

Proceedings of the Workshop on Developing a Strategy for Cyclone Mitigation in the Coastal and Island Regions of India

4-5 February, 2003
Administrative Training Institute
Kolkata



सत्यमेव जयते

Ministry of Home Affairs
Government of India



India

United Nations
Development Programme



সত্যমেব জয়তে

Department of Relief
Government of West Bengal

Organized by

Ministry of Home Affairs, Government of India

In collaboration with

**Department of Relief, Government of West Bengal &
United Nations Development Programme, India**

“National Workshop for Developing Strategy for Cyclone Mitigation in the Coastal and Island regions of India”

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EXECUTIVE SUMMARY

India is one of the most disaster prone countries in the world. With its vast territory, large population and unique geo-climatic conditions, in the last few decades the sub-continent has experienced many extreme hazardous events that have turned into disasters. Floods, droughts, cyclones, earthquakes and landslides are recurrent phenomena in the country. The multi-hazard scenario of India, as depicted by the Vulnerability Atlas of India (produced by Building Materials and Technology Promotion Council (BMTPC), New Delhi, India), shows that out of the total geographical area of 32,87,263 sq. km, 54% of the landmass is prone to earthquakes, over 40 million hectares are prone to floods and about 8% of the total area is prone to cyclones. Such extreme conditions and frequent disasters have greatly eroded developmental gains and caused loss of people's lives.

The coastal eco-system sustains a large portion of the population all over the world and India is no exception with a coastline of about 8041 km (Arabian Sea on the East and Bay of Bengal on the West). In India more than 10 million people live in nine coastal states, two union territory and two groups of islands. Besides, the population pressure on coastal areas is growing due to migration from inland to the coastal zone, which is more developed with more employment opportunities when compared to the hilly areas. Unfortunately, the activities in these areas have exceeded the absorption capacity of the natural coastal eco-system and the people who live in the coastal area are more vulnerable to the increasingly *frequent and intense natural and man-made hazards*. This is true especially in the case of cyclones.

Cyclone Scenario in the Coastal States of India

In peninsular India, cyclones occur frequently on both the coasts (The West Coast- Arabian Sea and East Coast-Bay of Bengal) An analysis of the frequency of cyclones on the East and West coasts of India in between 1891 and 1990 shows that nearly 262 cyclones occurred (92 severe) in a 50 km wide strip on the East Coast. Less severe cyclonic activity has been noticed on the West Coast with 33 cyclones occurred in the same period where 19 out of these were severe cyclonic storms that caused a loss of more than 10,000 lives. (Source: <http://www.bmtpc.org/disaster.htm>). The most recent cyclone that occurred on the 29th Oct.1999 in Orissa killed more than 8,000 person and 450,000 cattle, destroyed 2 million houses, 1.8 million ha paddy and 33,000 ha non paddy land. Besides, 90 million trees were destroyed and damaged/destroyed public infrastructure like schools, buildings, roads, communication network, power supply etc. with a total damage amounting to millions of rupees.

The losses due to these disasters could have been minimized if the value of disaster risk management in reducing the impact of natural disasters had been recognized. On the contrary, these regions witnessed unplanned and fast economic development without taking into consideration the bearing capacity of the region. When economic development is coupled with frequent natural disasters it produces ecological stress and environmental conflicts in coastal regions and leads to over-exploitation of groundwater, depletion of vegetation cover, increase salinity, desertification, erosion of biodiversity etc. often culminating in litigation and social tension. The only way to safeguard economic gains and ecological security of the coastal ecosystem is to adopt an integrated coastal environmental planning and include in this cyclone mitigation strategies to reduce the vulnerability of the region. **Mitigation means "measures taken in advance that are aimed to decrease or eliminate the impact**

of disasters on the community and environment". Today, the Policy makers and Disaster Management specialists are rethinking about their approach to disaster management by increasing investment in risk reduction & mitigation measures rather than concentrating on post disaster response (relief & reconstruction).

The Mitigation Strategies could be

- ✓ Proper infrastructure development for providing accurate and prompt cyclone warning.
- ✓ Design and construction of robust buildings, roads, bridges and other infrastructure besides "Cyclone proof" buildings, which have storage and sleeping areas high off the ground and use water-resistant materials.
- ✓ Hazard reduction by trying to control the hazard in advance, such as, seawalls, diversion drains, coastal shelterbelts, protection and promotion of natural sea side vegetation (mangrove) etc.
- ✓ Land use planning, which "builds in" a distance between the hazard and the community.
- ✓ Management of Delta Zones.
- ✓ Contingency Plans at all levels (community, government and civil society), which include disaster mitigation strategies.
- ✓ Awareness and Educational campaigns that provide advice to the community on cyclone preparedness as well as mitigations measures
- ✓ Develop healthy partnerships between stakeholders at all levels —especially government, private sector and the community to achieve sustainable mitigation strategies.

The purpose of the workshop was to consider preparedness and mitigation measures already taken by various agencies in different areas for Cyclone Management, and develop a suitable National Strategy Framework for Cyclone Mitigation with greater emphasis on environment planning and coastal belt protection. This workshop was part of the ongoing Government of India - UNDP National Programme on Disaster Risk Management (DRM) that aims at helping the GoI to be prepared for the growing problems due to disasters. It also aimed at creating a forum for exchange of ideas and at establishing a network among all states for future coordination on the mitigation strategy to be adopted.

Since the last decade, the Government of India in partnership with UNDP has been actively supporting programs for capacity building, piloting projects for reduction of vulnerabilities and linking these with sustainable development efforts. The ongoing debate was initiated by the UN declaration of the "International Decade for Natural Disaster Reduction (IDNDR-1990-2000) with the aim of promoting a culture of preparedness and response but due to last two major disasters in India the focus has shifted to mitigation aspects besides strengthening capacities for disaster risk reduction and sustainable recovery process across the country with the objective of minimizing life loss and protecting development gains. The workshop in Kolkata is a step forward in this direction and towards the commitment of the National and State Governments to promote a Holistic Disaster Management Programme as well as develop short-term and long-term strategies and activities for risk reduction. The workshop provided an opportunity for planners, researchers, executors to converge at one place to re-look at current initiatives in the States and identify the key issues that need to be addressed, and recommend mitigation strategies for better cyclone management in the coastal and island regions of the country. The workshop also provided a

unique opportunity for learning from several national experts working in the field of cyclone forecasting and management.

During the two days, representatives of various states shared cyclone contingency plans and mitigation strategies already adopted in their states. Some concerns were raised by the participants about the existing methods adopted for weather forecasting or early warning (prediction and dissemination) and ecological-economical linkages to cyclone mitigation efforts. National experts recommended the individual states to act in synergy and to link disaster management (preparedness, response and mitigation strategies) plans to development planning in order to minimize the losses due to such disasters.

The four broad issues discussed during this workshop were:

- A. Weather forecasting and early warning: policy, legal and institutional issues at National & State levels;
- B. Integrated coastal zone management, including delta and flood control structures;
- C. Public education, awareness generation and disaster planning at National and State levels;
- D. Investment in and planning of infrastructure in coastal and island regions.

The workshop with more than 70 participants including two State Ministers in charge of the Relief and Home (Civil Defence) departments of West Bengal, 7 coastal and island state government's representatives, national experts on cyclone mitigation and GOI-UNDP officials.

Resource persons for the workshop included eminent scientists, policy makers & researchers from different parts of India. These resource persons work within leading agencies such as India Meteorological Department (IMD), Central Water Commission (CWC), Department of Ocean Development (DOD), IIT and CRRI among the others.

The presence of Shri S.N. Roy (IAS), Chief Secretary, Govt of West Bengal in the valedictory function and Shri R.K. Singh (IAS), Joint Secretary, Disaster Management Division, Ministry of Home Affairs, GOI on both days added value to the workshop. The participation of the Hon'ble Minister, Relief, Mr. Hafiz Alam Sairani, Govt. of West Bengal in the inaugural section and Dr. Shrikumar Mukherjee, Hon'ble Minister of State, Home (Civil Defence), Govt. of West Bengal in the valedictory function helped in establishing the commitment of the government to the disaster risk reduction efforts.

The objectives of the workshop were:

- To gain a better understanding of the causes of the vulnerability of Coastal States to Cyclones;
- To analyze the gaps existing in the present preparedness and response structure;
- To Critically study the ongoing cyclone mitigation initiatives undertaken by different states;
- To seek synergy in cyclone mitigation initiatives by various resource institutes, government and civil society in the coastal regions;
- Develop a National Cyclone Mitigation framework.

This report is an attempt to bring together the key learning of the workshop that would act as a reference material in addressing basic issues in cyclone mitigation. It is also hoped that the report will help in raising awareness about the vulnerability to cyclones of the coastal regions so that long-term interventions/ mitigation plans can be developed by Governments, bilateral and other development agencies.

The following is a brief summary of the technical sessions.

The First Session of the workshop focused on the status of preparedness & mitigation initiatives adopted by different representatives. Most of the States had their preparedness and response plans in place but not much emphasis had been put on mitigation initiatives with the exception of Andhra Pradesh. However, after the 1999 Orissa Super cyclone and 2001 Gujarat Earthquake the need for linking disaster management activities with the regular development activities has been felt and mitigation efforts like construction of cyclone shelters and community preparedness initiatives have been initiated in some of the states.

The Second Session of the workshop provided the participants an overview of the protocol being followed for cyclone forecasting. Mr. R. N. Goldar spoke about the protocol being followed by the IMD in cyclone forecasting while Mr. R. N. P. Singh from CWC spoke about the early warning system for floods. Mr. A. K. Parida and Mr. K. A. Patel talked about the existing scenario at district level with respect to cyclone forecasting and warning dissemination and the areas that need to be strengthened. They all emphasized the need for greater networking amongst the research institutes and for strengthening the information dissemination system which is too centralized. One of the crucial aspects of disaster management is the availability of reliable information in a timely manner as information helps in minimizing damages by warning the affected population as well as in planning relief interventions and resilient solutions for rehabilitation and recovery.

The Third Session debated about Integrated Coastal Zone Management including Delta and Flood Control Structure management and was moderated by Mr. Kamal Kishore (BCPR/ UNDP). A conscious coastal management is crucial for reducing the impact of the cyclone and tidal surge on mangrove vegetation or the construction of structures like embankments and ports. In fact, the coastal vegetation especially the mangroves help in sheltering the coastline while deltas help in providing an outlet to the rising seawater, thus reducing the impact of cyclone. Mr. E. V. Muley and Prof. S. K. Dubey mentioned that there is need to adopt an integrated approach to coastal zone management and to ensure that development (embankment construction) is in harmony with the natural ecosystem (mangrove) so to reduce the impact of cyclones. They also claimed that there is need to enhance the capacity of the state level agencies in adopting an integrated approach to Coastal zone management.

The Fourth Session moderated by Ms. Sarojini Thakur, DFID, focused on Public Education, Awareness Raising and Disaster Planning in the Coastal regions of India. Mr. Arbindo Behera (OSDMA), Mr. K. John Koshy , Director, ATI and Mr. J. P. Gupta, UNDP India, emphasized the need for community based disaster management plans to be prepared by the communities. Besides the plans, regular mock drills and the use of print and electronic media, the inclusion of disaster management subject in the curriculum of children were highlighted as of paramount importance.

The theme of the Fifth Session was “Infrastructural Investment Planning in Coastal Areas: Construction of Cyclone Shelters, Tree Shelter Belts, Roads & Bridges, Ports & Harbour Facilities, and Public Buildings”. This session was moderated by Mr. Santosh Kumar, World Bank, India. Mr. D. N. Lakshman from SERC stressed the importance of structural measures, especially cyclone shelters designed for cyclone mitigation. He suggested that all along the coast strict building codes should be followed and all government buildings constructed within 50 km radius from the coast should have cyclone resistant features. Mr. V. K. Sood talked about investments in roads and bridges and noticed that currently not much attention is being given to the passage of natural water flow and construction of roads in rural areas thus intensifying people’s vulnerabilities during cyclones or floods. Mr.

Bhaskarcharaya from the Calcutta Port Trust claimed that the government should pay attention to the port assets.

Effective cyclone mitigation initiatives require synergetic use of technologies, interaction of different agencies (government and non-government organizations) and better environment and land use planning in order to minimize loss of human life and development gains. This workshop attempted to develop a common approach to development of information systems, development of infrastructure as well as building human resources for effective cyclone mitigation.

At the close of the workshop, resource persons and delegates came up with a set of recommendations. The key recommendations will form the basis for a National Cyclone Mitigation Strategy. These are:

Weather forecasting and early warning: Policy, Legal and Institutional issues

- Steering Committees should be formed at the national as well as the State levels;
- Strengthen weather forecasting and early warning system through equipment support for data collection and analysis;
- Establish linkages with different resource institutes for comprehensive information and analysis of forecasting and warnings;
- Support print and electronic media as dissemination systems;
- Popularize Ham radio;
- Enhance a decentralized information dissemination protocol;
- Encourage capacity building of communities in early warning and information dissemination procedure.

Integrated Coastal Zone Management including Delta & Flood Control Structure Management

- A committee to be formed for Integrated Coastal ecosystem management that would also include representation from all existing committees and Disaster Management Cell;
- Continue with the coastal shelterbelt plantation and mangrove restoration programme;
- Along with the Environmental Impact Assessment, Disaster Risk Assessment also needs to be made compulsory in all major projects;
- Community participation should be encouraged in the case of embankment management.

Public Education, Awareness Raising and disaster planning

- Develop a Management Plan for each village that addresses response as well as development needs with special funds allocated to mitigation initiatives;
- Establish an institutionalized awareness generation system;
- Effective use of Print and Electronic media for Disaster Management
- Training for stakeholders at all levels and development of appropriate training infrastructure;
- Trauma Counselling should be included in the training;

- Relevant Manuals including Relief Codes need to be amended to include training and planning components;
- At village level, each Panchayat should be in charge of the Planning exercise for Disaster Management while the government agencies should be at higher levels.

Infrastructure investment planning in coastal and island region

- Disaster Risk assessment should include Hazard and Vulnerability analysis;
- Implementation of development programmes and construction of embankments in ecologically sensitive areas should be carried out only after proper assessment;
- All new constructions must have cyclone resistant features while retrofitting needs to be made compulsory for old buildings;
- Public, Private and Government investments in mitigation measures needs to be increased;
- A database of the existing infrastructure must be created for every cyclone prone district to have data on roads, bridges, dams, power supply, telecommunications, mangrove plantations etc;
- Off site Plans of the Port Authorities and Industrial Areas needs to be made and shared with the community as well as migrant labourers on regular basis and such plans should be linked to the district disaster plan.

Copies of all presentations are available on the website www.undp.org.in/dmweb/index.htm

WORKSHOP PROCEEDINGS

DAY ONE: 4th February 2003

INAUGURAL SESSION

WELCOME ADDRESS BY MR NIKHILESH DAS (IAS), PRINCIPAL SECRETARY RELIEF, GOVERNMENT OF WEST BENGAL

ADDRESS BY MR. SAROJ KUMAR JHA, ARR (VE & SE), UNDP INDIA

ADDRESS BY MR. R. K. SINGH (IAS), JOINT SECRETARY (DIS. MGMT.) MINISTRY OF HOME AFFAIRS, GOVERNMENT OF INDIA

INAUGURAL ADDRESS BY HON'BLE MINISTER OF RELIEF, MR. HAFIZ ALAM SAIRANI, GOVERNMENT OF WEST BENGAL

VOTE OF THANKS BY MR K. JOHN KOSHY (IAS) DIRECTOR ATI, GOVERNMENT OF WEST BENGAL

Mr. Mr Nikhilesh Das (IAS), Principal Secretary Relief, Government of West Bengal, welcomed the participants and explained the purpose of the workshop, which focused on developing a strategy for cyclone mitigation in the coastal and island regions of India. Mr. Saroj Kumar Jha, ARR (VE&SR), UNDP India talked about UNDP's involvement in Vulnerability Reduction and Sustainable Environment and other thematic areas of concern. Mr. R. K. Singh, Joint Secretary (Disaster Mgt Division), Ministry of Home Affairs, GOI, in his address spoke about the role of the Ministry of Home Affairs in disaster management and the need for convergence of all concerned departments/ ministries in the mitigation strategy. The Hon'ble Minister of Relief, Mr. Hafiz Alam Sairani, Government of West Bengal, gave the Inaugural Address.



Following are the excerpts of address by the speakers in the inaugural session

Welcome Address by Mr. Nikhilesh Das (IAS), Principal Secretary Relief, Government of West Bengal

Mr Nikhilesh Das (IAS), Principal Secretary Relief, Government of West Bengal delivered the Welcome Address, and while welcoming the Chief Guest, distinguished delegates, resource persons and participants thanked the Ministry of Home Affairs and UNDP for choosing Kolkata for holding this workshop. He emphasized that West Bengal is one of the states that is most affected by cyclones. He felt that the workshop will bring out the issues as well as potential solutions that will help in the formulation of long term mitigation plans.

Address by Mr. Saroj Kumar Jha, ARR (VE & SE), UNDP India

Mr. Saroj Jha welcomed the participants and highlighted the association of UNDP with MHA in the area of vulnerability reduction and sustainable environment. He highlighted the activities undertaken by UNDP with MHA over the years and especially focused on capacity building and on the creation of a debate about issues of utmost importance for Disaster Risk Management. He gave a brief overview of the NDRM programme that is currently ongoing in three states, Orissa, Bihar and Gujarat and likely to start in nine more states shortly. He also talked about other thematic areas that would be supported under the GoI-UNDP Country Programme during 2003-2007.

Address by Mr. R.K. Singh (IAS), Joint Secretary (Dis. Mgmt.) Ministry of Home Affairs, Government of India

Mr. R. K. Singh informed the gathering about the recent transfer of portfolio of sudden disasters to the Ministry of Home Affairs from the Ministry of Agriculture. He was pleased to participate at this workshop focusing on mitigation issues, which he believes to be more helpful in reducing vulnerability of communities to disasters.

Inaugural Address by Hon'ble Minister of Relief, Mr. Hafiz Alam Sairani, Government of West Bengal

"I am very much happy to find that the Ministry of Home Affairs, Government of India has taken initiative for holding a National workshop in collaboration with UNDP and our State Government to develop a "National Cyclone Mitigation Strategy". The coastal states of India are very much prone to tropical cyclones. We have seen how the super cyclone devastated the state of Orissa in 1999.

During the last 4 decades due to widespread environmental degradation, there has been a rise in natural calamities all over the world especially in South Asia. We have also learnt lessons from various natural disasters faced by this State during the last 25 years. Our State is frequently affected by floods, cyclones, landslides, drought etc.

From past records we have found that a number of times Bengal was devastated by severe cyclones. We faced a recent cyclone on the 12th November 2002, which caused the death of 78 fishermen and the destruction of huge agricultural crops and properties. In our State we have developed a Disaster Management System and on the basis of this system we have prepared District Disaster Management Plans for all the districts. Our Disaster Management System basically envisages both short term and long-term planning. The planning process has been undertaken keeping a holistic approach to disaster management and mitigation of human miseries. To give it a shape we have delineated areas for planning

which include several Departmental activities including the planning at the Panchayat level. This has two aspects: planning for prevention and checking of any disaster and crisis management in the event of any such disaster. In this planning we have stressed human resources development and community participation keeping in view a long- term sustainable development. During the two days deliberations, I hope that each State will focus on their strategy on disaster management and share their views with each other and that will create a knowledge bank for all of us. While we shall discuss the strategy for cyclone mitigation, I feel that we should have a multi-prong approach to deal with different types of natural disasters.

I am extremely glad to find that senior officials from Government of India, coastal states and other specialists in disaster management are participating to this Workshop and I hope that this will be a grand success for developing a National Cyclone Mitigation Strategy.”

Vote of Thanks by Mr. K. John Koshy (IAS) Director ATI, Government of West Bengal

Mr. K. John Koshy, Director ATI thanked the ministers for coming and sharing their thoughts with all the participants. He informed the minister that ATI has already initiated some activities in the area of community based disaster management with the help of UNICEF. Mr. Koshy thanked the Government of India for selecting Kolkata as the venue for this workshop as cyclones and floods are recurring hazard in the State of West Bengal. He felt that the deliberations would help the state in getting a better understanding of the issues, concerns and mitigation initiatives under taken by other states.

TECHNICAL SESSIONS

The Session was moderated by Mr. R. K. Singh, IAS, Joint Secretary, MHA

Session I

STATE PRESENTATIONS: STATUS OF CYCLONE PREPAREDNESS AND MITIGATION PLANS

West Bengal

Mr. Nikhilesh Das, Principal Secretary, Relief, presented the state of Cyclone preparedness and mitigation plans in West Bengal. He gave an overview of the potential cyclone prone areas of the state and the loss cyclones cause both in terms of human life and infrastructure. He explained the administrative structure and the roles and responsibilities of each department in pre, during and post disaster phases. According to him, the District Collectors have to distribute action plans in advance so that these can be reviewed by the state authorities and necessary action can be taken before each season where a disaster is likely to happen.

He informed the house of the District Disaster Management Plans developed by the districts, which include both short term as well as long term planning in order to keep a holistic approach to disaster management and mitigation. These Plans also give emphasis to structural as well as non-structural measures, especially strengthening embankments, removal of obstacles from drainage channels, development of roads and evacuation channels. Mr. Das also emphasized the fact that Disaster Management plans should also include a plan for early warning dissemination, trauma counselling and response. An accurate and well maintained inventory of essential equipments, list of traders etc has been maintained including preparation of maps using GIS package. With the technical support of NATMO, Mr. Das had urged for development of multi hazard maps containing basic information for each district. He believes that these maps will help the new officials in the district to easily understand the vulnerability to hazards of their district besides getting an idea of the resources available.

Before any potential disaster season, messages are given to AIR and DD on Do's and Don'ts to be broadcasted at regular intervals as a preparedness measure. In addition to this, convening meetings are held at all levels for reviewing the preparedness of all the departments especially home (involved in rescue), Transport Department (provide Vehicles), Civil Supplies (Emergency stocks), etc.

Mr. Das emphasized the need of integrating disaster management into all the projects taken up by the various departments and informed the house that in West Bengal they have planned to take various activities in phased manner under the 10th Plan. They have emphasized and instructed their officials that rural development funds can be used for mitigation measures such as the strengthening of roads, bridges, schools. They are also giving priority to drinking water facilities in all villages and these are being constructed in such a way that they don't get affected by the floods in the long- run.

Mr. Das expressed his appreciation towards the Disaster Management Institute run by Dr. U. N. Bissau, which involved in training volunteers in rescue and evacuation with support from UNICEF and stressed how such initiatives should be supported to strengthen the capacity of communities to deal with

any disaster. He appreciated the work of the ATI, who have initiated the Community Based Contingency Plans with support from UNICEF in some of the districts. He emphasized the need for capacity building of the communities as well as other stakeholder on Disaster management.

He expressed his gratitude to MHA and UNDP once again for holding the consultation in West Bengal and felt that the implementation of the Disaster Risk Management in the vulnerable states would help in vulnerability reduction in the long run.

Orissa

Mr. Sidhanta Das, Executive Director, OSDMA presented the preparedness and mitigation plans of the state. According to him, the Super cyclone of 1999 generated greater awareness of the need for preparedness and mitigation initiatives in Orissa. Since the cyclone, many concrete steps have been taken.

Warning and Safe Shelters: Reconstruction activities started with active support from the Central and State governments, donors, INGOs and NGOs. A large number of multipurpose school buildings to serve as cyclone shelter (6029 School Building constructed and 650 under construction), Cyclone Shelters (50 completed, 48 under construction) and Indira Awas individual houses (3, 80,000 completed, 2, 13,000 under construction) have been constructed to provide safe housing stock to the people. The communication network is being strengthened through VHF (230 locations covered in first phase, 171 in second phase), satellite phones (20), Fibre optic cabling (by BSNL being strengthened in coastal districts) and district control room (11).

Planning and Preparedness: At the Planning phase, Community Contingency Plan (10 blocks completed, 103 started) have been taken, State and District Disaster Management Plans have also been prepared. Disaster Management Act/Policy/Plans are pending for approval. Exhaustive GIS database is being developed for easy access and analysis of data. Special teams are being formed (3 Units of Orissa Rapid Action Force formed and 2 more will be formed) at the state as well as village levels for Disaster Mitigation. Inventory of equipments, machineries, list of volunteers, IEC materials etc have been taken up.

Other Mitigation Measures: In many places the coastal ecosystem has been destroyed due to population increase, encroachment, prawn culture etc. Therefore, coastal shelter plantation has been aggressively taken up for providing natural shield. Inclusion of Disaster Management in the school curriculum is also under progress.

Mr. Das is confident that the Orissa population is better prepared to face a cyclone now than in 1999.

Andhra Pradesh

Mr. A. K. Parida, Secretary, Planning represented Andhra Pradesh. Andhra Pradesh has been often facing cyclones and over the last decade an integrated approach has been adopted and disaster management has become part of daily life.

In Mr. Das' opinion, disaster management cannot be taken up without enhancing the capacity of all stakeholders. In AP awareness and training programmes are being conducted for all the stakeholders besides taking up special projects and studies on various aspects of disaster management. Still there is a need to strengthen capacity in wind hazard mapping, prediction of storm surge, cyclone tracking, landfall prediction, rainfall and wind forecasting models.

The infrastructure and equipments available in AP have also helped other states in case of necessity. Still advanced infrastructure is needed for effective dissemination of information to the remotest villages or equipments for, rainfall recording, etc.

Mr. Das talked about the Cyclone Mitigation plans that have been prepared by the communities and the emphasis at State level to prepare good plans. The emphasis in the plans has been given to disaster risk transfer that covers both relief and insurance, disaster risk reduction, which consists of mitigation and preparedness and disaster risk identification. Panchayat mitigation plans have also been made and Panchayats are actively participating in the preparation.

Discussion

The discussions in this sub-session revolved around mangrove plantation, the strategy adopted by different states for cyclone mitigation and the need of embankments. The major points raised are:

- The participants felt that the importance of the mangroves is not properly understood. There is a need to concretely take up this issue with the community and the local self governments. The importance of mangroves in cyclone mitigation needs to be disseminated along with measures for conservation of this vegetation. Communities and PRIs have to be actively involved in this process.
- With regards to cyclone mitigation activities, an institutional structure needs to be formed. This would help in planning and integrating cyclone mitigation activities with the broader development goals. There is a need to construct all the public buildings in the coastal areas in the form of cyclone shelters. School teachers, Anganwadi Workers etc. have to be sensitized to cyclone mitigation issues.
- The points raised in the West Bengal presentation about the embankments, their maintenance and operations needs to be discussed at higher levels and there is a need to coordinate with various departments and come up with concrete measures on this. There are many embankments all over the country that have been constructed at least 30 years back and due to siltation, non maintenance, change in the course of the water flow etc. these have been damaged or are in very bad condition.

Gujarat

Mr. Murmu started his presentation by giving a brief profile of the state. He pointed out that Gujarat is frequently affected by many natural hazards such as cyclones, floods, drought and earthquakes. Gujarat was hit by cyclones 23 times between 1887 and 1990. The last devastating cyclone was in June 1998 and it affected 4.6 million people, killing 1261 people, and destroyed property worth Rs. 2100 crores.

Cyclone and Flood Management at the State starts with a review by the Chief Secretary before the cyclone and flood season. The functioning of the control rooms, the contingency plans and the availability of resources such as stock of essential commodities etc. are reviewed. Mr. Murmu then talked about the existing response structure, which is headed by the Chief Secretary, and the response mechanism. He highlighted the role of GSDMA, which was constituted after the Gujarat earthquake in 2001, and the mitigation activities it carries out. He also briefly mentioned the Community Based Disaster Plans that are being developed with the help of UNDP. He then stressed that the need to involve the communities because they are the first to respond.

According to Mr. Murmu Gujarat is rich in resources and since 1980; decentralized planning has been in place so that 20% of the State Budget goes directly to the Districts that can take up any development activity leading to mitigation initiatives. The future strategy is to use extensively GIS to identify the vulnerability of the areas and for preparation of Development plans.

Lakshwadeep

Mr. Nambiar expressed his thanks to the organizers for inviting him to this workshop. Even though Lakshwadeep does not often face cyclonic storms, he felt that it is important to be prepared for any calamity. 1977 cyclone destroyed coconut trees and electricity lines but there was no life loss. Seeing the destruction to the power supply, underground cabling was taken up and now high wind speed does not disrupt the life of the common people due to want of power.

Despite low frequency of cyclonic activity there is a committee headed by the district collectors for cyclone preparedness and that also prepares Cyclone Management Plans. Precautionary measures are taken in the cyclonic months and essential commodities are readied along with the helicopters, transportation and emergency medicines. School buildings and other Public buildings are used for shelter.

Andaman and Nicobar Islands

Mr. I. H. Khan, started his presentation by thanking the MHA and UNDP for giving him the opportunity to share the Island's preparedness and mitigation plans. He gave an overview of the island having an area of 8,295 km spread over 500 islands with a coastline of 1,962 km. It has a rich heritage of flora and fauna. It is classified as moderate damage risk zone (level A). It was last hit by a cyclone in November 1988, which was followed by floods. In the UT there is a Disaster Management Committee that has prepared an Integrated Disaster Management Plan in 1996 and reformulated it in 2001. They have also drafted an Andaman and Nicobar Disaster Management Regulation in 2002, which creates a two tier structure for disaster management, puts emphasis on the role of local bodies, defines the role of the Police and Home guards, incorporates insurance and brings all the mitigation work as development activities to be charged under plan head. Mr. Khan also outlined the UT's commitment in enhancing preparedness by reflecting the budgetary outlay and the assets created.



Discussion

An interactive discussion facilitated by Mr. R. K. Singh brought up some issues, which were slated to be discussed in the technical sessions:

- Andaman and Nicobar Islands may not face a severe cyclone but they are located where maximum number of cyclones forms from the Bay of Bengal. We gather very little information about this stage; so any forecast at this stage related to possible intensity, movement, sea temperature, etc. can be helpful in mitigating the impact of the cyclone. Thus, there is a need to strengthen the observatory in Andaman and Nicobar Islands.
- Lack of proper, timely and accurate information through IMD was another major issue that has come out quite clearly from all the presentations. The participants felt that even though a lot of activities have been initiated at the community level if the cyclone warning is not available to the people they will not be able to reduce the losses.
- The participants felt that there is no proper management of the coastal shelter belt in Gujarat and there is a need to study it and try to take-up plantation for restoration of coastal ecosystem.
- Another issue that was raised was the utility of the State's resource inventories and whether these resources were readily available in disaster affected sites.
- Another point was the inclusion of fisher men (migrants as well as settled) in the community contingency plan. It has been seen that in many places they are being left out.
- None of the states talked about coordination/collaboration with the Civil Society, which is an issue of primary importance.
- Another point that came out very clearly was integration of rehabilitation activities with livelihood because rehabilitation of the affected communities without consideration of livelihood options would remain incomplete.

Maharashtra

Mr. S.C. Mohanty, Officer on Special Duty in Orissa briefed the delegates on behalf of Maharashtra government the multi-hazard scenario of the state. He elaborated on the history of cyclone and the extent of damage it has caused to coastal Maharashtra.

According to him the early warning system in Maharashtra needs lot of improvement. The messages are not received on time and when they are received the language of forecasting is too complicated to be understood. There is a need for making the language more simple and understandable. He also felt that the role of mass media has not been very exemplary and there is a need to sensitize the media for responsible reporting of disasters.

Maharashtra has been the first State to receive UNDP support and has been able to prepare effective Multi-Hazard Management Plans at the State and the district level. There are many working groups who are working further to improve the disaster management of the State. Not much effort has been done to ensure people's participation in many parts of the state but efforts are being intensified to create awareness about various disasters.

Maharashtra Government has also been very forthcoming to help various state governments during disaster. They have done exemplary work in Orissa where they have supported the Government with

relief materials, cyclone shelters, individual houses, and some livelihood support. He felt that if all State governments come forward to share their experiences on regular basis and help each other at time of need we can do better Disaster management.

Discussion

The discussion was very limited and basically focused on why Maharashtra despite support of NGOs and UNDP is not involved in Community based Disaster Preparedness initiatives.

Session II

WEATHER FORECASTING AND EARLY WARNING: POLICY, LEGAL AND INSTITUTIONAL ISSUES

Forecasting has a long history. Most early forecasting was based on observation of weather patterns as seen through naked eyes. Today an accurate weather prediction is important for planning activities. Farmers need information to help them plan for planting and harvesting of crops. Fishermen need to know about local weather conditions before venturing into the sea for fishing. Such information is also required by airlines to schedule flights. Weather forecasting helps us to make more informed daily decisions, and keep us to be prepared and take precautionary measures especially when a cyclonic storm is building up in the sea.

Modern weather forecasting involves a combination of computer models, observation (local weather observers, satellites, and weather stations) and knowledge of trends and patterns. Using these methods, reasonably accurate forecasts can be made for a certain period.

In this session four presentations were made about the prevailing regional protocol for Cyclone forecasting and Early Warning followed by status of state networks for forecasting and early warning. Regional protocol for cyclone forecasting in the coastal regions of India was dealt by Mr. R.N. Goldar, DDG, Regional Metrological Centre, IMD, Kolkata while Mr. R.N.P Singh, Chief Engineer, CWC, Bhubaneswar spoke on Regional Protocol for Early Warning Systems for Floods. Brief presentation was made by Mr. A. K. Parida, Sec, Planning AP and Mr. K. A. Patel, CEO, GSDMA on Strengthening State and District Networks for Forecasting and Early Warning Dissemination. The session was moderated by Mr. G. S. Modal, Ex-IMD director.

Mr. R.N. Goldar, DDG, Regional Metrological Centre, IMD, Kolkata: *Regional Protocol for Cyclone Forecasting in the Coastal Regions of India:*

Mr. R.N. Goldar, DDG, Regional Metrological Centre, IMD, Kolkata, started his presentation by thanking the organizers for giving him this opportunity. He spoke about the cyclone forecasting hierarchy which is currently being followed in the country. There is one DGM based in Delhi and two DDGM one for weather forecasting and another for cyclone warning. Besides these, there are three area cyclone warning centres. Data and graphs were shown to indicate the extent of damage a cyclonic storm and storm surge has caused. He presented a pictorial slide to explain the collection and dissemination of the cyclone warning. He also mentioned about the various equipments available with the department for cyclone warning and their positions across the country. He added that some more equipment is needed for improving the data collection and analysis which will be procured and installed soon. He went on to explain about the cyclonic storm, its characteristic and how it looks. He also briefed about the damages it can cost to the region it hits. A proper forecast should contain when and where the landfall will occur, maximum wind at landfall, rainfall/storm surge/damage it can cause and what is the lead time available. There are two stages of warning to the state officials, one indicating cyclone alert and another cyclone warning. He then referred to the measures to be taken and briefly mentioned the recommendation of the CDMC, Kolkata for improving the forecasting and warning in the region. He ended his presentation by suggesting few mitigation measures for cyclonic storms.

Mr. R.N.P Singh, Chief Engineer, CWC: *Regional Protocol for Early Warning Systems for Floods:*

Mr. R.N.P Singh, Chief Engineer, CWC, Bhubaneswar thanked the organizers for giving him this opportunity for highlighting the activities of CWC. CWC is involved in preparation of National perspective plan and basin-wise master plans, surveys, investigations and designs of schemes for development of river valleys providing techno-economic appraisal of water resources projects, flood management and development and operation of flood forecasting system. Flood forecasting activities which were started by CWC in a small way in 1958 have been expanded with a network of 132 forecasting stations to cover most of the interstate flood prone rivers besides inflow forecasts for 25 major reservoirs of the country. Over 6000 forecasts are issued by CWC every year with about 95% of the forecasts within the permissible limit. CWC maintains close liaison with the local civil authorities to communicate advance warning for appropriate mitigation measures. He talked about the early warning system being followed in Orissa with respect to rivers like Mahanadi and Subernarekha. He expressed satisfaction in the way the Flood in 2001 was managed by the government of Orissa and the role CWC played in giving proper and timely information to the government. He felt that there are many areas where improvement is needed such as providing proper equipments to the blocks for rainfall monitoring, better coordination and networking between various departments, more data collection centres with VHF's (existing ones are connected) and proper infrastructure for dissemination and a strategy for quick and appropriate dissemination upto the village level.

Mr. A. K. Parida (IAS), Head, Andhra Pradesh Dis. Mgmt Unit & Secy. Planning, AP Govt & Mr K. A. Patel (IAS), CEO, GSDMA, Gandhinagar, Gujarat: *Strengthening State and District Networks for Forecasting and Early Warning Dissemination:*

Mr. A. K. Parida (IAS), Head, Andhra Pradesh Dis. Mgmt Unit & Secy. Planning, AP Govt & Mr K. A. Patel (IAS), CEO, GSDMA, Gandhinagar, Gujarat discussed about the above topic based on their experiences in their state. Both state representatives were very critical of the existing networking systems in the states. They felt that not much emphasis has been given to strengthen this sector. While recollecting some specific instances they raised the following issues for the consideration of the house

- There is a need to synergize all the approaches followed for forecasting at the national level
- The dissemination procedure was very lengthy and was not received on time.
- The message which is received is also not very understandable,
- There was no coordination between different nodal agencies and each has different models
- Capacity building of the personnel engaged in forecasting needs to be enhanced besides the staff should be trained in proper dissemination
- More equipments and models (GIS platform) should be used for forecasting. Many countries are able to forecast situations more frequently than IMD.

Discussion

The open house discussion was very intensive as this was one of the most important topics and everyone felt strongly about the need for improvement. IMD at many places was very defensive and could not come up with answers which could satisfy the participants specially officers from the various

states. Mr. G. S. Modal, moderating the session had to intervene and explain on behalf of the IMD based on his experience as ex-director of IMD. Major issues discussed were:

- The lead time and the standard protocol are too lengthy
- The quality, form and content of the message received or disseminated is too difficult to understand
- The dissemination procedure is inadequate
- The information gathering and message dissemination process should be from the districts to state and to national levels
- The models being used by different agencies for information collection and dissemination, was discussed and requirements pointed out.
- Networking among agencies such as IMD, CWC, DOD, ISRO were discussed.
- In order to facilitate better accessibility to information an Interactive weather information network to pool information from all agencies was suggested
- The need to design an appropriate communication system for information dissemination especially with the use of radio and ham, citizen bands was also discussed.

DAY TWO: 5th February 2003

Session III

INTEGRATED COASTAL ZONE MANAGEMENT INCLUDING DELTA & FLOOD CONTROL STRUCTURE MANAGEMENT

Coastal areas are economically important zones where fishery and tourism contribute significantly to the financial well-being. Integrated Coastal Zone Management is thus an interdisciplinary activity where natural and social scientists, coastal managers and policy makers, in the long-term focus on how to manage the diverse problems of coastal areas. The rapid exploitation and development of coastal areas along with augmenting population growth and urbanization have led to environmental degradation of coastal ecosystems. Consequently, the impact of any natural hazard namely cyclone is devastating and leads to loss of life and property. The coastal ecosystem in the India has become more vulnerable because of the loss of mangroves and unplanned development activities on the coastal shores.



The session was moderated by Mr. Kamal Kishore, Regional Advisor, BCPR, UNDP. The First speaker of this session was Mr. B. R. Subramaniam who focused on the Deltaic area management which is as important as any other ecosystem as it is unique by virtue of it being the meeting ground of the sea and river. Mr. E. V. Muley spoke about the importance of conservation and management of Mangroves, Coral Reefs and Coastal Shelter Belt as they act as barriers for the sudden water flow from the sea, besides providing enumerable flora and fauna for human exploitation. Prof. S. K. Dubey talked about the Coastal Zone Management with special reference to Flood Control Structure Management in the coastal regions of India.

Mr. B. R. Subramaniam, Advisor, Department of Ocean Development, Government of India:

The speaker felt that Integrated Coastal Zone Management concept incorporates both the environmental and social concern in the development and operational activities. This is the approach we should adopt for our vast coastline. Coastal areas are vulnerable to both storm surge and erosion while the delta zone is prone to floods associated with cyclone. Integrated coastal zone management would not only involve management at the delta mouth but also provides for management of silt flow from the rivers to avoid heavy siltation at the mouth. This would help in preventing flooding, sea water inundation,

loss of property and life in the coastal areas. The erratic rains in the upstream areas and the environmental degradation leads alteration in the sedimentation supply and its flushing rate leading to river based accretion at river mouth which is accelerated by dumping sand by wave action. This further leads to erosion on sides of the beaches close to river mouth causing damage to the settlements and some times relocation/resettlement is needed. Ill designed break waves; sea walls also cause problems to the river mouths. Easy livelihood options such as fishing and shrimp farming is changing the land use pattern and destroying the natural ecosystem, specially the mangroves, sand dunes etc. He further elaborated about the causes of flood occurrence in coastal zones which could be natural or manmade. He gave a brief idea to the participants about the storm surge and the impact of this. He felt that we could reduce the vulnerability of the community to these disaster but we need an informed and accurate management system with a good decision support system. He also elaborated on possible strategies for flood management in these areas through vulnerable area identification using historical data and remote sensing data, preparation of inventory of natural eco-systems and changing morphology of the area and reliable forecasting systems. He felt that some stringent measure like prevention of any development activities near the coast should be enforced; better water management techniques should be developed for water management and keeping tidal inlets adequately open by regular maintenance would help in reducing the vulnerability of the coastal areas.

Mr. E. V. Muley, Joint Director, Ministry of Environment and Forests, Govt of India

Mr. Muley provided a very comprehensive insight to the importance of mangrove, its ecological and economic significance and the threats to mangroves in India. He also spoke about various policy initiatives which have been taken by the Government of India for the protection of environment, forest, fauna, flora and coastal zones of India. He spoke about the scheme floated by GoI for conservation of mangroves and its objectives, activities and implementation modalities it. According to him there is no dearth of money but the state governments are not utilizing the money provided to them or have diverted to other activities.

In Orissa after the super cyclone devastation a special task force was constituted to assess the damage and suggests remedial measures. Management plans were made and for implementation a sum of rupees 46.50 lakhs for Bhitarkanika and Mahanadi and 55.75 for Subernrekha, Dhamra and Devi was released. A national Mangrove Genetic Resource Centre in Orissa is being established with the help of MSSF for conservation of threatened species.

According to him the real issues are lack of adequate knowledge about importance of mangroves with the common people, unprecedented shrimp farming and unplanned development is decreasing the mangrove stock. He feels that all ongoing programmes related to coastal belt should be integrated to reduce the vulnerability.

Discussion

The whole discussion became centered on conservation of mangroves. The coastal zone regulation act and infrastructure development- is there a conflict was also a part of the debate. The major issues which emerged were

- Mangroves are important and should be protected at all costs but how.
- Coastal Shelter Belt Plantations should be taken up aggressively and proposals should be forwarded from the states to the Central Ministry immediately

- There is a need to make statutory provisions to integrate disaster mitigation in the state Acts for Coastal Management
- Efforts have to be made to increase community participation in Mangrove protection and also management of the coastal ecosystem
- There is a need to strengthen the embankments and involve communities for it
- Review of existing legislations from vulnerability reduction lens and suggest steps for mainstreaming it needs to be undertaken
- Conservation of the coastal ecosystem is must and awareness strategy on legislative/legal framework needs to be made
- There is no linkage between National bio-diversity strategy action plan [NBSAP] and National Plan for Disaster Management. Ways and means should be explored to forge it. Similarly, there is no linkage between Coastal Zone Management Plan and State Disaster Management Plan at present and both plans are being made by different group of people.
- There is also a need for District and community level plans for Disaster management and Coastal Zone management
- How do we raise awareness and empower communities and Panchayats in conservation of eco-system?
- Is there a need for Shelter-based plantation by Village Disaster Management Committees?

Session: IV

PUBLIC EDUCATION, AWARENESS RAISING AND DISASTER PLANNING IN COASTAL REGIONS OF INDIA

The session was moderated by Ms. Sarojini Thakur, IAS Advisor (Livelihood), DFID who emphasized the need for awareness generations as communities are the first responders and proper planning with community participation will go a long way in reducing the vulnerability to disasters.



Mr. Aurobindo Behera, MD OSDMA, Orissa: *Public Education, Awareness Raising and Disaster Planning in Orissa*

Mr. Aurobindo Behera thanked the organizers for inviting him and for giving him a chance to share his thoughts. He felt that awareness programmes are very important as they help in understanding the risk, identify the factors leading to vulnerability and even provide solutions as well as help the community to prepare contingency plans. The vulnerability could be due to many reasons - inadequate knowledge, inappropriate housing technology, poor communication, lack of resources or poor infrastructure etc. Awareness is thus not only limited to the community or the most vulnerable groups but also to the disaster managers belonging to the government or non-government sector, and elected representatives. In Orissa with the support of UNDP contingency plans have been developed not just for the villages but linking it with the State level. Plans, Manuals, Safety tips, capacity building and identification of role and responsibilities have been part of the whole Disaster Management programme. In spite of these efforts there are some areas where Government of India could help the state in establishing a Disaster Management Institute, enhancing the capacity of the Civil Defence, improving the coverage of radio in all the coastal belt, Strengthening the Disaster Management Cell in the Gopobandhu Administrative Academy and providing support for documentation of best practices and learning's.

Mr. K John Koshy, Director ATI, Govt of West Bengal: *Public Education, Awareness Raising and Disaster Planning in West Bengal*

Mr. K. John Koshy revisited the Yokohama Strategy to remind the participants about the objectives and Action plan developed there. He pointed out that disaster response is something that we need to think last, first comes prevention, then mitigation and preparedness. Another important aspect was the

enhancement of community participation as they are the first to be affected hence first to respond. Their local knowledge and expertise needs to be tapped to make all plans more effective. With the help of UNICEF ATI, Kolkata launched a community preparedness programme working with district administration, PRIs, CBOs and local community. ATI facilitates the process by conducting training programmes to sensitize community, PRIs and the government officials about disaster management. Disaster risk reduction is the foundation of community contingency plans, where community is the focus, and there is emphasis on preparedness, mitigation and prevention rather than just response. It should make a strong effort to link it with other development plans. Community Preparedness programmes focuses on Contingency Plan preparation, training of volunteers, awareness and sensitization. A number of workshops at the state and district levels have been held, most vulnerable villages identified and mapped, 17 Community Contingency Plans prepared and 8 approved in gram sansad. Participatory Rural Appraisal tools have been used. He felt that a lot more needs to be done to create awareness amongst the community, in the area of capacity building; appropriate institutional mechanism is and link development issues with disaster management. There is a lot to learn from the community and we need to document it, improve upon it and then disseminate rather than importing new ideas and materials from outside which in the long run proves to be counter productive. In order to ensure sustainability technical departments as well as Panchayati Raj Institutions will have to be involved for mitigation strategies. Role of NGOs/CBOs In capacity building needs to be utilised.

Mr. J.P. Gupta, Team Leader, Gujarat Programmes, UNDP: *Public Education, Awareness Raising and Disaster Planning in Gujarat*

Mr. J.P. Gupta started his presentation recalling the 1998 cyclone which hit Kandla to present the importance of community preparedness. He felt that as the community is the first responder there is a need to prepare the community more than any other levels of respondents. He felt that the Community Contingency Plans needs to be developed in all the cyclone prone areas. According to him Community Contingency Plans are nothing but a list of activities a village decides to follow to prevent loss of life, livelihoods and property in case an emergency. The various task forces formed in the villages should be educated to be aware and prepared to face any eventualities because then only we can be reduce the impact. Use of all possible media is also very much necessary for proper dissemination of information on do's and don'ts, appropriate technologies to be followed in cyclone prone areas etc.

Discussion

All the participants agreed that there is a need for increasing awareness level of the community at large. They felt the two major disaster, the Super cyclone and the Gujarat earthquake have made the community aware of the disaster what need to be done to prepare and mitigate is still not fully understood. The issues that were raised:

- Is there a need to make Disaster Management a part of School curriculum at all levels
- Should all the officials at all levels be given induction and refresher courses on Disaster Management?
- Does the success of Community Based Preparedness Planning of Orissa lead to a national initiative?
- Have we been able to mainstream gender concerns in disaster management, if not how should we do it.

- How do we sustain awareness raising and public education which is being currently being undertaken by different agencies in very haphazard manner?
- Who will ensures community preparedness at all times because after some times the INGOs/ NGOs who are investing heavily may be withdrawn from direct involvement.
- We are creating new teams at the State, District, Block, GP and Village called the Disaster Management Teams—what is their status, do they have a statutory standing, will their decisions at the time of disaster be recognised.

Session: V

INFRASTRUCTURAL INVESTMENT PLANNING IN COASTAL AREAS: CONSTRUCTION OF CYCLONE SHELTERS, TREE SHELTER BELTS, ROADS & BRIDGES, PORTS & HARBOUR FACILITIES, AND PUBLIC BUILDING

Infrastructure includes public utilities such as schools, hospitals, transport, water supplies, and electricity, besides ports and harbours. While some of these are economically important the others are socially important. Investment in infrastructure has always been an important component of national planning and thereby sub serves the objectives decided upon by policy makers. Besides, other partners also invest in infrastructure development to reduce poverty. Investment in infrastructure development in coastal areas will have to factor-in various aspects of cyclone that could destroy the structure and the very purpose that strengthen overall development, both economic and social.

Investment needs to be made so that they are gains are not due any hazard. In the cyclone prone areas these investments have to take into account the impact of a possible cyclone and have inbuilt features to protect it. The topic of this session was Infrastructural Investment Planning in Coastal Areas: Construction of Cyclone Shelters, Tree Shelter Belts, Roads & Bridges, Ports & Harbour Facilities, and Public Building and moderated by Mr. Santosh Kumar, Sr. Consultant, World Bank, New Delhi.

Dr. D.N. Lakshman, Director SERC Chennai on Cyclone shelters and public buildings:

Mr. D. N. Lakshman started his presentation with a brief on the Cyclone Disaster Management framework and what is being done to sensitize the community as well as engineers through guidelines, pamphlets, trainings and construction of demonstration buildings. He explained the characteristics of a cyclonic wind and a study done on them to suggest a design for constructing a demo building. He also pointed out retrofitting needs of existing buildings will have to be studied to make these cyclone resistant. He then explained about different measures, which are taken to study the wind speed and its impact on the residential buildings to develop appropriate codes. He felt that the cyclone shelter needs to be carefully designed keeping the environment of that area in mind. He also presented an example of the SERC developed cyclone shelter incorporating all safety parameters. He emphasized that cyclone shelter and all public buildings should be based on scientific calculations.

Mr. V.K. Sood, Scientist, Central Road Research Institute, N Delhi on Roads and Bridges

He thanked the organizers for giving him this opportunity to present a paper in front of this august gathering. He started his presentation by giving a brief about the length of the coast of India and pointed out that 54% of land is vulnerable to earthquake, 8% is vulnerable to cyclone and 5% to floods and east coast is the most vulnerable as it is the passage for the east and west monsoon. Using data and pictures he presented the increases in flooding due to cyclones and how it increases sedimentation in the rivers, cause problem to drainage system, accelerates coastal erosion, and cause immense loss of human life and property. The main problem of this huge loss is lack of proper planning and lack of data for it. He felt that the need of the hour is proper and scientific planning, designing, construction and maintenance. He felt that roads that are built needs to be properly designed (construction of National Highways take care of this but not the rural roads) taking into consideration all the parameters, maintaining proper drainage system, stabilized embankments to mention a few. He felt the bridges need to take into account the wind speed of the area and then design it accordingly with protection bed with rigid aprons, relief culverts,

etc. His submission to the house was that there is a lot to be done for improvement in this sector specially maintaining a proper data base, capturing learning from past experiences, appropriate choice of construction materials, and robust cyclone disaster mitigation policies.

Mr. M. A. Bhaskarachar (IAS), Chairman, Kolkata Port Trust on Ports and Harbour

Mr. Bhaskarachar talked about the Calcutta Port trust, giving a brief infrastructural scenario of the port and the disasters it has faced over a period. He pointed out that the most vulnerable parts of a port are equipment, vessels, sager and sand heads. He informed the house that all ports have disaster mitigation plans mentioning response to warning signals, securing of vessels, equipments, standby crews and communication channels have been properly mentioned. The communication protocol to be followed and the liaison it has to maintain with the state governments are also indicated. All senior officials are involved to implement the plan but there are still many gaps that need to be filled up. There are very few or no cyclone shelter in and around the ports. There is always a funds crunch for immediate damage control or to undertake repair of serious damage which hampers the utilization of the port for a long period. There is no provision for relief for the port personnel's which in turn effects immediate restoration of port operations.

Discussion:

The participants mentioned about the possible damage to the Ports and Harbours, roads and bridges during a cyclone and the lack of proper planning or support for these infrastructures. Some of the major issues which came up were:

- There was no Risk appraisal of infrastructure projects—primary and secondary risks—direct and indirect –both ways
- There is a need to undertake Disaster Reduction Appraisal along with Environmental Impact Assessment because of the structures being built in hazard prone areas.
- Master Plan for Developmental Projects and Disaster Management Plans do not take into account land use plans and coastal zone management plans
- The financing institutions investing in infrastructure are more worried about penny pinching at a particular given point of time and do not invest properly for possible future hazard. This need to be discouraged and awareness needs to be created to ensure that the development gains are not lost.
- In the coastal areas cyclone shelters have been constructed by the government, INGOs/NGOs but there has been no systematic code for building on the coastal areas. There is a need to ensure that all public utility buildings in the coastal areas are made with cyclone resistant features.
- It is desirable to involve communities in maintenance of buildings which are exclusively used as cyclone shelters.
- There is a need to create awareness among communities about safe housing technologies and promote Individual safe housing in coastal areas

- There is also a need to develop a Safe housing atlas for awareness and info.
- Incorporation of disaster resistant features should be made mandatory in all state and national housing schemes
- We have to debate more on how we can ensure that roads and bridges are multi-hazard resistant. Here the institutions like IIT have to take a major role.
- There was also a debate on the need for Disaster Reduction Mission: do we need one and if yes, what linkages it should have with other missions [NLMA/SSA/...]

Session VI

SESSION MODERATED BY MR. R.K. SINGH (IAS), JOINT SECRETARY (DM), MHA)

This session was open house discussion and addressed various issues related to developing a framework for national cyclone mitigation strategy, need for convergence of all development programmes towards cyclone mitigation and techno-legal as well as institutional framework for implementation of the strategy. The major issues discussed in this session were:

- Timeliness, quality, language, and dissemination procedure for early warning
- Lack of linkages between various data collecting agencies
- In coastal management there is a need to review the existing legislations from vulnerability reduction lens and suggest steps for mainstreaming it within the broader framework of environment management
- Linkage between environment and disaster management plans as well as committees
- Management of coastal ecosystem through plantations and limited construction in eco-fragile areas or proper land use planning
- Increasing awareness of communities on disaster management, conservation of ecosystem as means of vulnerability reduction
- Disaster management should be a part of the study curriculum at all levels
- Reorganization of all Disaster Management Groups
- Risk appraisal as a part of infrastructural development
- Strengthening the code and norms related to construction in the coastal areas for all type of infrastructure
- How to improve community participation for all mitigation activities

Recommendations

The following emerged as recommendation for a draft framework for comprehensive Cyclone Mitigation strategy.

A. Weather forecasting and early warning: Policy, legal and institutional issues

National level	State and district levels
<ul style="list-style-type: none"> • Reduce lead time to the extent scientifically feasible. • Better facilities for interpretation. • Improved instrumentation. • Make the language of the warning more understandable and usable with improved dissemination facilities • There is a need to improve the dissemination procedure – make it faster. • The Satellite imagery should be put on the website more frequently with information and analysis. • Institutional mechanism including IMD, ISRO, CWC, etc with better information collection structure – Cyclone Steering Committee. • Weather Information Charter for citizens within one month. • Time gap between receipt of information from sensors and its dissemination to the public to be reduced to the minimum 	<ul style="list-style-type: none"> • Promote use of local language for dissemination of information (local language dictionaries to be used by cyclone warning centres). • Content of the warning message must be simple, understandable and usable. • Need to establish credibility and acceptability of warning messages. • Two ways communication system needs to be established and strengthened – Control Room at block level that can be accessed by people seeking information. • Flags on cyclone shelters. • Community radio, Ham radio, 24 hr music channels could be strengthened. • Linkage with the community could be strengthened using trained community volunteers for dissemination of information. • Steering committee should also be formed at the national as well as State levels.

**B. Integrated coastal zone management including delta and food and control structure management
National & Regional Level**

- Committees at all levels to include representatives of Disaster Management Division.
- There is a need for integration of the committees [three committees presently at the Centre discussing issues of coastal environment.
- Data/information for sharing needs to be collected at one particular place for overall planning.
- Legal provisions of environment protection laws to be strengthened.
- There should be no dilution in coastal regulations and the Bill introduced for this purpose may be withdrawn.
- Interactive website/knowledge hub for sharing of information.
- Commitment of the States to help each other.
- Training and capacity building of the personnel at all levels.
- Nodal agency should be made – necessary legislation needs to be amended.
- Along with the EIA, Disaster Risk Assessment also needs to be made compulsory for all major development projects.
- Coastal shelter belt plantation should be continued.
- National Action Plan on development of mangroves and coral reefs and State level micro plans should be integrated with CZM
- Coastal embankments built long back should be taken up by Water Resource Department for maintenance.
- Embankment management should be with the community with the technical advice of experts
- India Disaster Resource Network after validation in Orissa will be taken up in other States.
- Satellite based communication system (POLNET) to be extended and used for disaster management communication.
- Capacity building at the local level for all communication systems.
- Disaster management authorities will be able to bring in more coordination between different departments. Response should not be kept separate from preparedness and mitigation – CEO of the DMA should be ex-officio Secretary to the Government.
- There is a need to build local capacity multi-disciplinary teams in the Government for dealing with all issues concerning disaster management.
- Need to do a feasibility study of all the existing models for formation of the most appropriate model disaster management unit.
- Environment Protection Act should be amended to provide for stiffer penalties

C. Public Education, Awareness Raising and disaster planning

- Need for disaster mitigation concerns to be built into development plans.
- Need for clarity of roles and responsibilities of all the stakeholders i.e. community, Government, civil society.
- Need for institutionalization of CBRM/VDMCs / Disaster Management Planning by amending manuals.
- Use the existing structures like NCC/NSS/NYKS/DIET/DPEP etc. for capacity building and awareness generation.
- AICTE to include mitigation technology in undergraduate courses.
- COBSE curriculum to include district level planning committee to look into the mitigation needs of the district and plans for fund allocation from all the Departments.
- CBSE – awareness/Dos & Don'ts in syllabi for classes 8th and 9th.
- ATIs in hazard prone States need to be given more funds. Selected ATIs could be upgraded and supported as specialist centres for selected hazards.
- Use of media channels for awareness generation.
- Regular courses for disaster management should be introduced – existing IGNOU, Sikkim Manipal University.
- Training/sensitization of media
- Institutionalization of the planning process at the village level – inclusion in manuals, policy/Acts.
- Use already existing training centres.
- Disaster mitigation awareness campaigns.
- Training for the administrators and the implementers and legislators – refresher courses.
- Trauma counselling
- Relief codes in relevant manuals to be amended to include VDMCs/Disaster Management Plans etc.
- Institutionalization of the planning exercise for Disaster Management should be vested with the Panchayat for the villages.

D. Infrastructure investment planning in coastal and island regions

- Hazard and vulnerability analysis.
- Complete risk transfer mechanism under DRA may be through insurance and should be aggressively followed till the village level.
- Construction of embankments more R&D needed/alternative methodologies found to reduce risk.
- Not to allow any development projects in ecologically sensitive fragile areas.

- Retrofitting of public buildings needs to be taken up first and building norms strictly maintained for new constructions.
- Promote participation of banks, corporate sectors, NRI for mitigation initiatives through proper information sharing.
- All public funded buildings [schools, hospitals, Government buildings] in cyclone prone areas must be built to withstand high intensity cyclones.

Safe shelters

- All Government and Government sponsored buildings should be cyclone resistant.
- At least one water source for safe drinking should be made available above the flood water level of the area.
- A critical infrastructure data base must be created for every cyclone prone district consisting of data on roads, bridges, dams, power supply, telecommunications, and mangrove plantations.

Roads/Bridges and Ports/harbours in coastal and island States

- Off site plans for the port authorities and industrial areas needs to be made and shared with community as well as migrant labourers of their areas.
- India Disaster Resource Network-Authorities controlling equipments should register in the network.

CLOSING CEREMONY

**GUEST OF HONOR
MR. R.K. SINGH (IAS)
JOINT SECRETARY (DM), MHA**

**CHIEF GUEST,
DR. SHRIKUMAR MUKHERJEE
HON'BLE MINISTER OF STATE, HOME (CIVIL DEFENCE),
GOVT. OF WEST BENGAL**

**PRESIDENTIAL ADDRESS
MR. S.N. ROY (IAS)**

Introduction by S.K. Jha, ARR (VR & SE)

Mr. Saroj Jha, ARR (VR & SE), UNDP introduced the Chief Guest, Hon'ble Minister of State Dr. Shrikumar Mukherjee, who is an IITian from Kharagpur and served as Reader of Mathematics in a prestigious Collage in Malda. He has a great interest in Disaster Management and has been taking keen interest in the activities of ATI. Mr. Saroj Jha for the benefit of the minister gave an overview of the workshop. "Sir, this workshop is being organized by the Ministry of Home Affairs, Government of India, in collaboration with the Government of West Bengal and UNDP, India with a focus on Developing a National Cyclone Mitigation Strategy in the Coastal and Island Regions of India. We have been debating on a large number of issues, looking at the current status of preparedness and mitigation initiatives being taken in different coastal and island states in the country. After that we had several technical sessions- starting with a session on weather forecasting and early warning dissemination, followed by a session on integrated coastal management, session on public education, awareness raising and disaster planning, and finally after lunch a session on infrastructure planning as to how they will help in cyclone mitigation and not compound the problem. The participants essentially include representatives from Government of Orissa, Gujarat, Maharashtra, Andhra Pradesh, Andaman and Nicobar Islands, Lakshwadeep and West Bengal, and then we have participation from Ministry of Home Affairs, Department of Ocean Development, and Ministry of Environment and Forest, from the academic institutions such as SERC, Chennai, IMD, IIT, CWC, retired experts from the area of structural engineering and metrological forecasting, we also have representatives from International Organizations such as USAID, DFID, World Bank, UNICEF, and some of the reputed non governmental organizations like the Tagore society for rural development from West Bengal, Prepare from Chennai, CARITAS and others. Even though this discussion has formally come to an end, we have decided to continue our discussion to finalise the recommendations which will form the basis for National Cyclone Mitigation Project for the Government of India after this closing function.

Welcome Address by Mr. K. John Koshy, Director, ATI, Kolkata

Shri Srikumar Mukherjee, Hon'ble Minister of Civil Defence, Government of West Bengal, Mr. R.K. Singh (IAS), Joint Secretary (DM), MHA, Mr. S.N. Roy (IAS), Chief Secretary, Govt of West Bengal, Mr. Ardhendu S. Banerjee (IAS), Jt. secretary, Relief, Govt of West Bengal, Mr. Saroj Jha,

UNDP, other representatives of UNDP and all the participants. It is my pleasant privilege to extend a hearty welcome to Sri Srikumar Mukherjee, Hon'ble Minister, to this concluding session after two days of intense deliberations and sharing of ideas, the mitigation strategy for the coastal zones are being finalized. We are very happy that ATI was the venue for this exercise and we have also been a part of capacity building in the area of Disaster Management. We hope that there will be a strong element of capacity building and training in the National Mitigation Strategy also. I once again welcome the Hon'ble minister to this function and also the distinguished participants from the government of India and different state government and other organizations.



Address by Mr. Nikhilesh Das, Principal Secretary, Relief, Government of West Bengal (Presidential Address by Mr. S.N. Roy (IAS), Chief Secretary, Govt of West Bengal)

Mr. Das read out the speech of the Chief Secretary who was busy with the sudden visit of the Dy. Prime Minister. "He expressed his happiness for organizing this workshop by MHA and UNDP. He felt that over the last few decades there has been increase in the occurrence of Natural calamities due to environmental degradation and also human interventions. The last two days of deliberations amongst the participants has strengthened our vision for mitigation of natural calamities and human sufferings. The time has come when we need to take a holistic view towards mitigation. While we are



formulating a National Cyclone Mitigation Strategy we should take an integrated approach to fight other disasters. We need to create a forum of the coastal and island states to combat disaster in a systematic manner.

Following the Yokohama Strategy for a safer world, we should make a serious endeavour for making the natural disaster reduction process, a part of the development plan. We should not view disaster as a relief and rehabilitation event but prepare disaster management plans with an approach of integrating development process and crisis management. This will eventually reduce the intensity of the calamity and ultimately save human lives. We should develop disaster management maps that give an overview of disaster and available resources on a single map. I hope that through coordinated efforts at all levels; we shall be able not only to reduce the impacts of the natural disasters but also approach towards sustainable economic development.

We need to give top priority to disaster mitigation process in our development plan despite financial constraints because even a small amount spent on reduction of natural calamity will pay rich dividends. Efforts should be made to dovetail Plan money with the funds available with the Panchayati Raj. Our state has take steps to provide training to the PRIs and Rural development functionaries on disaster Management. Our state has also given top priority to afforestation in the coastal area as well as plateau area. It is a well know fact that if we are able to increase mangrove in Sundarbans we will reduce storm surge.

For Future Cyclone Mitigation, I strongly feel that there should be a proper approach to Weather Management System. Forecasting of warning messages well ahead of cyclone will have to be ensured. I feel there is a need to change the CWCD system into a digital system. I want to thank the IMD for installing a Doppler radar in Kolkata which can play a vital role in detecting the movement of cyclone for a wider area.

In the coastal areas we need a number of cyclone shelters. We have constructed some with our limited resources but we need more funds from the Government of India other than CRF for construction of the same. We need a number of equipment for search and rescue. There are a lot of embankments made from the Zamindari times which require repair and maintenance; I strongly feel that the government of India should come forward in phased manner to assist the state government in reducing the onslaught of disasters. More over experts from technical institutes should help in improving the design of the earthen embankments. I hope the representatives of different states will agree that the government of India should allow the states to utilize the funds from the Calamity Relief Fund for pre-emptive action by enlarging the scope of present guidelines.

Disaster Management cannot be the responsibility of the government alone and the community has to play a greater role. In West Bengal we have already taken Community based disaster Preparedness programme with the help of UNICEF through ATI, with help of NGOs and Local Panchayats. I believe that Ministry of Home Affairs in collaboration with UNDP will play a vital role in all the coastal states and island in future.

We are thankful to Government of India for holding this workshop in Kolkata. We are also grateful to the participants for bearing with us for shortcomings if any in our arrangements. We assure the Government of India that we shall take further effective steps as per the recommendations of this National Workshop".

Address by Guest of Honour, Mr. R.K. Singh (IAS), Joint Secretary (DM), MHA

The honourable Minister of Civil Defence, Sri. Mukherjee, Principal Secretary, Relief, Government of West Bengal Mr. Das, Mr. Koshy, & Friends. Sir, I would like to begin with thanking you, thanking Mr. Das and the UNDP for making this possible. This consultation has been of the highest importance to us in the GoI. In the GoI we had not been taking a holistic look at cyclone mitigation up to now, primarily every state was left to its own devices, to its own plans with the hope that the states would be doing something, many of the states have been doing a lot and there is no doubt about that. But we have decided that we need to look at cyclone mitigation at the national level and find out what needs to be done and we are thankful to Mr. Das and Saroj, UNDP to make this consultation possible. This consultation has been very useful and we are in the midstream, the consultations have been very lively. Due to time constraints many have been stopped from really expressing themselves. If we had allowed the discussion we would have been here for more days, thus we had to cut short our discussions.



Before I come to the issue being discussed, I would like to respond to some of the issues raised by the Chief Secretary. One is about the CRF and expanding its guidelines, Sir, you will be glad to know that we have setup a committee to revise and review the guidelines, so if any one present here has any suggestions or recommendations on guidelines kindly send it and I would request the Government of West Bengal also to send it. The idea to review CRF is to make it more liberal and we have already said that it can be used for procurement of search and rescue equipments. We will be sending a letter soon as the decision has been taken. The condition of the Civil Defence in the country as a whole is in a bad shape and one of the reasons was that GoI was giving 25%, and 75% by the state government but the financial position of the states has been bad. We set up a committee to review the present status, reasons and give recommendations. We will shortly taking a decision. Why I am mentioning it here is because we are expanding the ambit of Civil Defence to include Disaster Management. Sir, this organization will be playing a key role and we will get in touch with you as soon as the government takes a decision.

Recommendations of the Workshop:

- Timeliness of warning (How do we communicate to the people, language, fastest way it can reach the cutting edge)

- Coastal Zone Regulations have been flouted by vested interest and we as a body feel that it has to stop.
- Development is fine but they are not fine if they disturb the ecosystem and they have to be in harmony with the ecosystem and no development has the right to take away the shield that is available to the people
- Community participation in the management of the ecosystem, and it has to be informed community participation
- As disaster managers we are also a stakeholder in the management of the coastal zone and we will be involved in any decision taken with respect to it.

Community awareness, community mobilization and community preparedness-these are necessary and planning should begin at the community level and should be holistic i.e development plan and disaster management plan should merge and there should not be any dichotomy. It has to be institutionalized by revising the relief codes so that the disaster management teams are recognized and consulted. We still have to discuss a lot more and will continue later in the day.

Address by the Chief Guest, Dr. Shrikumar Mukherjee, Hon'ble Minister of State, Home (Civil Defence), Govt. of West Bengal

“Firstly, I want to thank GoI and UNDP for organizing this workshop in West Bengal and it is a pleasure for us. I want to mention some of the points.



It would have been very nice if I could have attended the whole workshop at least to understand how other states are thinking. Any way some booklet will be coming out and naturally I will go through it and understand how other states think and also how the government of India is thinking

We have divided the whole of WB into five regions, i.e. Hill region (Land Slide-Darjeeling, Kalinpong and Karshiang) Flash Flood (Darjeeling, Kochbihar and Jalpaiguri), Flood (five to six districts), Cyclone (Midanapur and 24 Parganas), & the industrial disaster zone (Haldia, Durgapur, Raniganj). 165 blocks in West Bengal are disaster prone, and for cyclone we have identified three districts. We have taken a decision to train 10 volunteers in each block for the particular disaster which takes place in that block. We are trying to raise 1050 volunteers in West Bengal so that they are able

to combat a particular type of disaster that takes place in that Block. I am thankful to UNICEF who has supported this endeavour, also CARE who is giving refresher training to these persons who have already got the training. Syllabus has been prepared for them.

We are also taking up mangrove plantation with the help of forest department and our civil defence volunteers. We have one lakh registered Civil Defence volunteers, 22,000 Home guards, 2 battalions of civil emergency, water wings battalion (550), we have also got lot of boats from Rama Krishna Mission, UNICEF and some procured with our own funds.

Our Civil Defence is very effective and they have been very useful in natural disaster management but we need more funds for improving our capability. We are also opening one Disaster Management Centre in North Bengal and it will also act as a training centre for the home guards. Boats will also be kept there and in the monsoon period it will be open for 24 hours and in normal times 16 hours."

In 1996 an Advisory Committee of nine members were formed to look after the Civil Defence matters but till date they have not met for once. I would request the Joint Secretary to call this meeting so that concerns and best practices could be shared amongst all.

I thank all of you from the government of India, different organizations, state governments for coming to this workshop. I am sure this will be a great success.

Vote of Thanks by Mr. Ardhendu S. Banerjee (IAS), Jt. secretary, Relief, Govt of West Bengal

Respectable Minister of Civil Defence, my senior colleagues and friends, the workshop which started with an inspiring lecture from Minister of relief yesterday has come to an end with an inspiring lecture and supportive suggestions from the Minister of Civil Defence, Government of West Bengal. Before the curtain is drawn I would like to thank on the behalf of the organizing team both the Ministers, for being with us and inspiring us with some inspiring words and also hope that in future when we proceed in the direction of Disaster Management we will be getting their guidance and support throughout. This workshop has been a boon for our state, because when we are about to enter the cyclone season we have felt the necessity of a forum to exchange ideas to synergise efforts and to develop a strategy for the coastal region which is the most vulnerable areas of the world. Every second or third year we see an area is affected by a disastrous cyclone, and that particular place draws its own plans from its own experiences and when the next area is hit it learns from its own experiences because it is not ready with its strategy. Why is this gap, because we need a forum to exchange our ideas and experiences and synergise our efforts so that we are able to develop a common strategy towards mitigation of cyclone and other hazards. So I am really grateful on the behalf of the state government to the Government of India for holding this workshop in collaboration with UNDP.

Secondly, this workshop could not have been possible without the unconditional support of the Principal Secretary, Mr. Nikhilesh Das, Government of West Bengal Mr. K. J, Koshy, Director, ATI Kolkata, Mr. R. K. Singh, DM, Government of India, Mr. Saroj Jha, UNDP. We extend our heartfelt thanks and gratitude to all of them. We have a long list of persons who have helped us in organizing this event. We also thank the UNDP team that worked untiringly side by side with the Director of Relief and his team of officials. I also want to thank the other officials and their staff of ATI whose support made it possible to hold this event in such a beautiful manner. We also extend our thanks to the Authorities of the Calcutta Port Trust, S. N. Bose Institute of Basic Sciences, Circuit House, State Guest

House, Ordinance factory for providing us with accommodation for our delegates. Lastly we express our heartfelt thanks to senior government and non-government officials, eminent scientists, academicians and experts from different fields who have come from different parts of India as well as representatives of government and non-governmental institutions such as OSDMA, GSDMA, SERC, CRRI, CWC, IMD, Ram Krishna Mission, NATMO, DMI, Ahmedabad and DMI, Kolkata. My Hon'ble Minister Sir, we are sorry to hear that you had a mind to come but could not come, we had lively two days of discussions, and all the delegates have exchanged their experiences that we really wanted for a long time. After two-day brain storming session we have come up with broad framework for a National Cyclone Mitigation Strategy in the coastal and island regions of India. Dear delegates we have learnt many things from your experiences and will cherish the memories of your deliberations. We wish you all the best.

Historical Records of Severe Cyclonic Storms Which Formed Over Arabian Sea And Made Landfall at Western Coast of India During The Period From 1970-1999

Sl.No.	Date	Landfall/Devastation
1.	October 19-24,1975	Crossed Saurashtra coast about 15 km to the north-west of Porbandar at 0930 UTC of October 22. The storm maintained its severe intensity inland upto Jamnagar Rajkot area. Maximum wind speeds were 160-180(86-97 kts) 85 people died. The cyclone caused considerable damage to property (estimated to be about Rs. 75 crores.)
2.	May 31-June 5, 1976	The storm crossed Saurashtra coast on the morning of June 3. Maximum wind speed of 167KMPH(90 kt) was reported by the Ship HAAKON MAGNUS. People killed 70:51 villages were affected badly: 25,000 Houses were damaged: 4500 Cattle heads perished. The total damaged was estimated to be Rs. 3 crores.
3.	November 15-23, 1977	Crossed near Honavar Karnataka and Kerala coast was affected. Tidal waves were reported to have damaged 620 Fishing vessels.
4.	October 28 to November 2 , 1981	Crossed Saurashtra coast west of Mangrol shortly after mid-night of November 1 and moved closed to Porbandar in the early morning of November 2nd. Then moving northeastwards as a severe cyclone upto Jamnagar, it weakened into a depression and lay near Radhanpur at 1200 UTC. About 5700 houses and about an equal number of huts were partially or fully damaged in Junagadh, Jamnagar districts.
5.	November 4 to 9,1982	Crossed south Gujarat coasts 5 km west of Kodinagar (Veraval) 511 persons lost their lives. 12624 Pucca and 54549 Kutchha houses completely destroyed. Damage to crop to the tune of Rs. 127.23 crores.
6.	October 1-3 , 1992	Crossed Oman coast on 3rd October morning and weakened rapidly into a low pressure area over Saudi Arabia by the morning of October 5th the system did not cause any rainfall or damage to India.
7.	November 12 -15 , 1993	Dissipated off Gujarat-Sind coast on 16th early morning. No loss of life or damage to property on the Indian territory as the system weakened over the sea itself.

N.B= only severe cyclonic storms and above its intensity have been taken into account. No severe cyclonic storms were reported in the Arabian sea during the period 1970 to 1999

Sl.No.	Date	Landfall/Devastation
8.	November 15-20 . 1994	Crossed north Somalia coast on the early morning of November 20. As the system hit the sparsely populated region north of Somalia. The death toll reported to be 30 only.
9.	June 17-20. 1996	Crossed near Diu between 2200 and 2300 UTC of 18th June. 33 people died and near about 2082 Cattle and 2472 people were affected in Maharastra, 14 persons died and 1611 houses damaged
10.	June 5-9 1998	The cyclone crossed Gujarat coast north of Porbandar at 0200 UTC of June 9. The system maintained its intensity till noon when it lay over Gulf of Kutch port. Thence onwards it moved north - east wards and weakened gradually. Total lives lost 1173 and 1774 persons were missing. Losses incurred due to storm were of the tune of Rs.1865 crores.
11.	May 16-22, 1999	Crossed Pakistan coast to International Border in the afternoon of May 20. The system caused severe damage in Kutch and Jamnagar districts. Loss of life:453: Loss of property : Rs. 80 crores. Partial damage: 5153. In Rajasthan loss of life is one. Cattle heads perished: 5104. Houses completely damaged: 50. Partially damaged: 5153

Historical records of Severe Cyclones which formed in the Bay of Bengal and made landfall at the eastern coast of India during the period from 1970-1999

Sl.No.	Date	Landfall/Devastation
1.	September 7-14, 1971	Crossed South Orissa coast and adjoining North Andhra coast on September 10 and moved up to eastern Delhi. 90 People died and 8000 Cattle heads perished. This system caused considerable damage to crops, houses, telecommunications and other property in the coastal districts of Orissa.viz.,Ganjam, Puri and Cuttack.
2.	September 20-25. 1971	Crossed South Orissa coast near Gopalpur on September 22 nd .Caused considerable damage to crops and houses due to flood and heavy rain at Vamsadhura village in Srikakulum and Koraput districts.
3.	September 27- October 1,1971	Crossed West Bengal coast near Sundarbans . Continued its movement towards NW, weakened into a low over Bihar State on October 1.60 People died and thousands of houses were collapsed in West Bengal.
4.	October 26-30,1971	Crossed Orissa coast near Paradeep early in the morning of October 30.Maximum wind speed recorded was 150-170KMPH (81-92 kt).Lowest Pressure recorded 966.00 hPa .near the centre of the storm. 10,000 People died and more than one mullion people rendered homeless.50,000 Cattle heads perished, 8,00,000 Houses damaged.
5.	September 7-14. 1972	Crossed the extreme North Andhra Coast near Baruva on the afternoon of 10th. Maximum wind speed recorded at Puri was 175 KMPH (94 kt) The maximum wind speed estimated from the satellite picture was 204 KMPH (110 kt).100 people died and 8000 cattle heads lost. Near about 2 lakhs people were affected due to this system. Heavy damage to crops and other property was reported from Ganjam, Puri &Cuttack districts, the worst affected being Ganjam district.
6.	September 20-25, 1972	Crossed extreme South Orissa coast near Gopalpur on the afternoon of 22 nd and weakened into a depression by the morning of the 23 rd .Max. wind recorded in gust was 136 KMPH (73 kt) at Gopalpur about 0740 UTC on 22 nd .Caused. Caused damage to crops &houses. No loss of life was reported.
7.	November 15-23, 1972	Crossed extreme south Andhra coast near Sriharikota Island during the early part of the night on 22 nd .The maximum wind was reported 111 KMPH (60 kt) gusting to 167 KMPH (90 kt) recorded by the ship ATAF. Lowest pressure recorded near the storm centre was 983.0 hPa.80 People killed. Many trees were uprooted and several thousands of people rendered homeless in their districts.

Sl.No.	Date	Landfall/Devastation
8.	December 1-8,1972	Crossed Tamilnadu coast close to and north of Cuddalore at 2330 UTC on 5th December and was within 50 km WNW of Cuddalore at 0300 UTC on December 6. Maximum wind speed recorded at Cuddalore was 111 KMPH to 148 KMPH (60-80) between 2230 UTC of 5th & 0230 UTC of 6th.80 People killed and 30,000 people rendered homeless in Madras due to flood. Total loss Rs. 40 crores.
9.	November 3-9, 1973	Crossed Orissa coast close to and north of Paradeep on the early morning of 9th. It weakened rapidly and lay as a trough over Orissa same day. Maximum wind reported 100 KMPH (54 kt) at Paradeep and Chanbali experienced surface 2wind of 100 KMPH (54 kt).This cyclone caused some damage to standing crops in the coastal districts of Orissa between Paradeep and Chanbali.
10.	August 13-20, 1974	Crossed West Bengal coast near Contai at about 0700 UTC on 15th afternoon and remained cyclonic storm over land until August 17.Maximum wind speed was 139 KMPH (75 kt).The storm caused floods in parts of districts of Midnapur, Hooghly, Howrah and 24 -districts of West Bengal.
11.	September 6-19, 1976	Crossed coast near Contai around noon of September 11 and reached Southeast Madhya Pradesh as a cyclonic by 13th morning. Maximum wind 160 KMPH (86kt) was in gust reported . 40 people died and 4,000 Cattle heads perished. Crops damaged were of the order of 1.25 Lakh.
12.	November 3-6, 1976	Crossed Andhra Coast just north of Machlipatnam on the night of 4th. It maintained its intensity over land upto 5th morning when it was centered about 50 km southeast of Hyderabad. Then it gradually weakened into a depression and emerged into the Arabian sea off North Maharashtra coast by 6th afternoon. 25 people killed and 25,000 huts damaged. 13 fishermen were missing.
13.	November 15-17, 1976	Crossed South Andhra Pradesh coast between Nellore and Kavali on 16th midnight, weakened thereafter it lay as a deep depression over South Andhra Pradesh coast and adjoining Rayalaseema on 17th morning. Maximum wind speed was estimated to be between 222-259 KMPH (120-140 kt) 30 People died and 10,000 houses damaged ,24 country boasts damaged Total loss of property was estimated to be Rs. 3.9 crores. KavaLI AND Kavur taluks of Nellore districts of A.P. were most affected by this cyclone.
14.	October 27- November 1, 1977	Crossed South Andhra Pradesh coast near Kavali between Nellore and Ongole around noon of 31st. Weakened into a depression over the interior parts of Karnataka by morning of November 1 and emerged into the Arabian sea as a low. It caused huge

Sl.No.	Date	Landfall/Devastation
		damage to property and Telegraph posts over 80 km stretch from Kavur to Singaraykonda about 40 km on either side of the storm track stood slanting.
15.	November 8-12, 1977	Crossed Tamilnadu coast within 10 km to south of Nagapattinam early in the morning of 12th around 2230 UTC of 11th. Weakened into a cyclonic storm by that evening over interior parts of Tamilnadu and emerged into Laccadives off North Kerala coast on the morning of 13th as a deep depression. Maximum wind recorded about 120 KMPH (65 kt) on 12th morning at Thanjavur, Tiruchirapalli and Podukottai. 560 people died and 10 lakh people rendered homeless. 23,000 Cattle heads perished. Total damage to private and public property estimated to be Rs. 155 crores.
16.	November 14-19.1977	Crossed near Chirala in A.P at 1200 UTC on 19th Nov and weakened into a low on the evening of 20th. It dissipated over Southeast M.P and adjoining Orissa by 21st evening. Maximum wind speed recorded by the ship Jagatswami recorded at 1030 UTC on 17th was 193 KMPH(104kt) Loss of human lives reported as 10,000. 27,000 Cattle head perished. Damage to the crops and other property was estimated to be around 350 crores
17.	November 19-24. 1978	Crossed between Kilakkarai and Rochemary and Ramanatharam District of Tamil Nadu on 24th evening as a severe storm and emerged into the Arabian Sea off Kerala coast as a deep depression on 25th morning. Batticola of Sri Lanka reported maximum wind speed northerly 145 KMPH (78 kt). In India 5,000 huts damaged and total damage estimated to be around Rs. 5 crores. In Sri Lanka, 915 people died and one million people affected One lakh Houses were damaged in Sri Lanka.
18.	May 10-13 1979	Crossed near Ongole in A.P. early morning of 13 th May 1979. Nellore reported maximum wind speed of 100-160 KMPH (51-86 kt) The storm surge was 12' above mean sea level at Pedddaganjam .Some coastal villages of Kavour. 700 People killed and 3 Lakh cattle heads perished. Near about 40 Lakh people affected. House damaged 7 Lakh.
19.	September, 24-28. 1981	Crossed Orissa coast near Puri on the early morning of September 26 and weakened into a depression on that evening over interior Orissa and adjoining East Madhya Pradesh. 5 Launches were lost in the Bay and many housed were damaged in Midnapur districts of West Bengal and Cuttack districts of Orissa.
20.	December 4-11. 1981	Crossed West Bengal Coast near Sagar Island around 1300 UTC on December 10 and weakened into a depression on 11th morning

Sl.No.	Date	Landfall/Devastation
		over Bangladesh and into a low the same evening over Assam and Meghalaya.200 people died in 24 Parganas district of West Bengal One Million people affect in the districts of 24 Parganas.
21.	May 31 to June 5th 1982	Crossed on 3rd June near Paradeep , Orissa As a result of high tides damage caused all along this Coastal stretch. This cyclone caused heavy damage in the coastal districts of Puri , Cuttack and Balasore.
22.	October 11-17 , 1982	Crossed A.P. coast and adjoining Telengana as a low on 17th morning. Heavy rainfall caused damage to roads.
23.	16-21 Oct. 1982	Crossed between Sriharikota and Dugaraja Patinam(A.P). 60 people died and 300-400 huts damaged.
24.	October 9-14.1984	Crossed North Orissa coast near Chandbali in the forenoon of 14th This system caused some damage in Cuttack and Balasore districts of Orissa and Midnapore districts of West Bengal.
25.	November 9-14, 1984	Crossed between Sriharikota and Durgarajupatnam between 0800 and 0900 IST. Sea water oof2 feet height entered the village Durgarajupatnam on14th and the village Durgarajupatnam on14th and reached 3 km inland from the coast 54 lives in Tamil Nadu, livestock's perished were 90650 and number of buildings destroyed completely were 3,20,000 in A.P
26.	November 27-30 , 1984	Crossed south Tamilnadu coast near Nagapattinam in the afternoon of December 1 near Karaikal. About 35,000 people were affected in East Thanjavur and South Arcot districts of Tamilnadu.50,000 acres of land was submerged in Thanjvur districts.
27.	17-21 Sept. 1985	Crossed on 20 th Sept. close to Puri Orissa Krishna Prasad, Chilka,Tangi submerged for three days due to inundation of sea water 1.5 metre sea wave off Puri coast was
28.	13-17 Oct. 1985	Crossed near Balasore on16th Oct. High tidal Crossed near Balasore on16th Oct. High tidal wave of about 16' to 18' was observed
29.	31 Oct. -3 Nov.1987	Crossed north of Nellore(A.P.) 50 People died in A.A.P. 50 people died and 25,800 livestock's claimed in A.P. 68,000 Housed damaged It affected 6.8 Lakhs population.
30.	November 23-30 1988	Crossed 20 Km west of Indo-Bangladesh b border in West Bengal. At 0000 UTC of 30th it lay centered near Dhaka.2000 People killed. 6000 people reported missing in Bangladesh
31.	23-27 May 1989	crossed 40 Km northeast of Balasore 61 persons died in Orissa and West Bengal 1000 Cattle heads perished in West Bengal

Sl.No.	Date	Landfall/Devastation
32.	01-09 Nov. 1989	Crossed near Kavali (A.P.). 69 people died and 7100 cattle heads perished. Loss of property estimated to be Rs. 14 Crores.
33.	04-09 May 1990	Crossed 40 Km SW of Machilipatnam 967 people died. 3.6 million Livestock perished. 14.3 lakh houses damaged
34.	24-30 April 1991	Crossed Chittagong (Bangladesh) across Sandweep Island.13200 people died Sandweep Island.13200 people died Colossal loss of property. One among The most devastating cyclones affected The most devastating cyclones affected In Bangladesh
35.	11-15 Nov. 1991	Crossed Tamil Nadu Coast north of Karaikal 185 people died and 540 cattle perished 16 people died in A. P.
36.	11-17Nov. 1992	Crossed near Tuticorin (Tamil Nadu).175 people died and 160 reported missing Damage to standing crops due to flood Reported.
37.	01- 04 Dece. 1993	Crossed on 4th Nov. 30 Km north of Karaikal.100 People died in Tamil Nadu.
38.	29 April - 02 may 1994	Crossed near Technaf in Bangladesh around midnight of May 2. Loss of life was limited to 188 due to timely and adequate cyclone warning issued by Bangladesh Met. Office
39.	07-10 Nov. 1995	Crossed North A.P. Coast south of Ichchapuram around 05 UTC of 1o Nov. 93 Persons and 81 boats were affected. 2631 housed damaged. 153 fishermen were reported to be missing.
40.	05-07 Nov 1996	Crossed A.P. Coast 50 Km south of K Kakinada around 1600 UTC of 6th Nov. 978 Persons died. 1375 Persons reported to be missing.1380 Villages affected in A.P. 6464 boats lost in sea.
41.	28 Nov.-06 Dec1996	Crossed near Chennai around 2100 UTC of 6th Dec.1996.The cyclone persisted for 9 days which is reported to be very long life compared to any cyclone in the Indian Ocean. It caused severe damage to life and property.

PROGRAMME SCHEDULE

**Workshop on
Developing Strategy for Cyclone Mitigation in the Coastal & Island Regions of India**

**Organized by
Ministry of Home Affairs, Govt of India
In collaboration with
Department of Relief, Govt of West Bengal &
United Nations Development Programme [UNDP]**

Venue: Administrative Training Institute, Kolkata

Day-I, Tuesday, 4.02.03

9.00-9.30	Arrival & Registration
9.30-10.30	Welcome by Mr. Nikhilesh Dash (IAS) , Principal Secretary [Relief], Govt of West Bengal Address by Mr. Saroj Kumar Jha , ARR(VR&SE), UNDP India Address by Mr. R.K. Singh (IAS) , Joint Secretary [Dis. Mgmt.], Ministry of Home Affairs, GoI Inaugural Address by Hon'ble Minister, Relief, Mr. Hafiz Alam Sairani , Govt. of West Bengal Vote of Thanks by Mr. K. John Koshy (IAS) , Director, ATI, Govt. of West Bengal
10.30 -10.45 AM	TEA BREAK
<i>Session: I</i>	States Presentations: [moderated by Mr. R.K. Singh (IAS), Joint Secretary (DM), MHA
10.45-11.35	Presentation of the State Cyclone Preparedness and Mitigation Plans: Ia. West Bengal, Ib. Orissa, Ic. Andhra Pradesh, [Each state presentation would be of 10 minutes]
11.35-11.45	Open House Discussion
11.45 - 12.35	Presentation of the State Cyclone Preparedness and Mitigation Plans: Id Gujarat Ie. Lakshawdeep If. Andaman and Nicobar Islands [Each state presentation would be of 10 minutes]
12.35 - 12.45	Open House Discussion
20.20-20.20	Presentation of the State Cyclone Preparedness and Mitigation Plans: Ig. Maharashtra, [Each state presentation would be of 10 minutes]

1.20 - 2.00 Open House Discussion

2.00 - 3.00 LUNCH BREAK

Technical Sessions

Session: II [moderated by **Dr G S Mondal**, New Delhi]

3.00 - 4.00 **Regional Protocol for Cyclone Forecasting in the Coastal Regions of India:**
➤ **Mr. R.N. Goldar**, DDG, Regional Metrological Centre, IMD, Kolkata [20 minutes]

Regional Protocol for Early Warning Systems for Floods:
➤ **Mr. R.N.P Singh**, Chief Engineer, CWC, Bhubaneswar [20 minutes]

Strengthening State and District Networks for Forecasting and Early Warning Dissemination:

➤ **Mr.A.K.Parida (IAS)**,Head, Andhra Pradesh Dis. Mgmt Unit & Secy Planning, AP Govt.[10 minutes]

➤ & **Mr K. A. Patel (IAS)**, CEO, GSDMA, Gandhinagar, Gujarat [10 minutes]

4.00 - 4.15 TEA BREAK

4.15- 5.30 Open House Discussion to evolve *an interactive network for forecasting and early warning networking in the coastal states*

RECEPTION DINNER FOR ALL PARTICIPANTS AND RESOURCE PERSONS

Day – II, Wednesday, 5.02.03

Session III Moderated by Mr. Kamal Kishore, Regional Advisor, BCPR, UNDP

9.00- 9.45 **Integrated Coastal Zone Management including Delta & Flood Control Structure Management**

➤ **Mr. B. R. Subramaniam**, Advisor, Department of Ocean Development, government of India, New Delhi

➤ **Mr. E. V. Muley**, Joint Director, Ministry of Environment and Forests, Govt of India

➤ **Prof. S K Dubey**, Director, IIT Kharagpur

9.45-10.00 Open House Discussion

10.00-10.15 TEA BREAK

Session: IV Moderated by Dr. Sarojini Thakur, Advisor (Livelihoods), DFID, India

10.15 - 11.15 **Public Education, Awareness Raising and Disaster Planning in Coastal Regions of India**

➤ **Mr. Aurobindo Behera**, MD OSDMA, Orissa

➤ **Mr. K John Koshy**, Director ATI, Govt of West Bengal

➤ **Mr. J.P. Gupta**, Team Leader, Gujarat Programmes, UNDP, India

11.15-11.30	Open House Discussion
<i>Session: V</i>	Moderated by Mr. Santosh Kumar, Sr. Consultant, World Bank, New Delhi
11.30-12.45	Infrastructural Investment Planning in Coastal Areas: Construction of Cyclone Shelters, Tree Shelter Belts, Roads & Bridges, Ports & Harbour Facilities, and Public Building: ➤ <i>Dr. D.N. Lakshman</i> , Director SERC Chennai on <i>Cyclone shelters and public buildings:</i> ➤ Mr. V.K. Sood , Scientist, Central Road Research Institute, N Delhi on <i>Roads and Bridges</i> ➤ Dr. M. A. Bhaskarachar (IAS) , Chairman, Kolkata Port Trust on <i>Ports and Harbour</i>
12.45-1.00	Open House Discussion
1.00-2.00	Lunch Break
<i>Session VI:</i>	Moderated by Mr. R.K. Singh (IAS), Joint Secretary (DM), MHA
2.00-3.30	Open House discussion on a Broad Framework for National Cyclone Mitigation Strategy, Need for Convergence of all Development programmes towards Cyclone Mitigation and Techno-legal and institutional framework for Implementation of Cyclone Mitigation Strategy
3.30-5.00 PM	Closing Ceremony Address by Guest of Honor, Mr. R.K. Singh (IAS) , Joint Secretary (DM), MHA Address by the Chief Guest, Dr. Shrikumar Mukherjee , Hon'ble Minister of State, Home (civil Defence), Govt. of West Bengal Presidential Address by Mr. S.N. Roy (IAS) , Chief Secretary, Govt of West Bengal Vote of Thanks by Mr. Ardhendu S. Banerjee (IAS) , Jt. secretary, Relief, Govt of West Bengal

LIST OF PARTICIPANTS

Resource Persons

Mr. E.V. Muley
Env. & Forest GoI
Additional Director
Ministry of Environment & Forests
Govt. of India

Mr. R. N. Goldar
Regional Meteorological Centre, Alipore
Kolkata-700027

Mr. R. N. P. Singh
Chief Engg. CWC
Mahanadi and East Rivers Organisation Central
Water Commission,
Bhubaneswar

Mr. A. K. Parida
Director, DMI and Sec Planning Govt. of AP
AP Secretariat, Hyderabad

Mr. B. R. Subramaniam
Advisor, Dept. of Ocean Dev.
CGO Complex New Delhi

Dr. S. K. Dube
Director, IIT
Indian Institute of Technology Kharagpur,
Kharagpur - 721302, INDIA

Mr. Aurobindo Behera
MD, OSDMA
Orissa State Disaster Mitigation Authority
Rajeev Bhavan, Bhubaneswar

Dr D. N Lakshmanan
Structural Engineering Research Centre, Chennai

Mr. K. John Koshy
Director, ATI
Salt Lake, Kolkata

Mr. V. K. Sood
Director Grade scientist
CRRRI Mathura Road,
New Delhi

Mr. M A Bhaskarachar
Deputy Chairman Calcutta Port Trust
15 Standard Road Calcutta Port Trust,
Kolkata

Dr. G. S. Mondal
Former Additional Director -General of IMD
248 Aravali Apt., Alaknanda
New Delhi 110019

Mr. J. P. Gupta
Team Leader, UNDP
Gandhi Nagar,
Gujrat

International Agencies

Mr. Vinod Menon
UNICEF
Programme Officer (Emergency)
UNICEF India County office,
73 Lodhi Road, New Delhi-110003

Mr. Kamal Kishore
Regional Advisor, UNDP
55, Lodhi Estates,
New Delhi-95

Mr A Dasgupta
Program Manager
USAID, American Embassy
New Delhi

Asim Gupta
USAID

Mr. Santosh kumar
World Bank
Disaster Management Specialist,
The World Bank,
70, Lodhi Estate,
New Delhi

Sarojini Thakur
DFID
Rural Livelihood Advisor, DFID-New Delhi,
B-28 Tara Crescent,
Qutab Institutional Area
New Delhi-110016

Nina Minka
USAID,
New Delhi

Mr. Shuman Shengupta
State Representatives
DFID 16, Jubilee
Court 11/1 Chi Minn Sarani
Cal-71

Government of India

Mr. R. K. Singh
Jt. Sec. GOI
Ministry of Home Affairs,
Government of India

Mr. M. D. Sajnani
Director (DM)
Ministry of Home Affairs,
Government of India

State Presentations

West Bengal
Mr. Nikhlesh Das
GoWB
Writers Building
Kolkata

Orissa
Mr. Siddhant Das
ED, OSDMA
Orissa State Disaster Mitigation Authority
Rajeev Bhavan, Bhubaneswar

Andhra Pradesh
Mr. A. K. Parida
Director, DMI and Sec Planning Govt. of AP
AP Secretariat, Hyderabad

Maharashtra
Mr. S. C. Mohanty
Officer on Special Duty
21, Forest Park, Bhubaneswar or Revenue and
Forest Department,
Government of Maharashtra

Gujarat
Mr.G.C. Murmu
Commissioner Geology and Mining
Revenue Dept., Gandhinagar

Mr. K.A. Patel
Government of Gujarat
Collector, Bhavanagar, Gujarat

Lakshadweep
Mr. M.C. B. Nambir
Lakshadweep
Dy. Collector (HQ), Revenue Department,
Kavaratti

Andaman and Nicobar Islands

Mr. V. Kandavelu
Deputy Commissioner
Office of Deputy Commissioner Andaman District
Port Blair

Mr. I. H. Khan
Conservator of Forest, Port Blair
Department of Env. And Forest,
A & N Administration

Press / Media

Mr. S. R. Maiti
Assistant Station Director
AIR, Kolkata

Mr. S. Nelson
CARITAS
Head, Gujarat Earthquake Programme
Caritas India 1 Ashok Place
New Delhi

Other Participants

Mr. Ardhendu Banerjee
Joint Secretary, GoWB
Dept. Of Relief
Govt. of West Bengal

Mr. Taposh Roy
Director, VANI
B-40 Institutional Area
South of IIT
New Delhi-16

S. N. Dutta
CII, Kolkata
CII 6 NS Road Cal-1

Mr. Pratik Kumar Bandyopadhyay
Inspector of Relief
Department of Relief WB 87 A,
SN Banerjee Road, Kolkata-15

Isita Roy
Programme Coordinator
TSRD

Mr. Prosenjit Sengupta
Inspector of Relief
Department of Relief WB 87 A,
SN Banerjee Road,
Kolkata-14

Prabir Bishnu
DMI, Gujarat
Disaster Mitigation Institute,
411-Sarkar V Asharam Road,
Ahemdabad

Deepak Ranjan Kar
Deputy Sec (OSD)
Department of Relief,
Government of West Bengal

Mr. Jacob D. Raj
Executive Secretary, Prepare
Mogappair west
Chennai-600058

Mr. N. V. Raja Shekar
Conservator of Forest (south) & JD/SBR
II Floor, North Block Bikash Bhavan,
Salt lake
Kolkata-91

D Guha Roy
Project Coordinator
Ramakrishna Vivekananda Mission,
Barrackpore, Kolkata

Mr. A. Dasgupta
Chief Engg, I & W
Jalasampad Bhavan, Salt Lake City
Kolkata-700092

Mr. U.N Biswas
Director
Disaster Mitigation Institute,
Salt Lake Stadium,
Kolkata

Mr. Biswatosh Sarkar
Chief Engg, I & W
Jalasampad Bhavan, Salt Lake City
Kolkata-700091

Mr. Sekhar Sengupta
Deputy Director, Relief
Department of Relief WB
87 A, SN Banerjee Road,
Kolkata-16

Capt. T. K. Chowdhury
Director-in- charge marine, CPT
15 Standard Road Calcutta Port Trust,
Kolkata

Mr. B. Roy Choudhary
Manager Infrastructure and Civil Facilities, CPT
15 Standard Road Calcutta Port Trust,
Kolkata

Shri. A. K. Meher
Manager Environment CPT
15 Standard Road Calcutta Port Trust,
Kolkata

Shri A. k. Mukhopadhyay
Officer-on- special Duty, CPT
15 Standard Road Calcutta Port Trust,
Kolkata

Mr. M. M. Pal
Scientific Advisor
NATMO, Dept. of Sc. And Technology,
Government of India,
Kolkata-700042

Shri G.N. Saha
Joint Director
National Atlas & Thematic Mapping Organisation
Government of India

Ms. Ankita Mishra
SDM, Port Blair
Dy. Commissioner office Port Blair

Tushar Kanjilal
Sec. Tagore Society for Rural Dev.

T R Roy
VHAI
Director Special Programme B-40
Institutional Area South of IIT
New Delhi-16

Mr. Sanjoy Razario
Regional Manager
CARITAS India 52-D, R. N. Chowdhury road
Kolkata-15

M.P Singh
Regional Director IIEE
Paryavaran Complex, South of Saket
New Dehi-110030

Mr. Tushar Bhattacharya
State Director, CARE
45 Jhowtala Rd
Kolkata-700019

Sourabh Sen
Economic Specialist
Local US Consulate 5/1 Ho Chi minh Sarani

Ms. Sonali Saha Battacharaya
Research Assistant
NATMO, CGO Complex DF Block Salt Lake
Kolkata-64

Mr. G. B. Thapliyal
PCCF
Aryan Bhawan Salt lake LA-10A, Block II
Kolkata-98

Soma Roy
Programme Officer
CINI Pailan,
Kolkata-700104

Mr. Saroj Ku. Jha
UNDP
256 Forest Park,
Bhubaneswar

Abha Mishra
UNDP
UN House II, 256, Forest Park,
Bhubaneswar

Aslam Perwaiz
UNDP, 55, Lodhi Estate
New Delhi