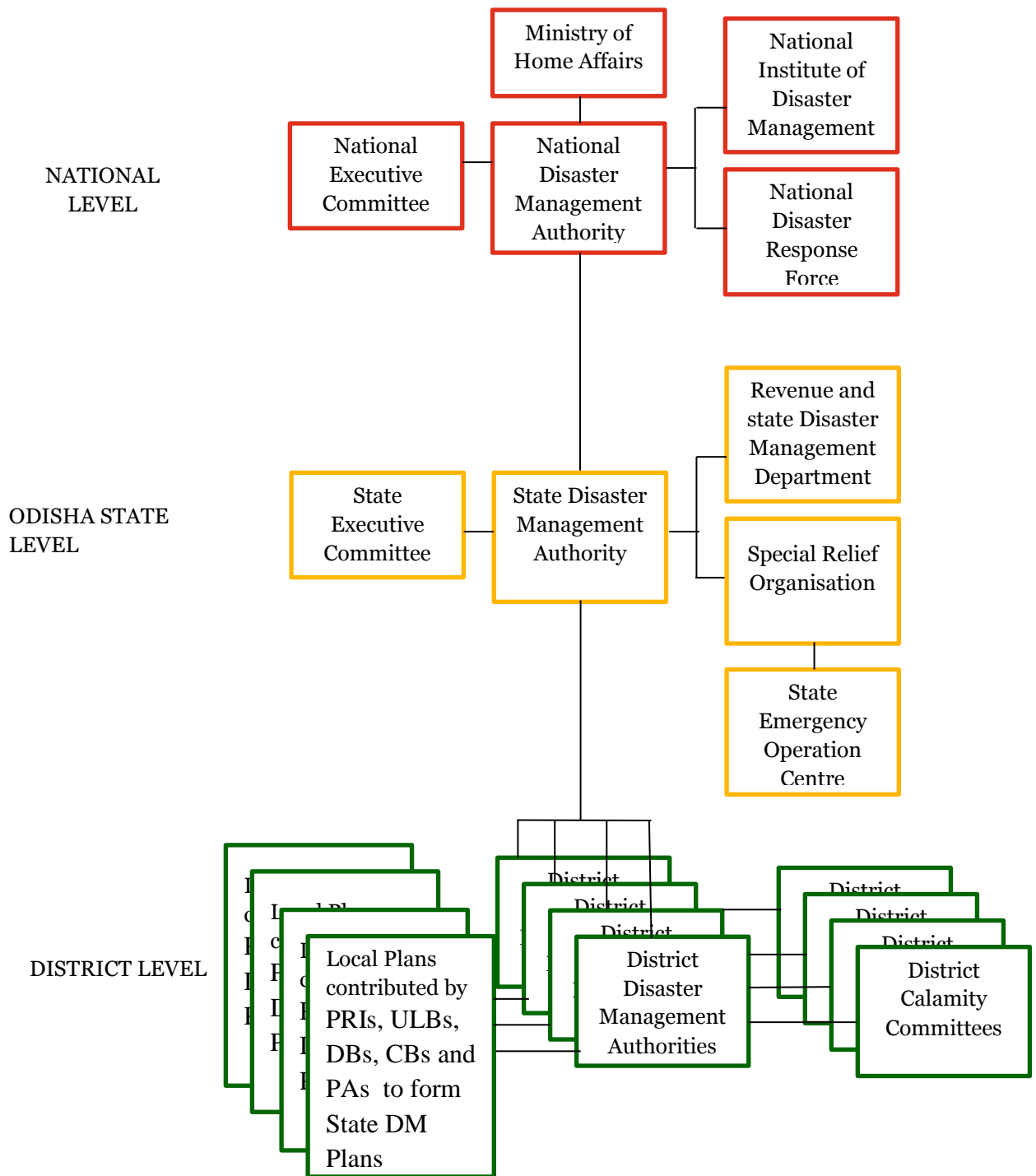


Figure 1 : Institutional arrangements for managing Disasters in India

11. Cyclone Disaster Management Guidelines and Specific Projects

6.1 The National Cyclone Disaster Management Guidelines

The guideline on “Management of Cyclones” by NDMA forms the basis of cyclone disaster management and preparedness in India. This guideline acknowledges that climate change and its resultant sea-level rise can significantly increase the vulnerability of the coastal population.

The Guideline on Cyclone Management recognises that fact that development cannot be sustainable unless disaster mitigation is built into the developmental process. It has been realised that developing appropriate coping strategies and risk reduction plans, along with greater public awareness is the high priority agenda for disaster management in India. This will have to be based on two following approaches:

- i) Enhancing national, state, district and local level advocacy partnerships and knowledge management for mainstreaming disaster risk reduction.
- ii) Developing hazard risk management tools, methodologies and practices.

The intention of this guideline was to provide guidance to the ministries, departments and state authorities for the preparation of their detailed DM plans with an approach which would be of proactive, participatory, well-structured, failsafe, multi-disciplinary and multi-sector.

The guideline is divided into nine chapters:

Chapters	Details/ coverage of issues
Introductory overview	Reflects the risk and vulnerability of the country to cyclones, including the dimensions and magnitude of the problem.
Early Warning Systems (EWS) for cyclones	Present status of EWSs has been discussed and the gaps have been identified. Requirement to bring them up to international standards and making them state-of-the-art systems has been recommended.
Warning Communication and Dissemination	Present status, its gaps and future improvements required towards making it fail-proof and modern.
Structural measures for preparedness and mitigation	Covering cyclone shelters, buildings, road links, culverts and bridges, canals, drains, saline embankments surface water tanks, cattle mounds and communication/power transmission networks.
Management of coastal zones and its relevance to Cyclone Disaster Management	Coastal zone management, sustainability of coastal resources, bioshields, coastal flood plain management, coastal erosion, natural resources management, etc.
Awareness Generation	Awareness generation related to CDM as an important preparedness measure.
Disaster Risk Management and Capacity Development	covers Disaster Risk Management (DRM) issues, risk assessment and vulnerability analysis, hazard zoning and mapping, data generation, including the use of GIS tools, and capacity development
Disaster Response Mechanism	A detailed account of several issues related to effective response such as response platforms, linking risk knowledge with response planning, evolving disaster response capabilities, etc.

Chapters	Details/ coverage of issues
Implementation of the Guidelines	preparation of DM and vulnerability reduction action plans, coordination at all levels of government, mobilization of financial resources and implementation methodology etc.

6.2 The National Cyclone Risk Mitigation Project (NCRMP)

The National Cyclone Risk Mitigation Project (NCRMP) has been drawn up to strengthen the structural and non-structural mitigation efforts towards reducing the risk and vulnerability of the coastal districts to cyclone-related disasters. This project is being implemented by NDMA, with assistance from the World Bank and supported by Ministry of Home Affairs (MHA). This effort is a paradigm shift from reactive disaster response to proactive risk management and allows implementation of a demand driven programme aimed at reducing cyclone impacts in vulnerable areas and strengthening capacity of various institutions. The project has four interdependent components:

Component A	Improvement of early warning dissemination system by strengthening the Last Mile Connectivity (LMC) of cyclone warnings and advisories.
Component B	Cyclone risk mitigation investments.
Component C	Technical assistance for hazard risk management and capacity building.
Component D	Project management and institutional support.

Odisha State Disaster Management Authority (OSDMA) is the nodal body for implementation of this project in Odisha. OSDMA coordinates various activities of disaster mitigation in the state including capacity building of the communities and disaster managers and strengthening of infrastructure, improvement in communication system, etc.

The NCRMP is being implemented in six coastal districts, namely, Balasore, Bhadrak, Ganjam, Jagatsinghpur, Kendrapada and Puri. While implementing this project in Odisha, the emphasis was on the construction and management of the cyclone shelters, godowns and approach roads. The Environmental and social monitoring framework has been applied to screening the project plan but has very limited inclusion of impact of climate change. Ecosystem based approaches are also missing in the development interventions.

6.3 The Odisha Integrated Coastal Zone Management Plan

The Integrated Coastal Zone Management Project (ICZMP) is a coordinated effort of the Ministry of Forest & Environment, Government of India, The World Bank and the state government to have an integrated approach in place to coordinate activities of various government agencies & departments for the sustainable management and usages of coastal resources maintaining the natural environment. Odisha is one of the three states in which the ICZMP is being implemented in the first phase.

The ICZM framework is a conceptual shift from the traditional approach of sectoral management of the coastal resources to a comprehensive, integrated approach for better governance and management. For effective management and implementation of all project activities and coordination with 10 PEAs of ICZM Project Odisha, a society namely “Integrated Coastal Zone Management Society, Odisha” has been registered to function as State Project Management Unit (SPMU). The duration of the project is for a period of 5 years starting from September, 2010 and the Department of Forest & Environment, Govt of Odisha is the Nodal department for implementation of this project in Odisha.

In Odisha, the project on pilot basis will be implemented in two coastal stretches – Paradeep to Dhamra and Gopalpur to Chilika. The initiatives proposed under ICZM Project, Odisha has following objectives;

- Formulation of Integrated Coastal Zone Management Plan for the State
- Coastal Erosion and Associated Oceanographic process
- Vulnerability to Disaster
- Biodiversity Conservation
- Livelihood security
- Pollution/ Environmental quality management Improvement and conservation of cultural / archaeological assets

Odisha is the first State in the country to initiate the process of Shoreline Management Plan and Integrated Coastal Zone Management Project (ICZMP) objectives. The integrated coastal management plan has been approved by the Ministry for two coastal stretches viz. Paradeep to Dhamara and Gopalpur to Chilika. The plan is to involve all the different departments like industry, forest, soil conservation, agriculture, irrigation, tourism, revenue and forest.

12. Brief overview of the Climate Smart Disaster Risk Management – CSDRM Approach

The Climate Smart Disaster Risk Management (CSDRM) approach integrates the Disaster Risk Management (DRM) programme with Climate Change Adaptation (CCA) and development programmes.



CSDRM is an integrated social development and disaster risk management approach that aims, simultaneously, to tackle changing disaster risks, enhance adaptive capacity, address poverty, exposure, vulnerability and their structural causes and promote environmentally sustainable development in a changing climate. “It also provides a guide to strategic planning, programme development and policymaking and should be used to assess the effectiveness of existing DRM policies, projects and programmes in the context of changing climate. It is an approach to help cross-check DRM interventions for their responsiveness to current and future climate variability. The three pillars within the approach, are founded on long standing concepts – mainly related to the progression of vulnerability from root causes to unsafe conditions (Wisner et al 2004) and to those associated with resilience, adaptive capacity and uncertainty (e.g. Holling 1973, Folke 2006)”. The three pillars of action include:

- Tackle changing disaster risk and uncertainties.
- Enhance adaptive capacity.
- Address poverty, vulnerability and their structural causes.

Twelve components of CSDRM have been elaborated under these three elements, as shown in the figure in the next page.

Climate Smart Disaster Risk Management Framework:

Tackle changing disaster, risks and uncertainties

Strengthen collaboration and integration between diverse stakeholders working on disasters, climate and development

Periodically assess the effects of climate change on current and future disaster risks and uncertainties

Integrate knowledge of changing risks and uncertainties into planning, policy and programme design to reduce the vulnerability and exposure of people's lives and livelihoods

Increase access of all stakeholders to information and support services concerning changing disaster risks, uncertainties and broader climate impacts

Enhance adaptive capacity

Strengthen the ability of people, organisations and networks to experiment and innovate

Promote regular learning and reflection to improve the implementation of policies and practices

Ensure policies and practices to tackle changing disaster risk are flexible, integrated across sectors and scale and have regular feedback loop

Use tools and methods to plan for uncertainty and unexpected events

Address poverty, Vulnerability and their structural causes

Promote more socially just and equitable economic systems

Forge partnerships to ensure the rights and entitlements of people to access basic services, productive assets and common property resources

Empower communities and local authorities to influence the decisions of national governments, NGOs, international and private sector organisations and to promote accountability and transparency

Promote environmentally sensitive and climate smart development

13. CSDRM for Climate Smart National Cyclone Guidelines

The implementation model of the national Cyclone guidelines were to happen in two phases. The phase-I action covering 0 to 2 years from 2008 to 2010 and phase- II actions covering 0 to 4 years from 2008 to 2012. The direct derivative of this would be the State Cyclone DM plan which would indicate detailed work areas and activities/targets with suggested time-frames and suitable indicators of progress along with the authorities/stakeholders responsible for implementing the guidelines. Different milestones and appropriate monitoring mechanisms will also be indicated.

To this effect, a Disaster Management Plan for the state of Odisha was made public by the OSDMA in August 2013. It takes into consideration all disasters that the state is prone to.

It is proposed that an **Odisha State Disaster Risk Reduction Plan be separately prepared for each hazard including Cyclones**. This will then contain an in-depth assessment of the requirements of actions to be taken for cyclone preparedness for the short term as per the cyclone guidelines issued by the NDMA and also for the long run in a climate change context.

Table -1 analyses the elements of the National Cyclone Guidelines of the NDMA and how it can be made Climate Smart through the CSDRM approach.

Further in Section 4, steps towards making it state specific through a climate lens has been suggested.

Table 1: CSDRMing of National Cyclone guidelines to male it state specific cyclone risk reduction guideline/ management plan

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
Implementation of rehabilitation, reconstruction and recovery post disaster	Coordination amongst institutions for control and management of civic services.	NDMA, SDMAs, DDMAAs, ULBs, PRIs, District and Cantonment Boards and Town Planning Authorities and with NDRAF & Civil defence	The institutions need to be aware of the extent of disaster recovery preparedness required post a worst case cyclone intensity scenario. This is only be possible if they are provided with the extent of vulnerabilities likely to happen due to the given worst case scenario vis a vis, extent of population likely to be affected, extent of area likely to be flooded due to the combined effect of high storm surges and rains accompanying the cyclone and infrastructure that is at risk.	Prepare guidelines to deal with the likely exacerbated impacts. Conduct M&E on a regular basis to ensure their actions as per their respective manadates are being carried out	Create special funds dedicated to make climate resilient infrastructure, align agricultural practices with the changing climate, and create location specific structures and/or bioshields to protect the coast line as per the requirement of different areas; Create opportunities for non-natural resource based livelihoods.
Observations and data processing for Early warning	Scientific data collection and processing for Early Warning System for cyclones.	DoEs, IMD, Deptt of Space, INCOIS, NRSA, MoWR, IAF, Navy, ISRO and other	All possible observation platforms have been provisioned for. A review of achievement through M&E to monitor and	Ensure that the Learning's from observations are shared with respective departments that are	Nil

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
		International satellite agencies, State Remote Sensing Agencies	evaluate progress of actions suggested with given timelines	involved in response and dissemination N DMA can be the nodal agency, which collates all information and disseminates to agencies involved in dissemination of warning and for response.	
Warning dissemination	Satellite based disaster communication infrastructure, seamless connectivity between national to village level institutions, 2 way data transmission, multiple disaster warning broadcast platforms, community level disseminations, weather portals and weather channel, DCWDs along with coastal community radio stations etc.	Communication groups of NDMA, SDMA, MHA, Prasar Bharati, Private broadcast service providers, DST, MoES, MoIT, and TRAI	For tackling the uncertainties, institutions like IITM and other institutions/universities who are doing climate modelling need to meet on an annual basis and discuss the new developments as well as share their results. Prominent International institutions and agencies that are running climate models simulating the complex monsoon system and tropical cyclones in the North Indian ocean will also need to participate. This will lead to an assessment of where we are, what are the uncertainties, and how they	Public which is forewarned is better adapted. IMD, being the agency that observes and forecasts the cyclones needs to directly disseminate information to private TV channels, Prasar Bharti, NDMA and SDMA. The NDMA's in turn can distribute this information to its NDRAF, SDMA. SDMA can give the information to departments, local	Fore-armed, loss and damages can be minimised

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
			can be reduced.	urban and rural bodies. Therefore appropriate communication products for each level of governance is necessary for enhanced adaptation	
Structural mitigation	Cyclone resistant shelters and determination of their locations, cyclone resistant rural and urban housing (IAY, JNNURM), cyclone resistant roads, communication infrastructure, power systems, ensuring full carrying capacities of drains, canals, channel etc.	Bureau of Indian Standards, Ministry of Urban Development, SDMAs, DDMA's, Local Authorities, Area Development Authorities, Engineering Departments of the Coastal States/UTs	OSDMA has constructed 135 nos. of Multipurpose Cyclone Shelters in 6 coastal districts of the state stretching from Ganjam to Balasore. The Cyclone Shelter Buildings are designed to withstand a wind speed of 300 km per hour. Cyclones are to be built at a distances where people have only to travel 2.25 kms to reach it. Increasing SSTs are likely to lead to higher wind speeds in excess of 300 km/hr. and accordingly BIS standards for shelters and other buildings might need to be changed.	Immediate actions to be taken: -Review of BIS standards for buidings for making them resilient to cyclones which can with stand the increasing intensities of cyclones with wind speeds in excess of 300 km/hr. Integration of BIS standards in urban and rural building codes and make it mandatiry -Assessing the housing stock of Kuttach houses -IAY scheme to immediately start helping to build BIS compliant housing-replacing Kuttcha housing with	Easily accessible subsidised loans may be made available from banks with very low interests for people to construct such houses. Simultaneously livelihood diversification campaigns to be started to ensure assured income generation and capacity for repayment

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
			<p>Still IAY housing is not cyclone resilient. Similarly norms haven't been changed for other privately constructed buildings. The SDMP only mentions capacity building of people who are responsible for housing.</p> <p>All power transmission lines need to be underground, so should be telephone cables. The cell phone towers need to withstand windspeeds in excess of 300 km/hr. It might be necessary to use direct satellite telephony in these area.</p> <p>Also 100% carrying capacities of drains/canals, channels needs to be maintained here.</p> <p>Regular meeting of these</p>	<p>cyclone resilient housing -schemes to give subsidies on relevant building material</p> <p>-Time line of this integration to be fixed to avoid damage in the next severe cyclone recurrence which according to historical trends may happen in the next 4 years or earlier</p> <p>- M&E can be a powerful tool to undertake the monitoring and suggest ways for course correction</p>	

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
			departments with SDMA required to gauge progress of implementation of action.		
Coastal zone management	Mapping and delineation of coastal zones, patches of mangroves, shelterbelts, potential zones for expanding bio-shield; devlp of coastal bioshields, spread, preservation, restoration/regeneration plans; regulation of infrastructure development in coastal zones, Monitoring of water quality, Assessments of carrying and assimilative capacities and remedial measures; ICZM framework for sustainability and optimal use of coastal resources; Eco-system restoration plans for degraded ecological zones & development ; Develop of delta water management and fresh water recharge; Coastal flood zoning and	Responsible agencies: DoS, MoEF, MoES, SDMAs, SRSA, Coastal area Devlp authorities, River water authorities, CGWA and GWB	<p>Extensive and exhaustive list of actions listed.</p> <p>ICZMPs have been developed and approved for two stretches such as Paradeep to Dhamara and Gopalpur to Chilika.</p> <p>The plan is yet to get implemented.</p> <p>Allocation of works to appropriate institutions to be ensured, Coordination between SDMA's and deptt and institution undertaking these actions required.</p> <p>Results to be communicated to appropriate departments for implementation to be ensured. For e.g extent upto</p>	<p>The extent of delineation to be in commensuration with the extent of inundation expected due to cyclones, cyclonic rains and storm surges in a worst case recurrence scenario.</p> <p>DSS need to be formulated based on the inputs received for Coastal Zone Management.</p> <p>SDMA's may form SDMI's; which will collate these information and form the DSS for Coastal Zone Management</p> <p>The line departments which will use these</p>	<p>Vuknerability of rural communities can be addressed if these inputs are also integrated within their village development plans</p> <p>Similarly, ULBs need to be advised on the coastal zone situation and actions they need to take for safeguardingthe same for redcing risks from cyclones</p> <p>Industries and infrastructure development plans need to take into account the climate change projections while designing</p>

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
	flood plain devlp and flood inundation management and regulatory plans; Ground water development for freshwater required in coastal Centres		which planting of mangroves for increasing bioshields needs to be done has to go to the Forest deptt.	information are to be made aware that these are being prepared and will be made available to them for their disaster risk reduction planning . Side by side their capacities to internalise and use his information also needs to be upgraded The departments should collectively provide advisories to the Industries, ULBs, PRIs about the coastal zone situation as they emerge from these activities being undertaken	their respective installations to reduce future vulnerabilites to these assets
Awareness Generation	Community preparedness for addressing cyclone warning, awareness raising on emergency response, awareness on structural safety measures, awareness	MHA, SDMAs, DDMAAs, Local bodies, NGOs	Awareness material to be designed and implemented for respective purposes and audiences.	Awareness campaigns to be designed	Nil

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
	of coastal zone protection and preservation				
Disaster Risk Management and Capacity Development	Integration of mapping and spatial data generation activities of various ministries, development of CDMIS, cyclone hazard mitigation models with DSS; generation of high resolution DEMs. Micro scale hazard maps; long term vulnerability reduction and micro level development action plans; technical capacity devlp in centra/state/PRI institutions; launch of CBDM activities; Develop of techno-legal framework; devlp of emergency response plans	National Spatial Data Infrastructure, Survey of India, MoEF, DoS, SRSAs. SDMA< NDMA, UD and Coastal Area Devlp Authorities	<p>The products being developed need to be appropriately be communicated to respective line departments that will use these products in addition to the SDMA which needs to be aware of these and their applications</p> <p>Further, Micro hazard map development needs to be done at village level to understand the nature and extent of hazards expected at that level and the extent of preparedness required to be climate resilient.</p> <p>Therefore this activity needs to be carried out in association with PRI institutions and in collaboration with technical</p>	<p>ULBs, PRIs, need to be communicated the products that are being prepared for disaster risk management and capacity development for them undertaken for them to integrate these information in their planning</p> <p>Integrated cyclone disaster risk mitigation management packages to be developed by each local body handling various sectors</p>	<p>Design and implement gender inclusive village level plans on water security, agriculture security, livestock management, afforestation, energy security, livelihood diversification, village roads and communication, village health care etc including cross cutting issues such as insurance for housing, livelihoods, health etc.</p>

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
			experts who take into account the projected impacts of climate change vis a vis likely trends of extreme events such as cyclones, rainfall, flooding in these areas		
Response	Integrated DM activities of various responder groups; Periodic evaluation of relief and evaluation; post disaster damages and needs assessment; emergency evacuation plans	MHA, SDMA, DDMA, ULBs, NGOs, PRIs	<p>Framework for periodic evaluation with given indicators need to be in place</p> <p>The response activities need to include development of disaster risk reduction plans by the various departments that are managing non structural resources i.e natural resources especially agriculture as well.</p> <p>No where in the cyclone guidelines is it talking about agriculture practice management. This being the livelihood option of 70% of the population, and highly climate dependent, a cyclone</p>	<p>Adaptive capacity of farmers is likely to increase if advisories are given to the following effect</p> <p>To adjust to the reducing Kharif season, short duration varieties need to be embraced</p> <p>Dry season to be made viable for agriculture by ensuring augmentation of surface water and ground water recharge availability.</p> <p>Introduce salt tolerant varieties in flood prone areas that become highly saline in dry season</p> <p>Also SRI of salt tolerant</p>	<p>The poverty issues can be tackled by diversification of livelihoods to non farm based activities</p> <p>Seed money for starting new village based ventures need to be instituted along with mapping of market strategies.</p> <p>The deptt of rural development along with depts. of textile, silk boards, fisheries, animal husbandary, irrigation, to work</p>

Elements of the National Cyclone Guidelines	Actions to be undertaken	Responsible agencies	CSDRM entry points		
			Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
			<p>based planning is necessary</p> <p>Similarly livestock management, fisheries are not talked about</p>	<p>varieties may be promoted to encourage less use of water in dry season</p> <p>Shelters for livestock to avoid extreme heat</p> <p>Popularisation of small indigenous ruminants climate resilient amongst small and marginal farmers</p> <p>Integrated farming may be promoted to enhance adaptive capacities</p>	<p>towards this.</p> <p>Creating insurance mechanisms that can be designed by communities by pooling in their own resources based on a sound business model</p>

9. Towards Odisha State Specific Climate Smart Cyclone Management

The following specific activities have been identified which needs to be under taken under the three silos of the CSDRM process for translating the climate smart national guidelines into Odisha specific state and district cyclone guidelines. The underlying principle again being the CSDRM approach. The three elements of the CSDRM will have to be addressed as follows.

9.1 Tackle projected changes in Disaster Risks and Uncertainties

Strategy	Actions to be included
<p>Ascertain the institutional Mechanism for developing DSS for managing the exacerbated intensities of cyclones in a warming atmosphere</p>	<p>1. Formulate a State Institute for Disaster Management (SIDM) for Odisha</p> <ul style="list-style-type: none"> • This will coordinate with all national bodies that are working on climate modelling and collate information on the projections of various hydro-meteorological disasters • Have its own GIS Team who can extract the climate projection information for various levels of governance, such as at state level, district level, city level or village level overlay it with the socio economic conditions and infrastructure to evaluate vulnerable areas and population • Put in place impact assessment teams who assess the impacts of these scenarios on various economic activities • Undertake regular technical consultations to prepare long term technical strategies for developing adaptation packages
<p>Develop DSS to integrate climate change in disaster risk management with following data products that are easily decipherable for use by different stake holders.</p>	<p>2. Map the current trends of cyclone occurrence and intensities at state and at coastal district levels</p> <p>3. Give projections of recurrence frequency and intensities of cyclones at the above mentioned geographical levels for the following categories of cyclone:</p> <ul style="list-style-type: none"> (i) Storms with 62 -88 km/hr wind speeds; (ii) Severe Cyclonic Storm (89-118 k/hr), (iii) Very severe Cyclonic Storm (199-221 km/hr) and (iv) Super Cyclones (222 km.hr and more) <p>4. Undertake assessment of storm surge recurrence frequency with storm surge heights likely to be associated with category i, ii, iii and iv cyclones mentioned above including cyclones with probable speed of more than 300 km/hr</p> <p>5. Estimate projections of rain fall associated for cyclone speeds of all above categories and also for cyclones with probable speed of more than 300 km/hr</p>

	6. Under take modelling to assess the extent of area to be inundated due to rains and storm surges for all categories of cyclones including cyclones with probable speed of more than 300 km/hr
	7. Undertake population projection for the coastal districts and estimate the population that will be at risk due to all categories of cyclones including cyclones with probable speeds of 300 km or more (a) due to cyclone, (b) Cyclone+ Rain, (c) Cyclone + Rain fall+ Storm surge

9.2 Enhance adaptive Capacities and address Poverty and vulnerabilities

Strategies	Actions to be included
1. Integrate cyclone projection in a climate change scenario within National Cyclone Risk Mitigation Programme being implemented in the Balasore, Bhadrak, Ganjam, Jagatsinghpur, Kendrapada and Puri districts of Odisha	Within the risk mitigation investment component of this project with current focus on cyclone shelters, godowns, and infrastructure for power distribution, which need to withstand cyclone with core speeds in excess of 222 km/hr or more in a continued warming scenario.
	Within the Technical assistance for hazard risk management and Capacity building to be provided in NCRMP. Review of BIS standards for cyclone shelters and godown's for making them resilient to cyclones with wind speeds in excess of 300 km/hr and corresponding inundation due to storm surge and rain fall. Integration of BIS standards in urban and rural building codes and make it mandatory
2. Integrate cyclone projection in a climate change scenario within the Integrated Coastal Zone Management Project being developed for Paradeep to Dhamara and Gopalpur to Chilika,	Odisha is the first State in the country to initiate the process of Shoreline Management Plan within the Integrated Coastal Zone Management Project (ICZMP). For sustainability and optimal use of coastal resources to formulate the ICZM following actions are necessary
	Map coastal areas that are likely to be inundated by cyclone+ flooding due to storm surge and rain fall
	Assess potential zones for expanding bio-shield including type of mangrove plantation required for areas that can be protected by such bioshields in the worst case scenario context
	Identify and map shelterbelts and develop them to their maximum potential so that they can serve as the oasis for cyclone affected people in other areas
	Model the extent to which surface water and ground water quality is likely to be affected in the worst case scenario due to flooding in delta areas and inland areas from cyclonic rain and storm surges. Suggest remedies for ensuring drinking water security for the region and food security as agriculture gets affected

Strategies	Actions to be included
	<p>Assess the carrying and assimilative capacities and remedial measures in the worst case scenario</p> <p>Undertake Coastal flood zoning and flood plain devlp strategies such as flood inundation management and regulatory plans in a CC context</p> <p>Undertake an assessment of industries at risk to cyclones</p> <p>Undertake capacity building of the various departments who will be involved in implementation of the various components of the ICZMP, namely, industry, forest, soil conservation, agriculture, irrigation, tourism, revenue and forest</p>
<p>3. Integrate Climate change projections of different categories of cyclones in State Disaster Management Plan (2013) to make the population climate resilient vis a vis cyclones in the long run</p>	<p>The state Disaster Management plan contains very detailed discussion on the vulnerabilities of each sector due to cyclones and ensuing floods. The sectors covered include water, agriculture, fisheries, livestock, infrastructure etc.</p> <p>For enhancing adaptive capacity in an exacerbated cyclone situation could include the following</p> <p>Agriculture crops: As both the Kharif and Rabi seasons are getting shortened due to extension of cyclonic aqctivities now even upto December - Identify and propagate cultivars that are</p> <ol style="list-style-type: none"> i. salt tolerant , i. flood tolerant and i. are of short duration. i. Make arrangements for using the dry season for cropping by increasing area under irrigation by augmenting surface water resources during monsoon and by ensuring artificial recharge of ground water <p>Livestock Get affected due to damages to sheds, crop loss leading to scarcity in feed, Parasitic infestation, Contagious disease outbreak, die due to and hypothermia and drowning water scarcity during floods and storm surges. The actions that can be taken in an exacerbated cyclone context may including:</p> <ol style="list-style-type: none"> v. Herding all animals to cyclone shelters or places which will be away from the cyclone track as soon as the warning is known 7 days in advance i. Make water and fodder available by building water and fodder banks inland <p>Fisheries</p> <ul style="list-style-type: none"> • Forecast of cyclones important for Fishermen to save them from being caught in the cyclones • It is important for them to be engaged in other livelihood activities as well to ensure livelihood

Strategies	Actions to be included
	<p>security in the cyclone period</p> <p>Managing drainage and water resources in the long run</p> <ol style="list-style-type: none"> c. Model the capacity requirement for canals, drains, channels to act as drainage during all categories of cyclones including supercyclones with windspeeds > 300 km/hr c. Estimate the strengthening of embankments required to prevent inland breach of salt water due to flooding for all categories of cyclones i. Ensure availability of drinking water by creating water banks not prone to cyclones and which can be distributed during cyclones in cyclone affected areas
<p>4. Develop District Climate Smart Cyclone Management Plans</p>	<p>Identify the vulnerability of each sector for the above mentioned cyclone categories including cyclone speeds >300 km/hr in each district along the coast line</p> <ol style="list-style-type: none"> i. Agriculture v. Water v. Housing (Including rural housing and urban housing, commercial buildings and institutional buildings) i. Infrastructure (Bridges, Roads, Drains, Power transmissions and distribution, industrial facilities) i. Livelihoods i. Health <p>Identify the inland districts that will be vulnerable to super cyclones with wind speeds >222 km/hr</p> <p>Involve the following departments for making the plan</p> <ul style="list-style-type: none"> • Department of Planning and Co-ordination (DoP&C) • Department of Agriculture (DoA) and its bodies at district level • Department of Forest & Environment (DoF&E) • Department of Water Resources (esp. the Flood Cell, etc.) • Department of Fisheries and Animal Resources Development • Department of Health & Family Welfare (DoHFW) • Department of Rural Development (DoRD) • Information & Public Relation Department • Department of Panchayati Raj (DoPR) • Public Grievance and Pension Administration Department • Department for ST&SC Development, Minorities and Backward Classes Welfare • Department of Women and Child Development (DoWCD) • Local Port development authorities • ULBs, PRIs, other local bodies

Strategies	Actions to be included
	<p>Develop plans in consultation with respective departments and concerned stakeholders in each district at a time, to ameliorate risks, vulnerabilities and reduce poverty towards developing</p> <ul style="list-style-type: none"> • Agriculture security (changes required in agriculture plans) • Livelihood security (diversified livelihoods) • Water security (preserving ground water, facilitating recharge of ground water, augmenting surface water by promoting rain water harvesting, avoidance of wastage of water, reutilization of waste water etc.) • Health management (identify actions to be taken for tackling a larger population, making them prepared for disease management) • Cyclone and flood resilient Housing and infrastructures (revisit BIS norms, provide incentives for building such houses and infrastructure, train planners, architects etc on climate resilient engineering etc.)

10. Conclusion

The National Level Guidelines on Cyclones is a comprehensive document prepared by the NDMA. However, there exist gaps in making it Climate smart. And these include

- Steps towards reducing uncertainties due to climate change
- Enhancing adaptive capacities of people and systems in the context of climate change and
- Steps towards reducing vulnerabilities and inherent structures that create these vulnerabilities.

In view of the above all the elements of the guidelines have been examined and some steps towards making it climate smart have been worked out. See Table Below.

Steps towards climate smart Cyclone guidelines

	Tackling Changes in disaster risks & uncertainties	Enhance Adaptive Capacities	Address Poverty & Vulnerability & their structural causes
Implementation of rehabilitation, reconstruction and recovery post disaster	Share CC projections with all departments and undertake impact and vulnerability assessments	Prepare guidelines for risk reduction , preoare M&E framework and undertake M&E at regular intervals	Create Special Central and State funds for long term disaster preparedness
Observations and data processing for Early warning	All possible observation platforms	SDMI/SIDM to be formulated that forms the nodal	--

	provisioned for. Installation of the same to be monitored	agency for developing products for DSS	
Warning dissemination	Biennial International workshops to be organized by MoES on this subject to exchange learning's across the nations	IMD to produce warning products for direct dissemination by broadcasters to all levels of governance including establishment of a dedicated weather channel	--
Structural mitigation	norms for infrastructure development, buildings to be revisited and changed in view of cyclones with wind speeds in excess of 300 km/hr	Review and change -BIS norms -IAY housing norms -Urban housing norms -Power transmission and Distribution -Cell phone tower strengths Develop M&E to review implementation	Make available subsidised loans for housing Explore avenues for livelihood diversification that are non firm based
Coastal zone management	ICZMP to extend to all districts along the coast line and reviewed in the context of climate change	Training and capacity bld of line departments to implement ICZMP plans	Integrate ICZMP elements in village development plans, ULB plans, and in Industries,
Awareness Generation for community preparedness	Audience specific communication to be prepared	--	--
Disaster Risk Management and Capacity Development	The results of Mapping, Cyclone modeling etc to be shared with all line departments to enable them integrate them into planning and at various levels of governance	Cyclone risk reduction packages to be developed for all concerned stakeholders operating at various levels of governance	Design gender specific village level plans on ensuring agri security, water security, livestock and fisheries management, livelihood diversification in a climate change context
Response	Urgently look at the agriculture management of the region given that	Make the dry season viable for agriculture by increasing irrigation cover	Provide seed money for starting new forms of livelihood in villages

	cyclones are intensifying and rabi and kharif seasons are shortening	Encourage short duration varieties Encourage salt tolerant varieties	Create opportunities for microinsurance based on their own resources and managed by them
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Very detailed planning guidance exists in Odisha, through its State Disaster Management Plan Released in August 2013 for pre and post cyclone disaster management.

For a sustainable long term climate smart plan which takes into account the climate concerns, it is concluded that the following elements need to be included at

- State and
- District levels

And they are:

- Assessments of impacts of intensification of cyclones in a warming scenario on all economic sectors for future planning
- Assessment of extent of vulnerabilities of the population due to these impacts
- Participation of all concerned departments/ institutions at district and state level in developing respective climate smart plans
- The information on climate change projections which will come from MoES to the NDMA to the SDMA's need to be shared with all these departments. The institutional arrangement can be through the formation of a State Disaster Management Institute (SDMI) which have all the expertise and infrastructure to extract climate data from given gridded data set, have access to all socio economic data, can make impact and vulnerability assessments based on climate projections at required levels of governance
- Undertake a public consultation of these plans as well on a regular basis to ensure all risks have been covered
- Formulate an M&E Framework for assessing achievements and for indicating mid course corrections if any
- Additionally, projects being implemented such as the ICZMP and NCRMP etc. need also to consider these aspects on the elements they are addressing.

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