

Cyclone hazard and unpredictability: preparing coastal communities

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The Bay of Bengal (BoB) forms the north-eastern part of the Indian Ocean. Resembling a triangle in shape, the Bay is bordered by Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. It is also the largest bay in the world by area.

A number of large rivers and their tributaries flow into the BoB, which is situated in the monsoon belt and receives high rainfall. It is a hot spot of biological diversity thanks to its coral reefs, estuaries, coastal wetlands and mangroves. More than a quarter of the world's population resides in the countries around the bay, many of them living below the international poverty line of US\$1 per day and dependent on coastal resources for food and livelihood security.

Cyclones in the Bay of Bengal

The BoB is also periodically in the news for the destructive cyclones¹ storms that occur from time to time. Of the 30 deadliest cyclones in world history from 1584 to 2008, as many as 22 have occurred here. Three recent cyclones, Sidr (2007), Nargis (2008) and Aila (2009), have caused great loss of life and property in Bangladesh, Myanmar and India respectively.

With a long coastline of over 8,000 kilometres, the Indian subcontinent is exposed to nearly 10 per cent of the world's tropical cyclones. Most of these have their genesis over the BoB and strike the east coast of India. On average, five to six tropical cyclones form every year, of which two or three could be severe. About four times as many cyclones occur in the BoB as in the Arabian Sea.

Bangladesh, due to its unique geographic location, frequently suffers from devastating tropical cyclones. The funnel-shaped northern portion of the BoB causes tidal bores when cyclones make landfall, affecting thousands of people living in the coastal

areas. One of the most devastating natural disasters in recorded history was the 1970 Bhola cyclone in Bangladesh (then East Pakistan) that alone claimed more than 500,000 lives. The maximum recorded wind speed of this cyclone was about 222 kilometres per hour and the maximum storm surge height was about 10.6 metres. The cyclone occurred during high tide, causing enormous damage. Table 1 provides a summary of loss of life and damage to property from cyclones in the BoB during the period 1900–2010.

Cyclone warning systems in the region

Ocean Observation Systems (OOS) have become vital for countries bordering the BoB. In 1996, the Indian National Institute of Ocean Technology (NIOT) established the National Data Buoy Programme with the objective of operating, maintaining and developing moored buoy observational networks and related telecommunication facilities in the Indian seas. These data buoys are offshore floating platforms, fitted with meteorological and oceanographic sensors and moored at specific locations to observe met-ocean data at regular intervals. The buoys are powered by lithium batteries and are equipped with Global Positioning Systems (GPS) to provide their locations. The observed data is then transmitted through satellite along with the location reference, in synoptic hours, to the state-of-the-art shore station facility at NIOT, Chennai. The OOS team at NIOT has also developed, tested and established a Tsunami Buoy System, using bottom pressure recorders in the Indian seas. The new venture has expanded the

Table 1: Summary of casualties in the countries around the BoB due to tropical cyclones, 1900 – 2010

Country	Tropical cyclones (nos)	Killed	Total affected	Estimated damage (US\$ Million)
Bangladesh	84	626 843	73 556 523	4 765.98
India	97	159 130	87 392 126	8 600.90
Maldives ²	1	0	23 849	30.00
Myanmar	17	144 663	3 935 844	4 079.39
Sri Lanka	5	1 160	2 060 000	137.30

Source: EM-DAT, OFDA/CRED International Disaster Database. Université Catholique de Louvain, Brussels, Belgium



Image: Yugraj Yadava

Small fishing boats that lack safety and communication equipment are at risk during bad weather conditions



Image: Yugraj Yadava

Cheap locally fabricated floatation devices come in handy during emergencies at sea

horizons of OOS in taking care of the safety and well-being of the coastal communities in the region.

The most important aspect of OOS is the real time dissemination of data, especially during extreme weather conditions. The shore station is manned 24 x 7 and the data obtained from buoys are disseminated in real time to the Indian National Center for Ocean Information Services, Hyderabad for further processing. The data is utilized by a wide spectrum of end users such as meteorologists, oceanographers, environmentalists and offshore engineers in the region and elsewhere.

In Bangladesh, a detailed programme for storm prevention was implemented by the Government following the 1991 cyclone. A comprehensive Cyclone Preparedness Programme (CPP) is jointly planned, operated and managed by the Ministry of Food and Disaster Management and the Bangladesh Red Crescent Society. A volunteer force of more than 32,000 people has been trained to help with warnings and evacuation in the coastal areas. Around 2,500 cyclone shelters have been constructed on elevated platforms in these regions, serving the dual role of schools or community centres during normal weather. The Chittagong coast has been

heavily protected with concrete levees and afforestation to create a green belt.

In the BoB Region, the Indian Meteorological Department (IMD) is designated by the World Meteorological Organization (WMO) as a Regional Specialized Meteorological Centre for tropical cyclones and is responsible for providing advice to neighbouring countries. As a part of the WMO Tropical Cyclone Programme (TCP), five regional panels have been established, which coordinate the planning and implementation of measures to mitigate tropical cyclone disasters on a worldwide basis. The main objective of the panels is to promote measures to improve tropical cyclone warning systems in the BoB and the Arabian Sea through an effective operational plan. The plan records the agreed arrangements for standardization of operational procedures, efficient exchange of various data related to tropical cyclone warnings, issuing of cyclone advisories from a central location (Regional Specialized Meteorological Centre), archiving of data

Table 2: Institutional arrangements for disaster management in the BOBP-IGO countries

Country	Nodal agency	Operational arm
Bangladesh	Disaster Management and Relief Division (Ministry of Food and Disaster Management)	Disaster Management Bureau
India	Ministry of Home Affairs and Ministry of Earth Sciences/IMD (for earthquake, cyclone and tsunami)	National Disaster Management Authority
Maldives	Ministry of Defence and National Security Services	National Disaster Management Centre (NDMC)
Sri Lanka	Ministry of Disaster Management	Disaster Management Centre of Sri Lanka



Image: Yugraj Yadava

Safe anchorages and berthing places can reduce damage to boats and gear during cyclones

and issuing of tropical weather outlooks. Table 2 provides details of the nodal organizations responsible for disaster management in the four member countries (Bangladesh, India, Maldives, and Sri Lanka) of the Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO).

Cyclone preparedness activities in the region

Key programmes on cyclone preparedness and vulnerability reduction have been implemented in the four BOBP-IGO member-countries, generating important lessons for the region.

India

On 6 November 1996, a tropical cyclone with a wind speed of 220 kilometres per hour and tidal surge of more than 2.2 metres crossed the coast of East Godavari district in Andhra Pradesh, India. Approximately 3,000 people perished in the cyclone and property worth millions of US \$ was destroyed. This cyclone focused attention on the need to take a fresh look at disasters and their management in India. Subsequently, in early 1997, the Food and Agriculture Organization of the United Nations implemented a Technical Cooperation Programme in association with the Ministry of Agriculture, Government of India and the Department of Fisheries, Government of Andhra Pradesh. This pilot project, implemented in and around Kakinada, Andhra Pradesh, was aimed at investigating and introducing measures that could reduce the vulnerability of fishing communities to cyclones.³ It yielded many important lessons on effective cyclone disaster prevention and mitigation, which are summarized below:

Cyclone forecasting and warning

For communities living in the coastal areas, survival is dependent on

- Early warnings that are timely, readily comprehensible and perceived to be accurate and reliable for their locality
- Availability and effectiveness of evacuation measures
- Availability of cyclone shelters or other safe buildings.

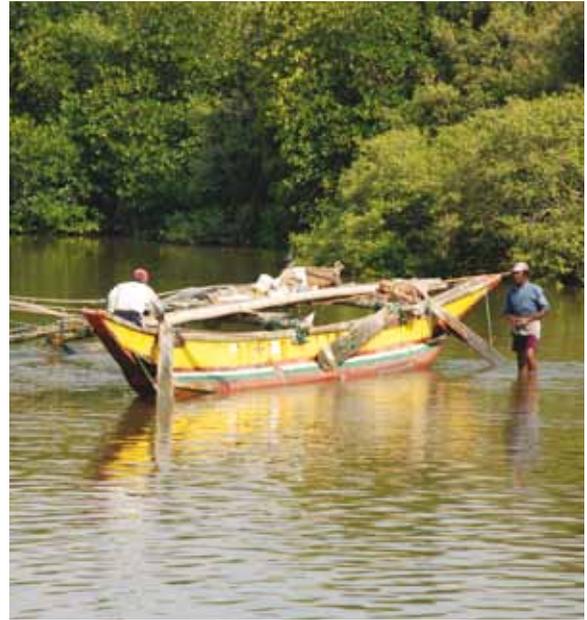


Image: Yugraj Yadava

Mangroves act as bio-shields and help in mitigating the effects of cyclones and storm surges

Similarly, survival at sea is dependent on the capacity to receive warnings as well as the capability of the vessel and crew to escape, find shelter or ride out the storm. For those who survive the immediate effects of the cyclone, timely rescue and relief may be required to ensure survival in the aftermath. At the community level too, there needs to be considerable awareness and educational work on how to best adapt forecasts and improve comprehension and trust among communities. Such work should build on indigenous knowledge about cyclones.

Connection between development and disaster preparedness

For community disaster preparedness to be sustainable, there needs to be long-term follow up by the Government and non-governmental organizations. Further, to assure sustainability the work needs to be interwoven with other livelihood and developmental activities undertaken by the Government and other civil society organizations in areas such as sanitation, water supply, education and housing, which are all vulnerable to disasters.

Gender mainstreaming

Gender balance is essential at all levels of disaster preparedness as women are frequently the caretakers and provide for basic survival. They also have a number of particular problems and perspectives that are different from those experienced by men in a disaster.

Creative approach to cyclone shelters

Such facilities in the coastal areas should have multi-purpose functions and could serve as schools, community halls, offices, etc., besides providing shelter from cyclones in an emergency. They should be constructed and managed with full participation and involvement of the local community.



Image: Yugraj Yadava

Folk songs and village theatre are effective media for raising awareness amongst communities

Learn from what is already being done

Exposure of Government officials and civil society organizers to disaster preparedness work at national, state and regional levels is essential since there is so much to learn from others' experiences.

Awareness raising and use of multimedia

There is a widespread lack of awareness on disaster preparedness at all levels of the community and Governments. There should be much greater use of media, especially television and radio, in raising awareness.

Teaching children disaster preparedness

Schools should include disaster preparedness and awareness raising about cyclones and their nature, especially at community and household levels.

Green belts protect communities

Forest and mangroves in the coastal areas help reduce storm surge penetration, soil loss and flooding. They sustain marine and brackish water fisheries and other ecosystems, and provide fuel, fodder, building materials and livelihoods to coastal communities. Therefore, their protection is important for the well-being of the community.

Bangladesh

The Empowerment of Coastal Fishing Communities for Livelihood Security (ECFC), an FAO/UNDP/Government of Bangladesh Project, was implemented in Cox's Bazaar district between 2002 and 2006. One of the main components of the project related to strengthening the capacity of the coastal fishing communities for disaster management, focusing on cyclone preparedness measures. The objective of this component was to facilitate and enable community access to advance disaster warnings in order to prepare them to cope with and recover from natural and other hazards at sea and on land.

One of the important lessons learnt from the project was that disaster preparedness in real time should be driven by a sense of



Image: Yugraj Yadava

Gender mainstreaming is vital for success of disaster preparedness

responsibility. This was shown during the cyclonic period in May 2004 by the fishing communities of all the villages covered under the project. The role played by Village Disaster Preparedness Committees (VDPCs), change agents and volunteers (both men and women) in alerting the communities was highly effective. These groups shared responsibilities for disseminating door-to-door weather forecasts and danger signals. The teamwork shown by the community in taking prompt initiative for cyclone preparedness was found to be excellent and highly appreciated by people from all walks of life.⁴

Regional training

The South Asia component of the FAO Global Project on Safety at Sea for Small-Scale Fisheries in Developing Countries was implemented in the four member countries of the BOBP-IGO from May 2007 until December 2010. The project focused on training, education and awareness for improved safety at sea. Various approaches were used to take the message to the community. These included colourful leaflets giving key messages on subjects such as cyclone signals, folk songs and village theatre, and video films in local languages.

Rising risk, prepared communities

With the increase in sea surface temperatures due to global warming, there is likely to be an increase in the frequency and intensity of tropical cyclones. In such situations, community preparedness will be of immense help. There is a pressing need to replicate the lessons learnt from the above examples, not only within the BoB region but also in other parts of the world, where coastal communities face constant threat from cyclones and other natural hazards.