Managing Disaster in the Marine Sector

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1. Introduction

The coastal region is one of the most vulnerable disaster-prone regions on the surface of planet earth. A wide range of natural, technological and environmental hazards can lead to disasters in the coastal region. This range from simple sea erosion and oil spills to devastating tsunamis and major fires. Historical information on the coastal disasters are scanty except for cyclones, coastal erosions, oil spills and floods. The 2004 tsunami in the Andamans and mainland India has brought to focus the relevance of natural disasters, the vulnerability of people living in the coastal regions, the inadequacy and un-preparedness of the administrative mechanisms to cope with the fall outs and the enormity of the problems and issues in the management and rehabilitation processes.

Disaster management is an emerging science and must be considered in the context of the development challenges that a country faces as a whole. Factors such as growth, employment and wealth redistribution are critical in reducing the vulnerability of people to disasters. Disasters have many consequences. Therefore, it is necessary to understand the various dimensions of hazards and disasters and develop a holistic approach to their prevention and management of their consequences and fall outs.

2. Hazards and disasters

What is the difference between hazards and disasters? Hazards are natural or human induced processes or events with the potential to result in loss. Exposure to a hazard need not necessarily mean disaster. This can be explained through a simple example. Imagine that two persons are

crossing the ocean, one in a large ship and the other in a small boat. The hazards in the ocean (the waves, deep seas, winds, swells, currents) are the same in both cases, but the risks are far greater for the person in the boat than the person in the ship. This is because the small boat is more *vulnerable* to the impact of the hazards like waves, winds etc. Thus, the person in the small boat faces a greater risk of a disaster than the person in the ship although the hazards are the same for both. Therefore, exposure to a hazard need not necessarily mean disaster. It is the level of vulnerability of those who are exposed to the hazard that increases the risk and thus the likelihood of disaster occurrence.

2.1 Disasters in the coastal region

The coastal region is a highly hazardous area and therefore the risks of potential disasters are very high. The hazards in the coastal region and the seas include a variety of natural and human induced processes or events ranging from sea erosion, cyclones, tsunamis, tidal waves, tornados, oil spills, fires, spills in oil and chemical storage tanks on the shore, spills from ships, flooding of dwelling areas with sea or flood water, sinking of fishing boats, entanglement of propellers in nets, entanglement of fishing nets, collision with ships, engine failure, sinking of boats, fire on board, man overboard etc.

2.2 Effects of disasters

Disasters have many impacts and consequences. First, they cause loss of human and animal life. They also result in huge loss of infrastructure, fishing craft and gear, essential civic facilities, fish yields, employment, livelihoods, opportunity loss, disruption in communication, transport, environmental degradation, increase in the level of poverty, migration of people and various kinds of risks including diseases. The indirect impact is that the developmental agenda of the government is disrupted through reduction and diversion of funds. The social impact of losses due to disasters is difficult to measure. They include trauma, depression and grief which continue for long periods after the disaster. Disasters also depress the non-formal economy through direct costs of lost equipments, infrastructure, housing, lives, household items, personal properties. It also results in indirect costs through loss of employment, opportunity loss and other economic losses.

2.3 Linking development with disasters

Viewed from the development perspective, disasters are not seen as isolated acts of nature or situations, Instead, they are expected consequences of poor risk management over the long term. Therefore, they are the outcome of interconnected social and physical processes which increase the risk and vulnerability to threats of varying intensities from very light, moderate to intense. Therefore, both risk reduction and disaster management are multidisciplinary processes involving many types of stake holders. Reducing risk is a developmental initiative with the objective of achieving sustainable growth as well as a strategy for protecting the lives and livelihoods of the most vulnerable people. Thus, it is clear that disasters can provide development opportunities and development can reduce vulnerability.

3. Principles in disaster management

Some of the key principles for disaster management include the following. The management interventions should focus on key issues, not all issues. The most vulnerable people must be taken care of first. The point to remember is to develop a culture of prevention than redemption. The focus must be to integrate in to development and must ensure an equitable distribution of mitigation and ensure community participation in the process. It must have transparency, accommodate local conditions, have legitimacy, must be flexible and adaptable, efficient, effective, affordable, sustainable, needs oriented, prioritized, multidisciplinary and integrated.

3.1 Approaches to disaster management

3.1.1 Key elements in disaster management

The five key elements to disaster management are: **1. Prevention, 2.Mitigation, 3. Preparedness, 4. Response and Relief, 5. Rehabilitation.** Many disasters can be prevented if hazards are recognized and a precautionary approach is adopted. Reducing the risks is the key element in prevention. On the coastal region, staying away from the *vulnerable zone* is one way of prevention. Recognizing the risks of a hazard turning in to a disaster and making the people aware of the risks is a key element in prevention. While it is accepted that many natural disasters cannot be prevented, there are many man made hazards on the coastal region which are potential disasters. The knowledge of the risks lurking under these hazards should be well understood.

3.1.2 Early warning system

Cyclones, tornados, heavy rains and consequent flooding are generally predicted and early warnings issued by the agencies concerned. However, still there are many events such as tsunamis, oil spills, collisions, fires etc. which cannot be warned early. The vulnerable community can be made well aware of the risks and what actions should be taken in the event of an eventuality. It is also necessary to have village disaster warning centers linked to district headquarters where nodal centers could be established for advance warning by linking to meteorological centers, central disaster warning agencies etc. There is need for creation of a well structured, connected and managed early disaster warning mechanism in the country.

A good early warning system will have the following features and capabilities. It should be able to forecast and monitor physical indicators from a wide range of national and international sources. It will be able to do risk mapping and prediction, analyze the information on the duration, severity, spatial extent, probability of occurrence, and time of occurrence and possible impacts on infrastructure, human and animal life and indicate likely losses. It will be able to do vulnerability mapping from both social and environmental angles. It will also provide information on the progress of relief and their impacts. It will be able to procure early warning information and rapidly transfer the information to decision makers as well as prepare suitable advice to the vulnerable population. It will communicate to the media and public especially NGOs and communities in the affected areas so as to enable them to take action to prepare for and mitigate disaster.

3.2 Legislative frame work

In India, there is a **National Disaster Management Committee** under the chairmanship of the Prime Minister set up in 1999 to take immediate action whenever a disaster strikes. A vulnerability atlas prepared by Building Materials and Technology Promotion Council is available with the Govt. of India. The designated nodal ministry for disaster management at the national level is the Ministry of Home Affairs. The Central Relief Commissioner (CRC) in the Ministry is the nodal officer to coordinate the disaster management and relief operations. The CRC receives information relating to forecasting / warning of a natural calamity from the Indian Meteorological Department (IMD) or from the Central Water Commission of Ministry of Water Resources on a continuing basis. The various agencies/

organizations concerned with the primary and secondary functions relating to the management of disasters include: Indian Meteorological Department, Central Water Commission, Ministry of Home Affairs, Ministry of Defence, Ministry of Finance, Ministry of Rural Development, Ministry of Urban Development, Department of Communications, Ministry of Health, Ministry of Water resources, Ministry of Petroleum, Department of Agriculture & Cooperation, Ministry of Power, Department of Civil Supplies, Ministry of Railways, Ministry of Information and Broadcasting, Planning Commission, Cabinet Secretariat, Department of Surface transport, Ministry of Social Justice, Department of Women and Child Development, Ministry of Forest and Environment, Department of Food. Each of the above nominates its nodal officer to the Crisis Management Group chaired by the Central Relief Commissioner. The nodal officer is responsible for preparing sectoral Action Plans / Emergency Support Function Plan for managing disasters.

The National Crisis Management Committee (NCMC) is headed by the Cabinet Secretary. The NCMC gives directions to the Crisis Management Group. The Secretary, Ministry of Home Affairs is responsible for ensuring that all developments are brought to the notice of the NCMC promptly. The NCMC can give directions to any Ministry / Organization for specific action needed for meeting the crisis situation.

The Crisis Management Group is chaired by the Central Relief Commissioner in the Ministry of Home Affairs. The CMG's functions include review of contingency plans formulated by various sectors, review of measures required to deal with natural disasters, coordination of the activities of the central ministries and state government in relation to disaster preparedness and relief, providing information from the nodal officers on measures relating to the above. The CMG, in the event of a natural disaster, meets frequently to review the relief operations and extend all possible assistance to the affected States to overcome the situation effectively. The Resident Commissioner of the affected State is also associated with such meetings. All the above mechanisms enable the country to be in readiness for coping with any disaster in any part of the country should it occurs.

3.3 Vulnerability tracking and risk mapping

A proper vulnerability analysis will indicate how a disaster will affect various risk groups. Such an analysis could lead to a risk mapping of the

zone and community. Together, these information can be used to guide the local developmental agenda on interventions which could be used for prevention as well as mitigation.

3.3.1 Information system

Access to information and dissemination of information are vital in disaster management. In the present age of information technology, this is not a difficult task. Adequate investment on infrastructure, both hardware and software, is essential. A key to having a god information system is to invest in mechanisms and capacity for monitoring, surveillance and evaluation.

3.3.2 Communication

Operational efficiency to disaster management plans and strategies can be achieved only by timely and appropriate communication of information to the target community and decision makers. There are national and regional governmental and private communication agencies and mechanisms like the radio and television channels in place. Ham radios also could play a major role. Creation of a national disaster radio frequency could be an effective way for advance warning system.

3.3.3 Role of media

The media has an important and powerful role to play in creating public awareness as well as changing public perceptions on disasters. The media could be used for communicating the advance warning, to prepare the communities for the ensuing disaster and to report actually what is happening and happened during and after the disaster. There should be adequate precautions not to sensationalize issues and to air opinions and canards or misinformation. It is very important to remember that the media has a responsible and responsive role during the times of disasters in fairly and justly reporting the facts and situations.

3.4 Budgeting and insurance

At times of disasters, timely and adequate availability of financial resources is vital for relief measures. Relief agencies are quite often ill equipped and unprepared to meet this eventuality. There could be also financial incentives as well as insurances to generate the required funding in addition to the State relief measures. Tax relief and subsidies can shift the dependencies on the State machinery for relief assistance.

3.5 Use of research

The need for and importance of research is linked to the extent of vulnerability of the community to the disasters and the smallness of the budget available for relief. Research should mainly focus on the most effective method to be used for risk reduction. Research is also important in identifying the characteristics of each hazard, how to integrate risks and hazards in to the developmental planning agenda, livelihood strategies in the communities at risk, existing and advanced methods of prediction, early warning, monitoring, decision support tools for management, new forms of technologies, historical disaster data analysis, lessons learnt from the past, study of disaster management in other countries, and research in the development of human resource in disaster management.

3.6 Survival tools and kits

Disaster survival tools and kits are needed both on board fishing vessels and on land. On board, these include life jackets, buoys, flares, signals, fire extinguishers, life boats, emergency lights, food and water reserves, radio/ wireless communication equipments, extra fuel, ropes, anchors, first aid kits, mobile phones etc. On land, each village must have a disaster management center with the necessary infrastructure and linkages. The center must become active at the first sign of an impending disaster. The center must have adequate warning systems like sirens, loud speakers, lights and rescue tools like life jackets, first aid kits, rescue boats, ropes, wires, stretchers, fire extinguishers, communication facilities and connectivity to hospitals, fire brigades, police stations, and regional disaster center. Trained manpower must be accessible at short warning to start rescue/ mitigatory measures. Table 1 presents a list of hazards which could develop in to disasters and the coping strategies.

3.7 Training and education

Preparedness of a community to cope with a disaster would eventually depend on its skills to address the situations as they emerge. This calls for adequate education and training. Training needs of various communities vary. There could be both formal and informal training. Communities could do preparedness, and awareness building could be undertaken by NGOs in coastal villages. Identified functionaries and prospective functionaries could be trained in various aspects of disaster management so that they could man the village disaster management centres at times of disasters. There is also need to incorporate the subject of disaster management into the

Table 1. Short listed hazards which could develop to disasters and the suggested strategies to cope with them.

Hazard	Coping strategy
Sea erosion	Reduce vulnerability by locating dwellings away from erosion zone, providing sea walls, mangroves, tripods, coastal vegetation
Cyclone	Act on first warning, move to cyclone shelters, temporary migration to hinder land
Tsunami	Temporary migration to hinder land
Oil spill	Safeguarding animals and pets, craft and gear
Chemical spills	Keeping away from spills
Flooding	Moving away to elevated places, use of life jackets, rafts, inflatable boats
Boat sinking	Warning signals, use of flares, seeking help by attracting attention
Net entanglement	Seeking help by attracting attention
Collision at sea	Use of flares, signals, seeking help
Engine failure at sea	Use of flares, signals, seeking help
Fire on board	Use of fire extinguishers, life jackets
Man overboard	Use of life jackets, setting off alarms floats, seeking help

curriculum of primary and secondary education. Further, local leaders at both *panchayat* and government levels should be oriented to aspects of disaster management. Development workers and NGOs could be given advanced training in managing the entire ambit of disasters from warning, rescue, to mitigation.

3.8 Public awareness

Informal mechanisms like public awareness are more cost effective and could be used for creating the required awareness among people. Existing platforms, institutional mechanisms and resources could be used effectively to widen the awareness with least costs.

4. Planning and management

Present day disaster management strategy revolves around

understanding the cause and risks. This will include the social, economic, environmental, infrastructural, and opportunity losses and the factors which will worsen the impacts if the threats of disasters repeat. Adequate and detailed planning are essential for effective management. The plan should encompass: 1. Identification of risks and vulnerability. 2. Development of a system for information receipts, reporting and warning. 3. Assignment of duties with agencies responsible for disaster management. 4. Establishment of a focal centre for coordination and direction in disaster management. 5. Identification of expertise, resources, facilitators, targets, mechanisms for implementation. 6. Linkages with national and international agencies involved in disaster management.

4.1 Liaison and cooperation

It must be recognized that disasters when they strike often do not confine to national boundaries. Thus, disaster management should be seen in the broader context of human values and virtues, fostering peace, goodwill, human rights and dignity and universal brotherhood. Thus developing international and regional cooperation and linkages would not only make sense but also hasten the process of developing confidence building and fostering friendship between nations.

4.2 Role of NGOs

NGOs, community based organizations and the private sector have major roles to play in disaster management and mitigation. Creating awareness, upgrading preparedness, training, education, capacity building and more important undertaking emergency relief measures are all important to these organizations. NGOs could also be integrated in to the local disaster warning system.

4.3 Role of GOs

Safety, well being, welfare of citizens are prime responsibilities of any government and more so, in the event of disasters. The Government machineries should be ever prepared to meet the challenges in the event of a disaster and undertake immediate relief operations. The system should be ever ready and ever vigilant as many disasters cannot be predicted. It is therefore of paramount importance that the country has a vigilant and effective disaster management system.

5. Conclusions

Hazards and disasters should be understood and vulnerabilities of people to these should be recognized. Impacts of many disasters could be considerably reduced if early warning systems are in place and action is initiated at the first warning. The five key elements to disaster management are **Prevention, Mitigation, Preparedness, Response, Relief and Rehabilitation.** Vulnerability tracking and risk mapping are essential elements in upgrading the preparedness of the community to cope with disasters. Information system, communication, media, finance and insurance, research, development and availability of survival kits, training and education, public awareness, planning and management have vital roles in any disaster management system. In addition, liaison, cooperation, inputs from GOs, NGOs, and other community participation are vital especially in relief operations. Awareness and education must find a place in the curriculum of children so as to make them partners in the management and relief process. Every State must have a well structured and functional early warning and disaster management system in place to cope with a disaster when it occurs.