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# EXECUTIVE SUMMARY

Bangladesh is a disasterprone country that is affected almost every year by some form of natural disaster of which cyclone in the coastal region causes colossal of life and property of the coastal region of Bangladesh. Climate change adds a new dimension to disaster risk and vulnerability. In recent years, the Government of Bangladesh (GoB) has been placing increased emphasis on reduction of the human, economic and environmental costs of disasters, through enhancing the national capacity for disaster mitigation. The Comprehensive Disaster Management Programme (CDMP) of the Government of Bangladesh (GoB), is being implemented by the Ministry of Food and Disaster Management (MoFOM) and Is supported by the United Nations Development Programme (UNDP), UK Department for International Development - Bangladesh (DFID) and the European Commission (EC).

ECOMAC and its associate UTTARAN have conducted several studies under the subcomponent RFP IV.4 of CDMP. As an outcome to those studies three reports were produced- 1) Preparation of spatial distribution map of coastal livelihood industries, 2) Contribution of the Coastal Industries to the National Economy and 3) Economic Risk Assessmen of the coastal livelihoods (fishing/tourism industry) to tsunami/cyclone events. These reports provided exposure of the population and their livelihood to physical vulnerability to cyclone and tsunami inundation and also nature and extent of the vulnerability of the economic sectors and provided economy wide significance of cyclone and tsunami hazards in the coastal region of Bangladesh.

Based on the findings of the previous reports and extensive consultation with local community the present report examines risk management strategies of the economic sectors following disaster risk reduction framework provided by ISDR for dealing with extreme events like cyclone and tsunami. It provides a policy guidance to reduce the risks of the economic sectors and to increase resilience of the coastal livelihood to the adverse impact of hazards like cyclone and tsunami tidal surges.

The risk reduction issues were identified and categorised on the basis of urgency:

- those of an emergency nature requiring immediate remedial action
- the expected ‘knock-on’ effects or secondary risks that may undermine community livelihoods and ecosystem integrity in the future

In addition, preparedness actions such as disaster specific agencies or the development of early warning system.have also has been included.

The recommendation of the draft guidelines has been vetted in the Upazila and Zila level workshops in selected Zila and Upazilas covering the cyclone/tsunami vulnerable coastal zones of Bangladesh. The snapshots of the economic sector vulnerability presented are:

**Household Vulnerability**

The Individual (or household) vulnerability is determined by access to resources and the diversity of income sources, as well as by social status of individuals or households within a community. Household vulnerability of the coastal population arises out of the complete or partial destruction of their houses, capital assets and loss of income potential and also access to resources. The average level of poverty of the coastal district is higher than the national average by 3 percent. Around half of the extreme poor households live in the high to very high risk cyclone inundation area. From the view point of tsunami most of the households of all types live in the moderate risk area. It was found that around 80–90 percent of the households of each disaster zone own only subsistence level of housing and there is hardly any variation in the living status across different zones under cyclone risk or tsunami risk categorization.

Coastal communities depend highly on the natural resources for earning livelihoods most of them area poor. Such high dependence on environment is the prime source of vulnerability of the coastal livelihood. Homelessness, food insecurity and loss of other livelihood outcomes cause household to fall in credit trap. There is high variation of the consumption of food produced by the households themselves which is low at 3-4 months for moderate, high and very high cyclone risk areas. In contrast, households living in low cyclone risk area can afford to consume from own production around 11 months of the year. Thus households living in high risk zones are more vulnerable to natural disasters such as cyclone.

**Vulnurability of the Agrisector**

Crop losses have also meant loss of wage income for a large number of households with very limited alternative sources of livelihoods. Most of the gross cultivated areas fall under moderate risk zone (0.95 million hectares) followed by low (0.72 million hectares) and high risk zones (0.61 million hectares. Even though a small fraction of land is cultivated in the very high risk zone, a large part of the gross cropped lands is vulnerable to cyclone hazard.

In the coastal zone, fishing is the predominant source of livelihood for about 20% percent of households. About 22 percent of the households have experienced loss of fishing gears and boats and 13 percent of the households suffer from loss of culture fisheries. The total value of shrimp was estimated to vary from Tk.2.2 billion to Tk.3.8 billion in each of the four cyclone risk zones. The highest amount of shrimp is cultivated in the high risk cyclone zone. In contrast, shrimp worth about Tk.22 billion and Tk.12 billion are cultivated in moderate and low risk tsunami zones. The value of the potential loss of the dried fish estimated to be about Tk.200 million all are located in the very high inundation risk zone.

Livestock sector was also hard hit by past cyclone. Many households, to whom, livestock was one of the major sources of livelihood lost their only livelihood sources. The value of the livestock in different inundation zones estimated to be Tk.46,818 million of which about half of the resources exposed to high and very high cyclone inundation risk zones.Regarding tsunami exposure, 87% of the resources are located to low inundation zone.

Salt production a labour intensive process provide livelihood to significant population in the coastal upazilas of Cox’s Bazar district.Depending on the seasonality of the hazard the sector

is hard hit due to washing of the produced salt from the field or submergence of the stocks in the storage godown.The salt production area is located in the high and very high inundation zone with an estimated potential loss valuing Tk.314 million across all inundation risk zones.

**Forestry sector**

Besides supporting livelihood of million population ( bowalis, hone collector and artisinal fishers, thatching and fire wood harvesters), these forests serve as buffer zones against cyclones and tidal surges and provide the first line of defense to the life and property of the coastal population against natural hazards like tidal and storm surges, cyclones and tsunami generated tidal waves. Many households depend on forest resources for their livelihood. The World Bank missionafter cyclone SIDR estimated that some 4-5 percent (20 -25 000 ha) of forest area has been severely damaged and nearly 15 percent (60 000 ha) partially damaged. Damages to forest department infrastructure also follow the extent of damages to forests.

**Tourism Sector**

The present study and also the earlier SIDR damage study reported that both public and private sector infrastructures are exposed to damage by cyclone wind and consequential tidal surges, which negatively affected eco-tourism in the Sundarbans, Cox's Bazar and Kuakata and other tourist destinations in the coastal region. The damage incurred is mostly in the informal sector. Potential damage to the tourism infrastructure all over coastal zone particularly hotels and restaurants are estimated at Tk15, 371 million. The potential value of the subsector located in different cyclone inundation risk zones are 15% 25% 37% 23% in very high, high, moderate, and low inundation risk zones respectively.

**Infrastructure**

Disasters exact an enormous toll not only on lives, but also on livelihoods, homes, basic social services and community infrastructure. Coastal region has very low level of infrastructure facilities. Potential damage to such infrastructure will vary depending on the intensity of the cyclone/tsunami events.It was estimated that the value of the critical infrastructures including roads, buildings and irrigation structure etc is Tk.54,809.00 of which 3%, 17%, 38% and 42% are exposed to very high, high, moderate and low risk zone respectively.

**Commercial Sector**

The commercial sector risk assessment in the ERA Report included the manufacturing industries, rural informal business and tourism sector. The distribution of the industries in different cyclone inundation zone reveals that the high value industries particularly industries of the Chittagong and Karnafuli EPZ are located in the very high and high risk cyclone inundation. The estimated value of the vulnerable industries and commercial enterprises was about2,276,483 million of which 14%,23%,34% and 29% of the area are in the very highly high, moderate and low inundation zones. Besides, some industries containing stored highly flameable ( oil, petroleum coke, and natural gas).and other hazardous chemical substances in the port city of Chittagong exposes the area to high risk due to the tidal surge.

**Recommended RR interventions**

As the household level risk reduction measure the economic diversification is central to poor people's strategies for reducing their vulnerability to external shocks. Providing vocational and other income earning training to the local people reduces future risks due the disaster. The role of cash transfer like release of disaster fund, activating social safety programme, ensuring food security, financial mechanism such as microcredit, microinsurance as risk transfer mechanism are suggested. To ensure equitable access to social services and address the needs of the vulnerable groups, a conducive national level policy is crucial for engaging all community stakeholder groups in a multisectoral post-disaster planning and rebuilding process. It is to ensure that these groups are involved in livelihood, governance, risk reduction planning etc.

Agricultural sector reduction measure can be addressed both at preparedness before cyclone and also recovery after the cyclone.Facilitating the recovery of the farming system to pre-disaster levels is problematic. To reduce future in the agriculture sector the guideline recommended *Crop diversification, Seedbank and supply of agriequipment, better landuse and crop planning, Community capacity building for a*gricultural planning based on agroclimate and sensitive to disaster impact.

Fisheries sector is one of the worst affected due to the cyclone which has rceived inadequate attention in the past disaster recovery and mitigation programme of the government. More emphasis should be given to risk assessment and vulnerability reduction within the sector. The fisheries sector should be explicitly included in the national disaster response and preparedness institutional set-up and form an integral part of disaster preparedness plans. Regional cooperation to rescue cyclone drifted distressed fishermen to other countrys also suggested as contingency planning.

The rural economy is very much linked to animal husbandry activities which not appropriately addressed in disaster risk reduction plan. Both short and long term measures are suggested to reduce future risk in this sector integrating livestock shelter with human shelter as long term measure to reduce the risk.

The high winds and storm surges associated with the cyclones have adversely affected fragile coastal ecosystems, such as coastal forests, mangroves and coral reefs that are particularly vulnerable to cyclone damage. The Sundarbans unique ecosystem which is a world heritage site, for its unique biodiversity and by virtue of the harvests it yields, ecological services protecting life and property of the surrounding population during cyclone require special attention for management capacity building. Social forestry and national capacity building to assess damage and monitor unique ecosystems of the coasts the Sundarbans and coral ecosystems is suggested as long term risk reduction options for the natural ecosystems. This should include the promotion of community-based environmental projects and participation in environmental management including the rehabilitation and replanting of damaged mangrove stands that provide a frontline buffer to incoming cyclonic winds;

A chronic problem that was aggravated by the tidal surges concerns the intrusion of saline water into the ponds and increasing levels of biological (mainly faecal) contamination of wells for drinking water. Poor hygienic conditions and limited resources for water and sanitation underlie this situation. This report recommends that urgent attention be paid to the issue of polluted drinking water wells, tubewells that has been aggravated by the disaster. The sources of deep aquifer in the coastal region should be explored.

Disaster risk awareness and education strategies should be aimed at promoting a culture of safety, so as to achieve changes in current patterns of human behaviour that influence the risk of large-scale damaging effects of natural hazards. The rebuilding of coastal livelihood is a good time to address educational and training needs in coastal communities. Training in disaster management and management of coastal resources should be made a part and parcel of coastal educational curriculum.

An immediate requirement is a sound tourism policy addressing risk reduction as part of holistic tourism development. Access to credit finance after cyclone for rehabilating the informal sector down stream business, Capacity building training for tourism stakeholders. Local economic activity is key to disaster resilience in much of the world. Micro-finance is also important in reducing vulnerability before disasters and supporting post-disaster recovery for the informal business sector.

Paved road to coastal ommunities electricity, drainage, improved water and sanitation, community hall and schools are some of the investment that serves as a foundation for rehabilitation of coastal livelihoods. Insurance to buildings and machineries can be important mechanisms which act to spread the risk and costs of disaster in most of the economic sectors. Besides constructing adequate number of cyclone shelter it is also important to retrofit the existing embankments to withstand tidal surges due to increased frequency of cyclone.

National plans for warning systems should address the means to transmit warnings and should include disaster management, risk mitigation, public awareness, and community-based activities. Tsunami warning systems should be linked to other hazard warning systems and strengthened as part of an integrated disaster risk reduction approach.

Bangladesh is the pioneer among the developing countries to adopt a comprehensive disaster management approach. A series of inter related institutions, at national, subnational and local levels have been created to ensure effective planning and coordination of disaster risks reduction and emergency response management. The guideline identifies both public and private sector organizations including financial institutions in implementing the proposed risk reduction measures.In conclusion, the report makes a number of recommendations for consideration by the concerned agencies.

# 1. INTRODUCTION

## 1.1 BACKGROUND

Bangladesh is a disasterprone country that is affected almost every year by some form of natural disaster. The geographical location, land characteristics, multiplicity of rivers and the monsoon climate render Bangladesh highly vulnerable to natural hazards. Natural and human induced hazards such as floods, cyclones, droughts, tidal surges, tornadoes, earthquakes, river erosion, fire, infrastructure collapse, the high arsenic contents of ground water, water logging, water and soil salinity, epidemic, and various forms of pollution are frequent occurrences.

The coastal morphology of Bangladesh influences the impact of natural hazards on the area. Climate change adds a new dimension to disaster risk and vulnerability. About one-fifth of the 144 million population lives within 19 coastal districts. Frequently disasters adversely affect the livelihood of coastal regions by damaging their means of earning (destruction of the factory, loss of crop, destruction of shop) and or assets (loss of animals, plowing tools, boats etc). Of the 508 cyclones that have originated in the Bay of Bengal in the last 100 years, 17 percent have hit Bangladesh, amounting to a severe cyclone almost once every three years inflicting heavy losses of life and property. Of these, nearly fifty three percent have claimed more than five thousand lives. The economic losses of the last three cyclones amounts to US$ 4.6 billion

Disaster Management in Bangladesh had gone through a process of significant reforms. Since independence the focus was limited in relief and rehabilitation activities.The main mission of the Government is to bring a paradigm shift in disaster management approach from conventional response and relief to a more comprehensive risk reduction culture ensuring the resilience of the communities to hazards.The GOB has, therefore, total commitment towards the reduction of human, economic and environmental costs of disasters by enhancing overall disaster management capacity.

The Comprehensive Disaster Management Programme (CDMP) of the Government of Bangladesh (GoB) Is being implemented by the Ministry of Food and Disaster Management (MoFOM) and Is supported by the United Nations Development Programme (UNDP), UK Department for International Development - Bangladesh (DFID) and the European Commission (EC). CDMP is designed to strengthen the Bangladesh disaster management

system and more specifically to achieve a paradigm shift from reactive response to a proactive risk reduction culture. This programme has adopted a more holistic approach, embracing processes of hazard Identification and mitigation, community preparedness and integrated response efforts, where relief and recovery activities are planned within an all-risk management framework, CDMP seeks to raise the capacities of at risk communities while lowering their vulnerability to specific hazards: Study under the subcomponent RFP IV.4 has Identified and appraise d economic risk to the coastal livelihoods (fishing/tourism industry) to tsunami/cyclone events. Based on the findings of the previous reports on spatial distribution map of coastal livelihood industries and also findings of economic risks assessment to the livelihood for the coastal inhabitants this report provide a policy guidance to reduce the economic risks of the coastal livelihood.

In this report we will examine risk management strategies for dealing with extreme events like cyclone and tsunami. We suggest set of policy prescriptions mainly targeting the rehabilitation of coastal livelihood apart from including few general directions to undertake physical, social and environmental reconstruction measures. The rehabilitation of coastal livelihood after natural disaster paves the way to revitalize the coastal communities. To meet this end coastal people should be given the skills and recovery for self-recovery.

We have given special attention to economic incentives; in particular, we discuss the need for risk management strategies that involve both the private and public sectors for dealing with the negative externalities created by the disaster impacts. We also give special attention to the need for cooperation between the public and private sectors with the ultimate goal of generating sound strategies for reducing the risks of extreme events and reducing the damage should such catastrophes occur.

This guide is also intended to serve as a framework to highlight implementation strategy that can be addressed by the community together with government agencies, nongovernmental organizations (NGOs), private sector, and other stakeholders. The guide is intended to complement other planning tools and approaches. It also provides guidance for implementation of the economic risk reduction measures with clear role of the implementing stakeholders. The findings of reviews and assessments carried out using this guiding note may also have some value in advocacy work at local and national levels policy interventions.

Objectives

To provide guidance to take measures to reduce economic risks of the coastal livelihood

To provide policy guidance for economic sector planning and programme to make resilient to cyclone/tsunami disaster

Provide guidance for mainstreaming risk reduction measure targeting gender and other socially disadvantaged group

To create support for adequate resources for DRR measures

## 1.2 APPROACHES TOWARDS DEVELOPING THE ERR STRATEGY

Till a few decades ago, government responded disasters and relief agencies without taking into account the social and economic implications and causes of these events. These emergency measures are defined as Ex-Post Coping Strategies. They are designed to relieve the impact of the risk once it has occurred. In the immediate aftermath of natural disasters, emergency actions may include search and rescue, food-aid, emergency medical assistance, evacuation r the construction of temporary shelters. During the medium term, actions may focus on rehabilitation by helping households maintain a minimum level of consumption and preserve their asset base and transition towards normalcy. The long-term reconstruction phase focuses on physical reordering of the community and the physical environment.

Gradually, approaches have changed towards an increasing emphasis on preparedness measures or risk reduction measures. These measures are defined as Ex-ante Measures. These are aimed to avoid risk from occurring (risk prevention) or if this is not possible, to reduce its impact (risk mitigation). In terms of prevention, instruments may include actions to reduce risk exposure to natural disaster, such as constructing levees to avoid tidal surgeing. Mitigations actions can include improving households and community's ability to absorb the impact of natural disaster (by improving income, savings and other risk sharing mechanisms and building codes). In addition, preparedness actions can also include establishment of mechanisms for effecting disaster specific responses and recovery via natural disaster specific agencies or the development of early warning system. This guideline uses the framework on the sustainable development approach of risk reduction adopted by *The International Strategy for Disaster Reduction (ISDR) Secretariat.*

# 2. METHODOLOGY

The previous report on spatial distribution map of coastal livelihood industries provided exposure of the poulation and theeir livelihood to physical vulnerability to cyclone and tsunami inundation Economic Risk Assessment Report idendified the nature of the vulnerability of the economic sectors and provided economywide significance of cyclone and tsunami hazards in the coastal region of Bangladesh and the problem they pose for country's development.

The findings of the previous studies Spatial distribution of coastal livelihood industries and other critical community infrastructures in different inundation risk zone, (under Task-1 a Task-2 of RFP.IV.4) and also previous cyclone damage studies (Japan Society of Civil Engineering, Joint damage assessment of SIDR) have also been consolidated to form the basis of identification of risks. Further community consultation were made through Upazila and Zila level FGD in selected districts of the vulnerable area to identify the strategies of the community to cope with the risks and different stakeholders perception on the risk reduction measures.

Based on these findings draft guidelines has been prepared to reduce the economic risks of coastal livelihood due to the tsunami/cyclone impacts. The recommendation of the draft guidelines has been vetted in the Upazila and Zila level workshops in selected Zila and Upazilas covering the cyclone/tsunami vulnerable coastal zones of Bangladesh. Recommendations of those workshops have been incorporated into the final guideline which was veted in the National Workshop.

# 3. CYCLONE/TSUNAMI HAZARDS IN THE COASTAL REGION OF BANGLADESH

The risk from coastal hazards is characterized by the frequency of occurrence and severity of the hazard. Bangladesh is a part of the humid tropics with Himalaya on the North and the funuel-shaped coast touching the Bay of Bengal on the South (Banglapedia 2003). This peculiar location of Bangladesh brings not only "life-giving monsoon" but destructive cyclones, tornadoes and tidal surges. The Bay of Bengal is an ideal breeding ground for cyclones.

**Cyclones**

Cyclones are formed in the Bay and characterized by high winds in the tropical climate in excess of 63 km/hr. Storm surges is simply water that is pushed toward the shore by the force of the winds swirling around a storm. This advancing surge combines with the normal tides to create the storm tide. Under the influence of the speed of the cyclone wind in the tropical zone, storm surges can raise sea water levels up to 10 meters above mean sea level. This rise in water level can cause severe flooding in coastal areas, particularly when the storm surge coincides with the normal high tides.

The greatest potential for loss of life related to a tropical cyclone is from the storm surge, which historically has claimed nine out of ten victims of these events. When the high water levels of the storm surge and the accompanying surface waves make landfall, the absence of high ground in coastal areas like Bangladesh, results in many people to be swept away and drowned. Even though the high winds and rise in water levels last only a few hours, the magnitude of the wind speed and the rate of rise of water levels make cyclones extremely destructive to individuals and communities in their path. When cyclones make landfall during the night and coincide with the normal lunar spring high tide impact impact is much worse due to high tidal inundation and those affected have great difficulty in determining what is happening.

Cyclonic storms form in the Bay of Bengal during April/May (pre monsoon cyclonic storms) and September to December (post-monsoon cyclonic storms). Of the cyclones formed, about one-sixth make their landfall in Bangladesh and since 1900, about 70 cyclonic storms have made their landfall along the country's coastal region.

Table 3.1: Number Of Cyclone Recorded During The Last 200 Years In The Coastal Region Of Bangladesh

| Time | Cyclone |
|---|---|
| 1795 – 1845 | 3 |
| 1846 – 1896 | 3 |
| 1897 – 1947 | 13 |
| 1948 – 1998 | 51 |

Source: BBS, 1993, 2002,

Table 3.2 Chronology of Cyclones in Bangladesh

| Date | Wind speed (km/h) | Height of the tide | No of people died |
|---|---|---|---|
| October 9, 1960 | 162 | --- | 3000 |
| October 30, 1960 | 210 | 4.5 – 6.0 | 5149 |
| May 9, 1961 | 146 | 2.5 – 3.0 | 11466 |
| May 30, 1963 | 146 | 6.0 – 9.0 | --- |
| May 28, 1963 | 203 | 4.0 – 5.0 | 11520 |
| May 11, 1965 | 162 | 3.5 | 19279 |
| December 14, 1965 | 210 | 4.5 – 6.0 | 873 |
| October 1, 1966 | 146 | 4.5 – 9.0 | 850 |
| November 12, 1970 | 223 | 6.0 – 9.0 | 500000 |
| December 9, 1973 | 122 | 1.5 – 7.5 | 183 |
| August 15, 1974 | 97 | 1.5 – 6.5 | --- |
| November 28, 1974 | 162 | 2.0 – 5.0 | --- |
| October 21, 1976 | 105 | 2.5 – 5.0 | --- |
| December 10, 1981 | 97 | 2.0 | 2 |
| May 25, 1985 | 154 | 3.0 – 4.5 | 11069 |
| November 29, 1988 | 162 | 1.5 – 3.0 | 2000 |
| April 29, 1991 | 225 | 6.0 – 7.5 | 138000 |
| November 14, 2007 | 250 | 7.00 – 10.00 | 4000 |
| November 15, 2007 | 250 | 6.00 – 10.00 | 4000 |

Source: Source: BBS, 1993, 2002

A large number of devastating cyclones have been recorded in the history. The famous Bakerganj cyclone of 31 October 1876 was one of them. This cyclone covered an area of 4800 km2 in Chittagong, Noakhali and Bakerganj. A huge tidal wave combined with the storm, caused the death of 400000 lives (Ahmed, N., 1968).

Table 3.3: Cyclone hit the coastal area since 1981: Characteristics and Affected Ares

| Time | Wind speed km/h | Height of the tide (feet) | Area affected |
|---|---|---|---|
| December, 1981 | 120 | 8 | Khulna, Barisal, and the Islands of Potuakhali's |
| October, 1983 | 93 | --- | Chittagong, Islands and Charlands of Noakhali |
| November, 1983 | 136 | 5 | Chittagong, Cox's Bazar, Noakhali, Barisal and Potuakhali |
| May, 1985 | 100-153 | 10-12 | Hatia, Sandip |
| November, 1986 | 90-100 | 2-3 | Chittagong, Noakhali, Barisal Islands and Charlands of Potuakhali |
| November, 1988 | 160 | 14.5 | Hatia, Sandip |
| April, 1991 | 225 | 6-7.5 (meter) | Chittagong, Hatia, Bhola |
| June, 1991 | 75-110 | 6 | Chittagong, Noakhali, Barisal Island and Charland of Potuakhali |
| May, 1992 | 77-90 | --- | Chittagong, Cox's Bazar, and Island and Charlal |
| April, 1994 | 210 | Not known | Cox's Bazar |
| November, 1995 | 210 | --- | Cox's Bazar |
| May, 1997 | 220 | 10 | Chittagong, Cox's Bazar, Noakhali, and Bhola |
| September, 1997 | 150 | 6-10 | Chittagong, Cox's Bazar, Noakhali and Bhola |
| May, 1998 | 120 | 6-8 | Chittagong, Cox's Bazar and Noakhali |
| November, 1998 | 90 | 4-6 | Khulna, Barisal, Potuakhali at its Island and Charlal |

Source: Coastal region, WARPO

Table 3.4 Loss of life due to cyclone in Bangladesh

| Year | Month | Wind Speed | Loss of Lives | Areas Covered in km2 |
|---|---|---|---|---|
| 1876 | 31 October | Not known | 400,000 | 4828 |
| 1897 | 31 October | Not known | 1,75,000 | Not known |
| 1970 | 12 November | 240 | 5,00,000 | 8100 |
| 1991 | 29 April | 220 – 240 | 1,40,000 | 4000 |
| 2007 | 14 November | 250 | 4000 | 8400 |

During the last 200 hundred years or more nearly 70 large devastating cyclones hit the coastal region of Bangladesh. The table 3.1 shows that the number of cyclones has been increasing gradually over time. During 1948 and 1998 the number of cyclones bit the coastal region was almost 4 times higher than the previous period of 1897 and 1947. In 1897, twenty-one years after this disaster, another cyclone hit Chittagong with almost an equal destructive force killing about 1,75,000 people (Ahmed, N., 1968).

But the cyclone of 12 November 1970 had no equal example in living memory. It came as an incursion from the Bay, then crossed the coast and devastated 8100 km2 of the coastal belt. The cyclone killed half a million people destroyed 400,000 houses, and 3000 schools and 20,000 fishing boats. About 500,000 tons of crops were destroyed and unlimited number of cattle's and other domestic animals were killed or washed away by ebb tide.

The cyclones of 1991 and the SIDR of 2007 were also unprecedented in many years in terms of loss of human lives and livestock as well as property. The cyclone of 1991 killed 1,40,000 people. About 10 million people of 102 upazila of Chittagong, Noakhali and Cox's Bazar became direct victims of this cyclone. The cyclone killed 50 thousand domestic animals, damaged 17 lacs houses and 6 thousand schools. Besides, it destroyed 2.76 lac acres of land, 470 km dam and inundated 72,000 acres of land by saline water. About 16 years later, the cyclone struck with a wind speed of 250 km/h covering nearly half of the total coastal area, which the country has ever experienced. The destruction of properly caused by this devastating cyclone was enormous. However, in spite of the highest wind speed accompanied by 7 to 10 meter high tidal wave, the loss of human lives was comparatively less than that of the previous cyclones. Although an exact number of death tolls were not available it was estimated from various sources that around 4000 people most of which are fishermen were killed by this cyclone. This loss of lives was lower due to timely warning system and arranging precautionary measure to protect the coastal people from the cyclone.

However, almost all the districts of the coastal region is affected by devastating cyclones, but most of the damage occur in the coastal regions of Khulna, Potuakhali, Barisal, Noakhali and Chittagong and the offshore Islands of Bhola, Hatia, Sandip, Manpura, Kutubdia, Maheshkhali, Nijhum Dwip, Urir Char and other newly formed Islands.

**Tsunamis.**

A tsunami is a series of ocean waves typically generated by an underwater earthquake. Landslides, volcanic activity, and meteor strikes may also generate a tsunami. A tsunami wave may be very small in the deep ocean, but as it approaches land can increase to more than 10 meters in height and reach shore as a fast-moving wall of turbulent water. Tsunamis can inundate low-lying coastal areas with multiple waves that can penetrate and cause destruction far inland. There are two types of tsunamis: distant and local. A distant tsunami travels long distances from the event that triggers it to impact the coast hours later. A local tsunami can impact the coast within minutes after the triggering event, allowing little to no time for warning and evacuation. The frequency of damaging tsunamis throughout the Indian Ocean region has been low compared with other natural hazards such as tropical cyclones, earthquakes, and floods.Coastal erosion may be a chronic event with mild consequences or, coupled with other hazards, may result in severe impacts on the shoreline.

The earlier known tsunami in south asia that affected Bangladesh coast and adjoining areas was on April 2, 1762. The earthquake was centred 40 kms and 257 kms SE of Chittagong and Dhaka respectively, which was again 61 kilometres North of Cox's Bazaar distrct. The quake caused a tsunami in the Bay of Bengal. The water in the Hoogly River in Kolkata rose by two metres. The rise in the water level at Dhaka was so sudden that hundreds of boats capsized in Burigonga River and many people were drowned, lot of peoples lost their lives and properties. The most recent tsunami of December 2004, the greatest earthquake (a magnitude 9.3) in 40 years occurred about 150 kilometers off the west coast of northern Sumatra Island in Indonesia. The earthquake resulted from complex slip on the fault where the oceanic portion of the Indian Plate slides under Sumatra, part of the Eurasian Plate. The earthquake deformed the ocean floor, pushing the overlying water up into a tsunami wave. The earthquake generated a disastrous tsunami that caused destruction in eighteen (18) countries bordering the Indian Ocean including Bangladesh. Though no severe casualty or property

damage was recorded in Bangladesh but abnormal tidal behavior was reported from the coastal region.

# 4. STAKEHOLDER PERCEPTION ON HAZARD AND RISK REDUCTION

## 4.1 HAZARD PERCEPTION BY DIFFERENT LIVELIHOOD GROUP

The risk from coastal hazards is characterized by the frequency of occurrence and severity of the hazards. People had been asked to rank the natural disasters by assigning points to them. The most common hazards considered by the respondents are cyclone, storm surges, sea erosion. Fig 4.1 shows that in the coastal zone of Bangladesh, 82.7% people, irrespective of their background consider cyclone be most risky. Another 13.9% people consider cyclone to be risky. Around one forth of coastal people rank tidal surge to be most risky event. Around 67.6% people categorize tidal surge to be risky. Around 85% -95% of the coastal population have rated Earthquake and Draught as either “least risky” or “moderately risky”, whether livelihood groups deviate from this general perception is explored then,. It is found that people from all the livelihood groups are consistent in rating riskiness of natural hazards. These findings help us to deduce that cyclone and tidal surge appear to be major threats for all the livelihood groups.

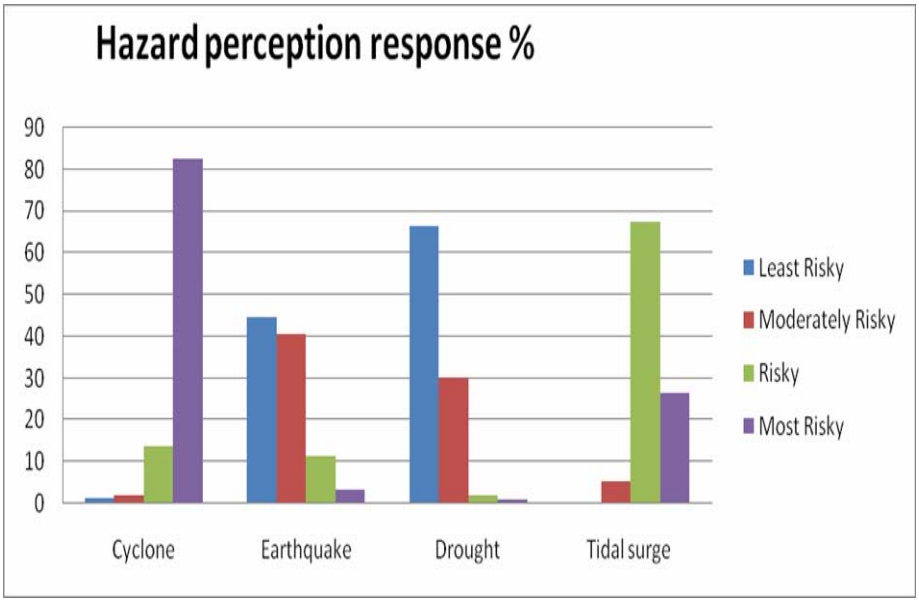



**Fig: 4.1 Hazard perception response of the local community**

## 4.2 COMMUNITY RISK REDUCTION PERCEPTION

Our study has found the following strategies that should be undertaken for the sake of their livelihoods. On an average more than two responses were reported by the respondents. Construction of embankment was found as the most frequent response (35.18%) in order for their livelihood protection, which was followed by construction of new shelter place (13.44%), and early warning signal before disaster etc. Fig 4.2 shows the community response on the risk reduction measures.

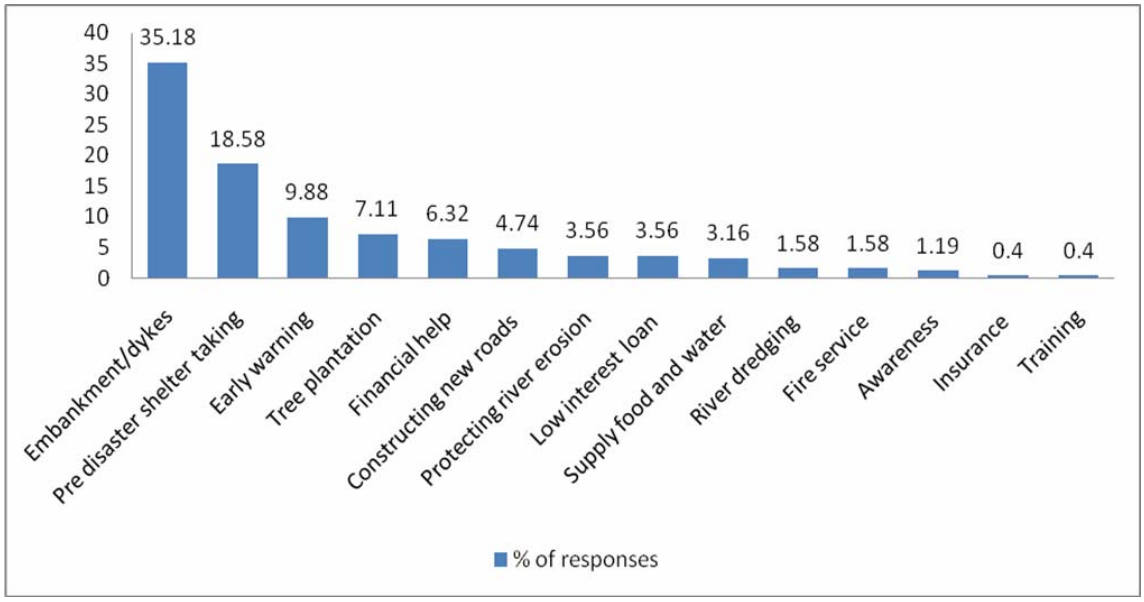



**Fig. 4.2 Community Perception on Risk Reduction Measures**

# 5. CURENT VULNERABILITY AND SUGGESTED MITIGATIONS

Identification of the sources of vulnerability is the first step towards sustainable rehabilitation of the coastal livelihoods. This requires understanding the diversity of coastal people and communities, especially in relation to their livelihood strategies. The Economic Risk Analysis report identified the vulnerability of the economic sectors due to the cyclone and tsunami storm surges separately. Based on the identified sectoral vulnerability and the stakeholders' perception, this section of the report provides risk reduction guidelines to address vulnerability of the economic sectors and to increase resilience of the coastal livelihood to the adverse impact of hazards like cyclone and tsunami tidal surges.

Destruction of crops during 91 Cyclone

The causes of vulnerability of the sectors identified are discussed under the following:

## 5.1 HOUSEHOLD VULNERABILITY

Vulnerability is the exposure of individuals or collective groups to livelihood stress as a result of the impacts of hazards. Individual (or household) vulnerability is determined by access to resources and the diversity of income sources, as well as by social status of individuals or households within a community. Household vulnerability of the coastal population arises out

of the complete or partial destruction of their houses, capital assets and loss of income potential. The indicators of individual vulnerability used in the earlier ERA are the incidence of poverty, food security and riskiness of income sources to extreme events. Vulnerability of the economy of the household or the community livelihood that has been analyzed in the report can be expressed in three components:

- the size and likelihood of the shocks
- the exposure of the shocks
- the capacity of the people to response to the shocks or its "resilience"

### 5.1.1 The size and likelihood of the shocks

The total loss to the economy would range between Tk.400 billion and Tk.1 trillion across different risk zones under cyclone categorization.Total potential loss to the household sector would range between Tk.13 billion and Tk.59 billion across different risk zones under cyclone categorization.

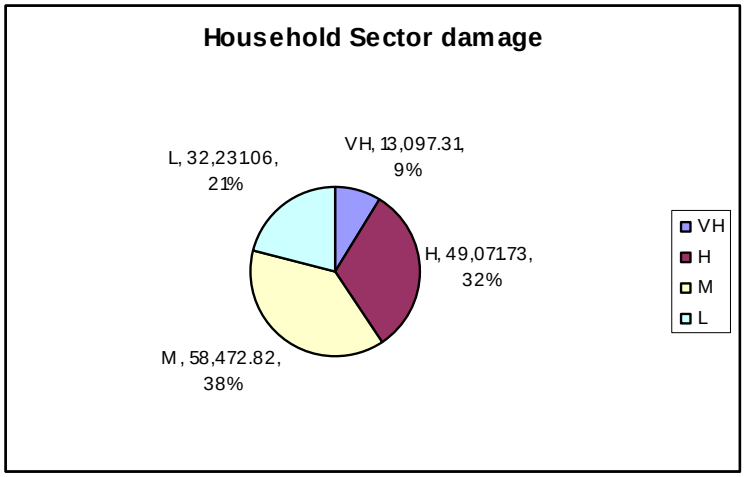



**Fig: 5.1 Household Sector Damage in Different Cyclone Zone**

However, the highest amount of loss of Tk.329 billion and Tk.764 billion across different risk zones would be inflicted to the industries and services sectors. Under tsunami categorization where the total loss would range between Tk.126 billion and Tk. 400 billion. Given that the

total GDP of Bangladesh was about Tk.3,218 billion, the natural disasters such as cyclone and tsunami would create a havoc in terms of economic loss.

### 5.1.2 The Exposure of the Shocks

The population size exposed to the different risk areas indicate that about half of the coastal population resides in the Very high to high inundation areas i.e. if a cyclone hit the area will be flooded with an inundation depth of 3m and above of which 19% of the population are residing in the area to be inundated with flooding depth of 5 m and above.

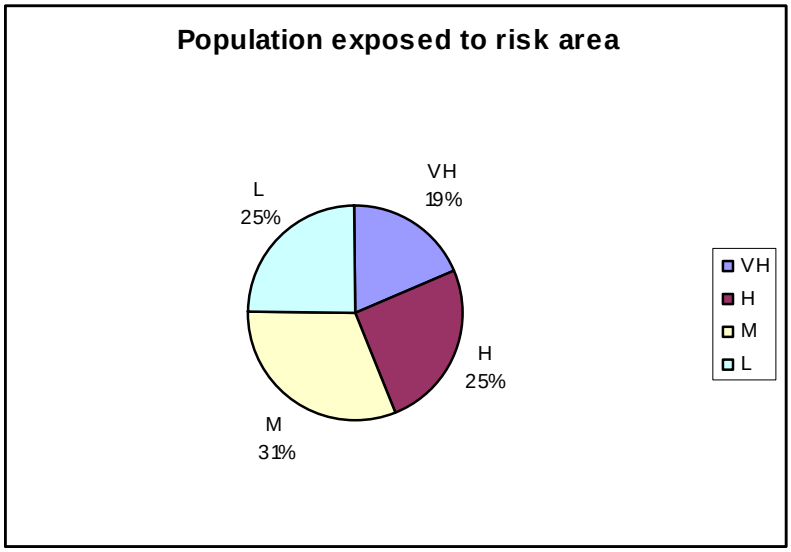



**Fig 5.1 Population exposed to risk area**

Photo showing the plight of affected family with their belongings

### 5.1.3 The Capacity to the Shocks

Vulnerability of the capacity to respond to the disaster shocks has been elaborated in the earlier report (CDMP, ERA, 2009) based on both individual vulnerability (using the indicators such as poverty, resource entitlements and resource dependency, food security etc. as idicators) and collective vulnerability using (infrastructure, institutions, finance etc).

Access to resources affects not only vulnerability but also coping from impacts of natural extreme events. Access to resources is a pre requisite for recovery from the impacts of natural hazards. Poverty is a meaningful proxy for access to resources. It has been revealed that the concentrations of non-poor and moderate poor in the high cyclone area are 64 and 51 percent respectively. Around half of the extreme poor households live in the moderate and low cyclone risk area. From the view point of tsunami most of the households of all types live in the moderate risk area and also it was found that around 80–90 percent of the households of each disaster zone own only subsistence level of housing and there is hardly any variation in the living status across different zones under cyclone risk or tsunami risk categorization.

It was found that the poverty situation in the coastal district is very bad since half of the population lives below the poverty line in 9 coastal districts. The average level of poverty of the coastal district is higher than the national average by 3 percent (Fig 5.2).

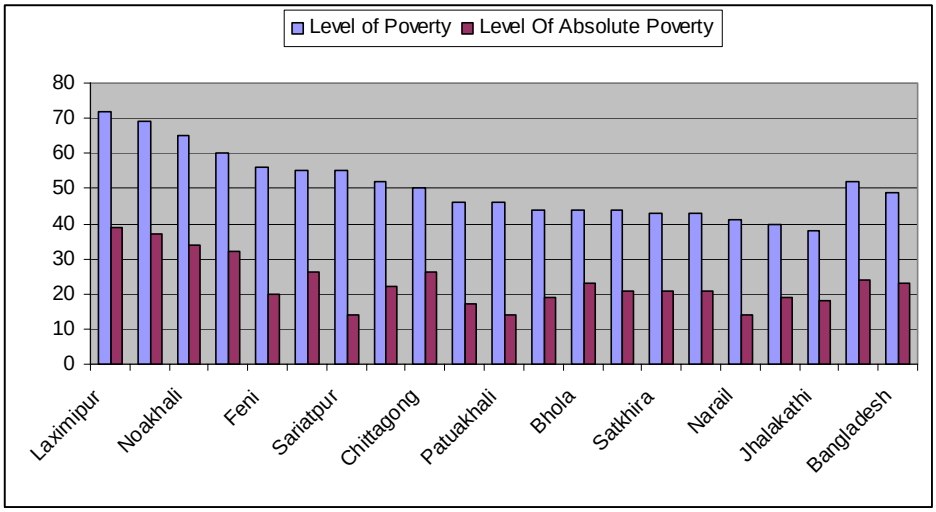



Fig 5.2 Poverty Level at District Level in the Coastal Zone of Bangladesh

Source: BBS, 1994, 1996, and 2001

It was assumed that a household to reside below extreme poverty line if the monthly average income is less than 2500 taka. Household earning between 2500 and 5000 are considered to be “Moderately poor”. If the household income is above 5000 per month we consider the household to be “Non-Poor”. It was found that 20 percent of the households are non-poor, the rest belong to poor or extreme poor groups (Fig 5.3). Thus, around four-fifths of the coastal population are vulnerable to natural disasters such cyclone and tsunami. Evidence also suggests that it is the poor who are discriminated in access to such resources in disaster situations, making them inherently more vulnerable. Thus individuals at the lower end of the distribution of income are more susceptible to the impacts of extreme events because they have little diversity in their income sources and fewer ‘reserves’ to absorb shocks. These are added to the institutional factors which act to disempower the poorer sections of populations and prevent their access to resources for recovery.

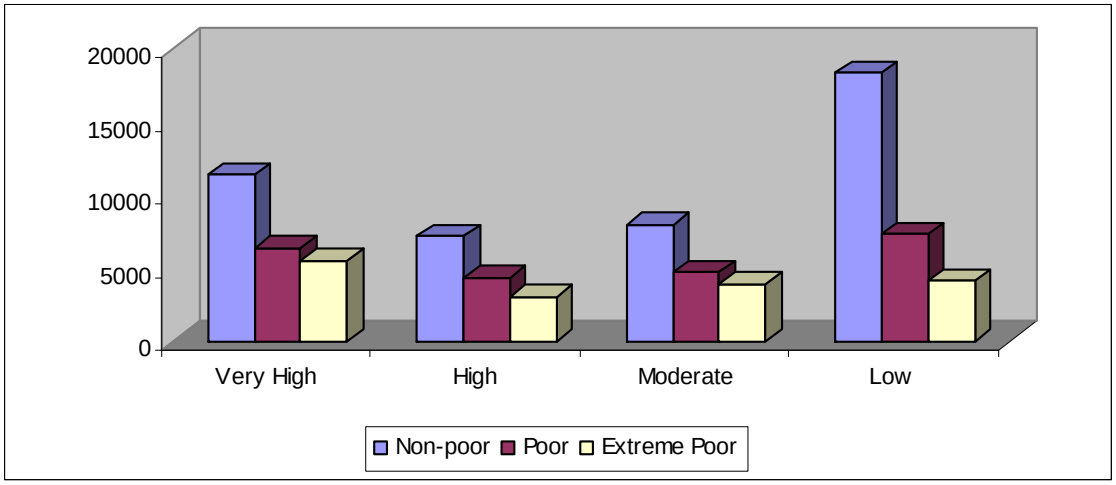



**Fig.5.3 Distrubution Poor in Risk Zones**

Changes in collective vulnerability are indicated through changes, in distribution of resources within a population, and by institutional changes which can either enhance security or exacerbate vulnerability. Coastal communities depend highly on the natural resources for earning livelihoods. The natural resource dependent activities are mostly associated with agriculture and fisheries. It was found that 68.9% of the coastal labour forces are engaged in environmental dependent livelihood (agriculture related activities, fisheries and wage labour).

According to this operational definition we estimated that livelihood communities who depend on environmental resources intensively are more vulnerable than those who depend

less on environmental resources. Only 27% people of Environment Dependent Livelihood are found to be non-poor where as 43.90% people of Environment Independent Livelihood community belong to non-poor.

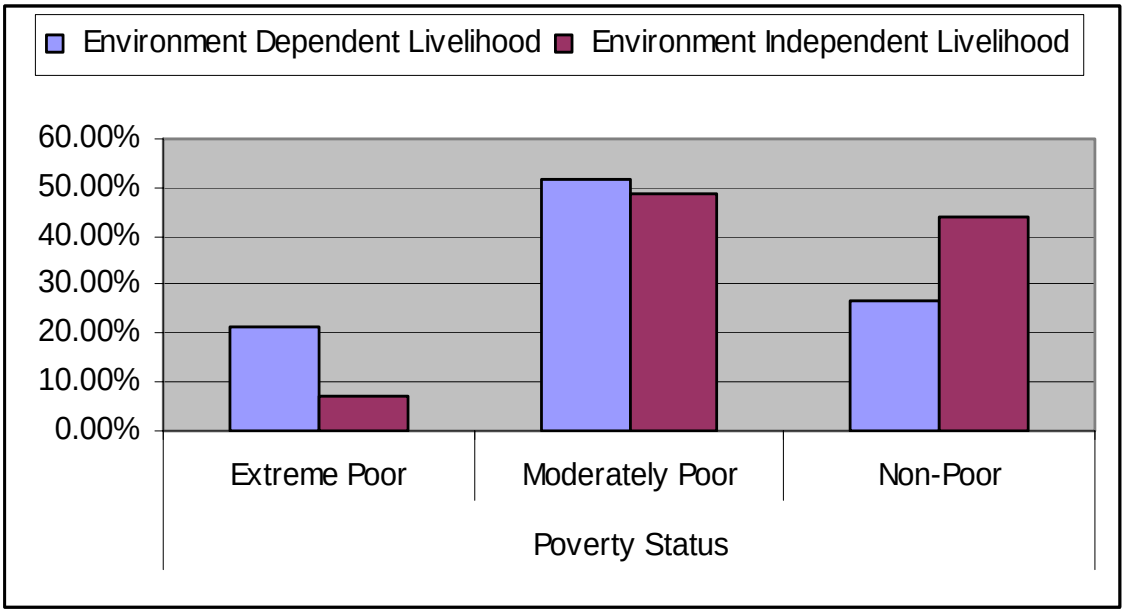



**Figure 5.4 Dependency of The Coastal Population on Natural Resources**

Such high dependence on environment is the prime source of vulnerability of the coastal livelihood. Lack of access to other productive resources and physical isolation are the two main reasons, which compel the coastal communities to utilize the natural resources intensively for their livelihood. Another phenomenon, which might aggravate the threat to coastal livelihood, is the unsustainable resource use by the coastal communities.

**Homelessness**

Our survey data reveals that around three forth of the households became homeless as an immediate outcome of the disaster across different zones irrespective of their livelihood pattern. Under the cyclone categorization about 70 percent of the households reported to have become homeless in the high and moderate zones. The average duration of remaining homeless was found around 12 days. Households in these zones reported to have remained homeless for 9-15 days after the disaster. As expected, the lowest duration of around 1 day was found for households living in the low risk zone under cyclone categorization.

**Indebtedness**

Indebtedness is exposes the vulnerability of the households after the natural disaster. The more vulnerable the households the more would they demand credit. It was found that about 38 percent of the households had to take credit from some sources after the disaster. Across different cyclone zones there are high variation of households falling into credit trap. About 40 percent of the household under high and moderate zones had to take credit after the cyclone. This may be compared with 9% and 11% percent of households in very high and low risk zones.

Under the tsunami categorization three fourth of the households in the moderate zone had to take credit after the disaster. It may be noted that there is a negative correlation between the severity of the risk and the amount credit taken by an average household. Ideally one expects that households living in the riskier zone would incur higher damage and consequently would need more credit. The opposite situation appeared to have prevailed in the coastal region. It was also found that agricultural livelihood group took the highest amount of credit. On the contrary, the paid employment group took the lowest amount of credit. The environment dependent households borrowed more money than environment impendent livelihood group.

**Food Security**

Food security is an important parameter of household wellbeing. Table 3.5 shows the coastal households have about 7 months of food security and consume food barely more than 3 months out of own production. As a result the coastal households in general are deficit households. It also reveals that there is negative correlation between the food security status and the resident location of the households. Whereas households living in the high risk cyclone zone have food security for half a year those living in the low risk cyclone zone can afford to have food security for three quarters of the year. In case of tsunami categorization any household group does not seem to have any advantage over the others groups.

The consumption food produced by the households themselves is low at 3 and 4 months for moderate, high and very high cyclone risk areas. In contrast, households living in low cyclone risk area can afford to consume from own production around 11 months of the year. Thus households living in riskier zones are more vulnerable to natural disasters such as cyclone. The situation is almost opposite in the case of tsunami.

## 5.2 AGRICULTURE

The major means of livelihoods of the area is agriculture. Agricultural wage as the major sources of the seasonal income of almost 1 million people is affected. As a Percentage of Total Rural Households Rice harvesting and further processing is a major source of employment for many marginal land owners and landless households. Crop losses have also meant loss of wage income for a large number of households with very limited alternative sources of livelihoods.

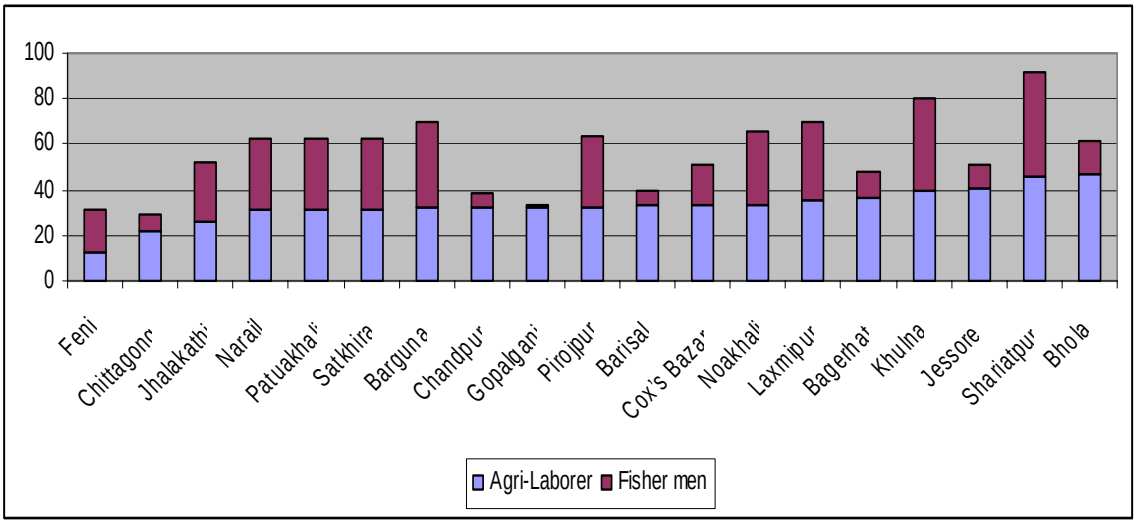



**Fig: 5.5 Agricultural & Fisheries Dependent Households, Source: BBS, 1994, 1996, And 2001**

Across the cyclone zones, about 2.6 million hectares of land were cultivated for different crops in the selected coastal upazilas (Fig 5.6). Most of the gross cultivated areas fall under moderate risk zone (0.95 million hectares) followed by low (0.72 million hectares) and high risk zones (0.61 million hectares. Even though a small fraction of land is cultivated in the very high risk zone, a large part of the gross cropped lands is vulnerable to cyclone hazard. The same observation holds for the tsunami zones (Fig 5.7).

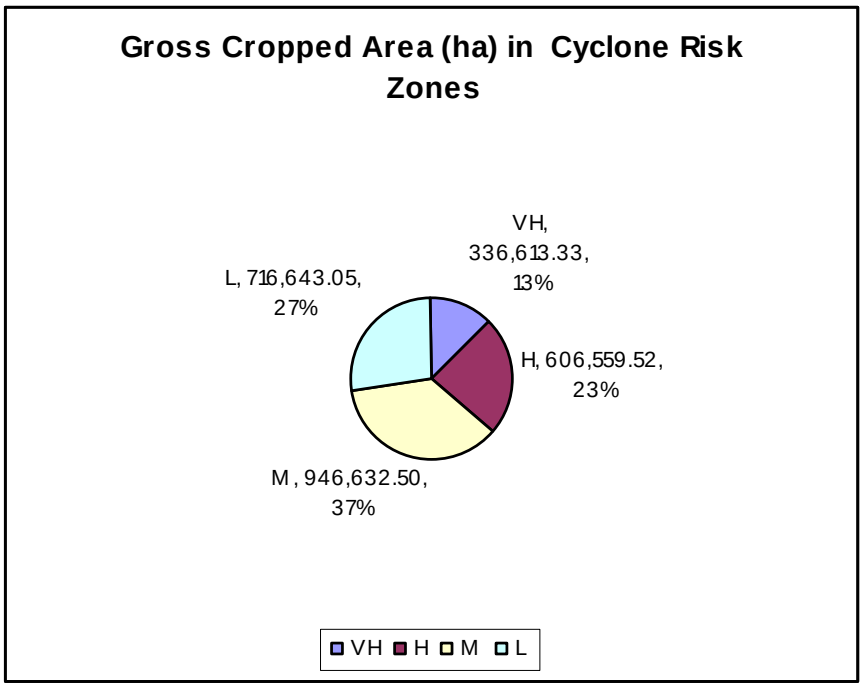



**Fig: 5.6 Gross cropped in cyclone risk zone**

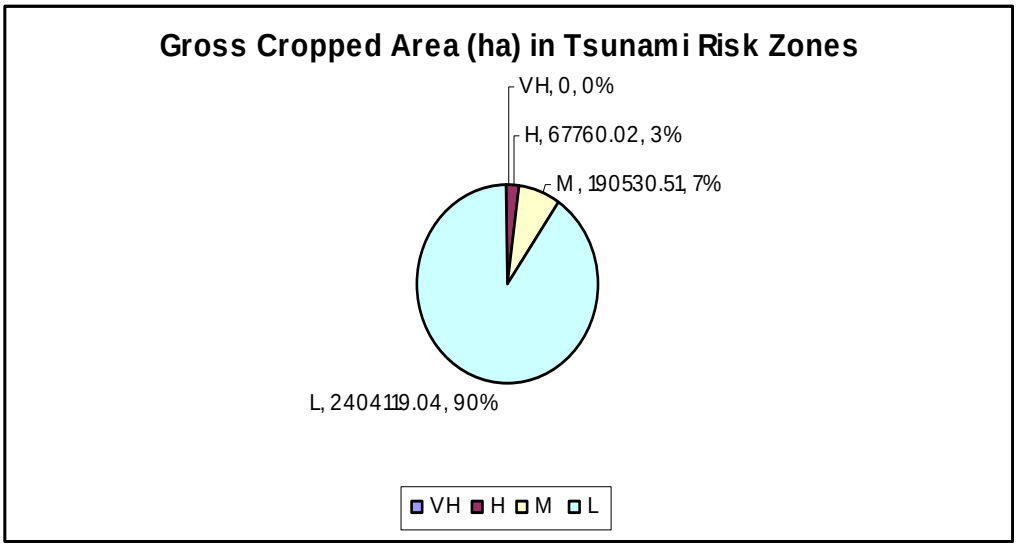
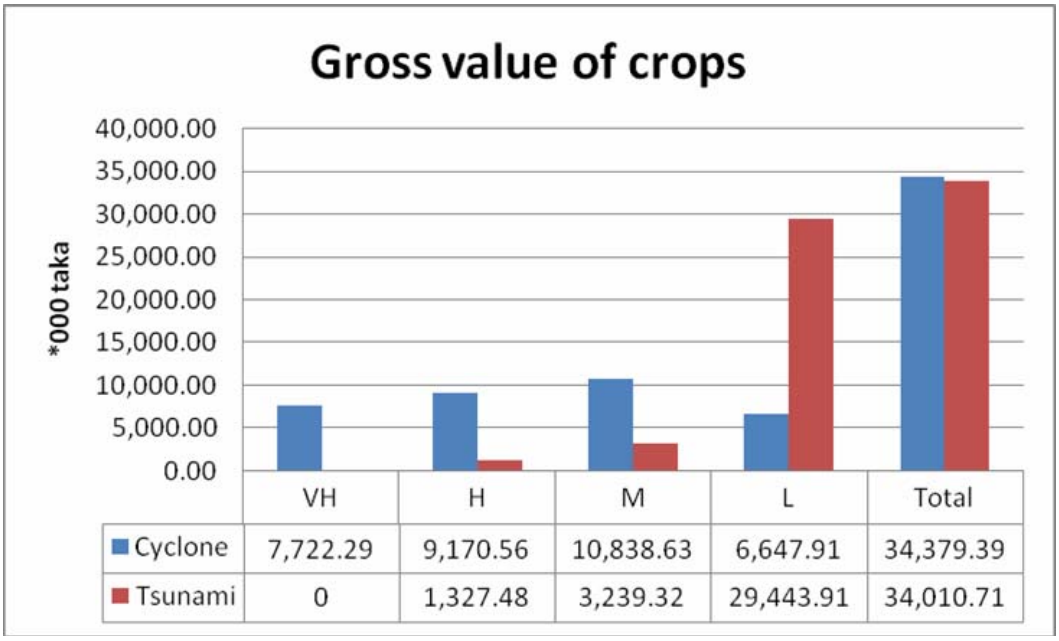



**Fig: 5.7 Gross cropped in tsunami risk zone**

The ERA estimated that value of rice crop ranges from Tk.1.2 billion to Tk.2 billion. That means rice contributes to about two-thirds of the total value of the crops which ranges from Tk.1.8 billion to Tk.3.2 billion. The distant second and third important crops are various types of spices and pulses.




| | VH | H | M | L | Total |
|---|---|---|---|---|---|
| Cyclone | 7,722.29 | 9,170.56 | 10,838.63 | 6,647.91 | 34,379.39 |
| Tsunami | 0 | 1,327.48 | 3,239.32 | 29,443.91 | 34,010.71 |

**Fig: 5.8 Gross value of crops in the risk zone**

The FAO-GoB Mission for SIDR damage estimates that crop damage in the severely affected districts was about 70 percent and between 20-40 percent in the moderately damaged subdistricts of the crops, mainly rice and grass pea. In addition, crop damages in further 5 districts in the South have also been estimated at about 10 percent of the normal production levels. The ERA estimated that potential damage across different inundation risk zone varies differently. The value of the crops exposed to different cyclone inundatioin risk zones were estimated as Tk.40,068 million,Tk.48,214, Tk.55,694 and Tk.33,949 in very high, high, moderate and low risk zones respectively. For the tsunami inundation the value of the potential loss in the crop sector was Tk.6,839, Tk16,695, and Tk.151,093 in the high, moderate and low inundation risk zone.

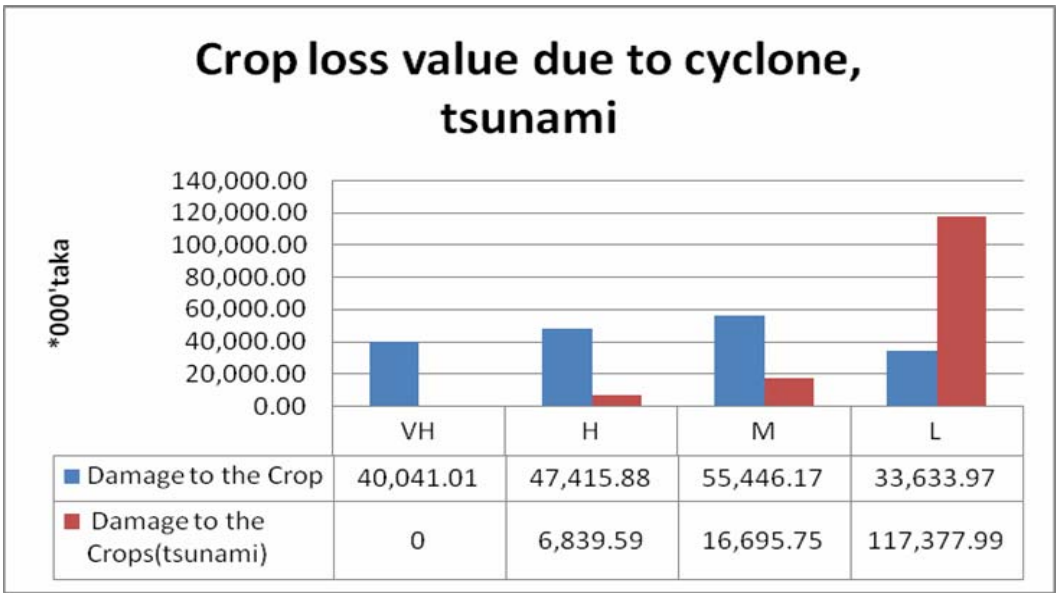



**Fig: 5.9 Value of potential damage in crop sector by risk zones**

## 5.3 FISHERIES SECTOR

In the coastal zone, fishing is the predominant source of livelihood after agriculture which is about 20.4 percent of the households. The estimated number of fisher households as of 2001 is over half a million with a population of about 2.65 million. The fisher communities usually live on the marginal lands of the coastal areas and were the first to experience the full force of the cyclone. They operate in the estuary, on coastal waters and sometimes in the deep sea. The areas suitable for shrimp culture methods are estimated at 200,000 ha of which 150,000 ha are in the southwest and 50,000 ha in the southeast. Coastal offshore areas and the estuaries also exploited by the country's small scale fleet composed of some 17,000 boats of different sizes, 6,000 of which are reported to be motorized. About 90% of the country's marine fish catches are taken by artisanal fishermen and the remaining 5% by the industrial trawlers. However, in terms of value, the industrial sector is of great importance because landings of high-valued shrimp. But at the same time it is responsible for damaging about 30,000 tons of by catches (or trash fish) per annum which are discarded in the sea.

A large number of fisher folk lost their fishing gear and houses. Most of the fisher folk are not necessarily owners of the gear (boats and nets) but rather are employed by boat owners. Remuneration from capture is either in kind or cash and the level of payment vary across owners, season and geographic location. The majority of fisher folk lost their only source of

livelihoods as a result of damages caused to boats and nets as a source of employment. Regarding the capture fishery, the Department of Fisheries of GoB estimates that a total of 2,761 boats have been damaged or was lost during the Cyclone SIDR in 2007. The entire dry fishing infrastructure of the Dubla Island fishing areas in the Sundarbans, and Rangabali of Barguna district were swept away due to tidal surges.The dry fishing clusters of Kutubdia, Sonadia, Gatibhangha, Dalghata of Maheshkhali,and Cox's Bazar were also affected.

It was reported that the early recovery activities in the fishery sector was minly through rehabilitation of boats and fishing gears of the fishers resident to officially affected Upazilas by some NGOs. The fishermen camped at Dubla Island were mostly come from Anwara and Banshkhali Upazila of Chittagong district.These fishermen and fishermen from the coastal areas of Cox's Bazar district who lost their fishing gears and dried fish stock did not rceive any rehabilitation finance because they were not resident of the officially declared SIDR affected areas. Most of the fishermen they depended on Mahajan for capital investment or mortgage loan from the Bank. To repay the loans almost all of them had to make distress sale of their urban and other landed property..

About 1.2 million people are directly or indirectly involved in the shrimp industry. Damages to fish and shrimp ponds/enclosures also closely follow the geographical distribution of the damage severity. Inundation, oxygen depletion, damages to dykes and pond structures as well as some loss of equipment and fish stock have been the main damages to the aquaculture sector. It was estimated that the total value of shrimp across all risk zones amounts to Tk. 33276 million of which the value of the very high inundation zone is Tk.1984 million and high inundation area is Tk.6417 million. Another Tk35955 million was estimated for damage to pond fisheries. The damage also varies depending on the seasonality of the hazard. The value of the potential damage to shrimps exposed to different risk zones is given in Fig 5.10. and value of clture fisheries of the pond is given in Fig 5.11.

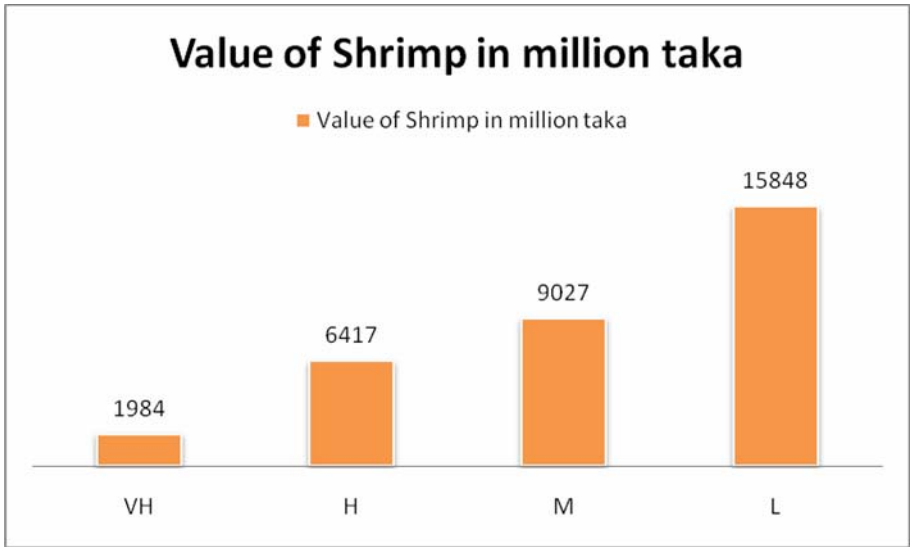



**Fig: 5.10 Value of shrimp sector by cyclone risk zones**

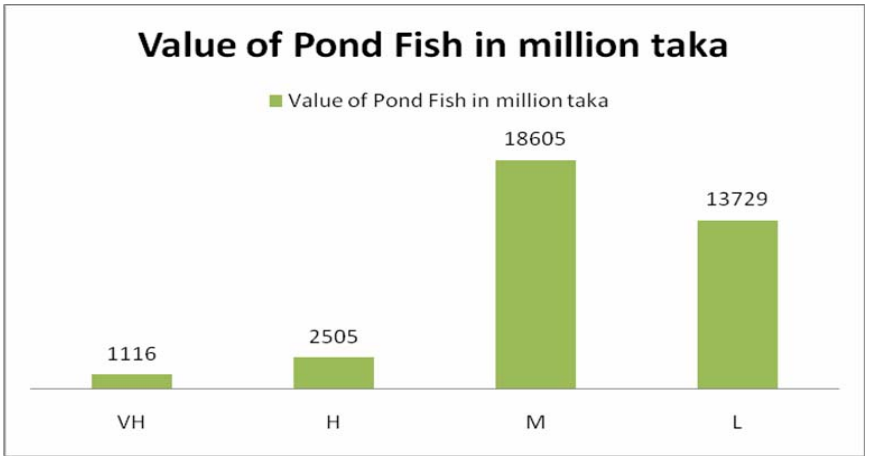



**Fig: 5.11 Value of pond capture fisheries sector by cyclone risk zones**

## 5.4 LIVESTOCK

Livestock Sector was hard hit by past cyclones. Many households, to whom, livestock was one of the major sources of livelihood lost their only livelihood sources. Cyclone Sidr had huge impacts on livestock, killed 106,189 cattle, goat and sheep along with 2,527,880 poultry birds. Apart from the death of livestock, some 4,884,503 cattle and 31,510,839 poultry bird in 112 Upazilla of 17 cyclone affected districts were affected as an adverse effect of the

cyclone, which pose extra stress on the livelihood restoration. A large number of livestock have been injured from falling trees and collapsing sheds and almost all large animals are visibly very weak and susceptible to diseases. Most of the crop residues, the

Photo shows an affort to save animals after cyclone of 91

main source of Feeding is a major issue and some farmers have begun washing up the rice stems, which may be partially edible but certainly not sufficient to feed the remaining cattle and buffalos. Goats and poultry usually scavenge and require little additional feed. The death of cattle and buffalos has also reduced the amount of draught power available to farmers in the ensuing season. The value of the livestock in different inundation zones estimated to be Tk.46,818 million of which about half of the resources exposed to high and very high cyclone inundation risk zones.Regarding tsunami exposure, 87% of the resources are located to low inundation zone.

## 5.5 FORESTRY

The Bangladesh coast supports about 587,400 ha of natural mangroves, the Sundarbans the largest compact mangroves in the world and a further 100,000 ha of planted mangroves. This includes the biggest mangrove forests in the world- and coastal mangrove plantations. Three wildlife sanctuaries, in the Sundarbans, covering an area of 139,700 ha was declared as world heritage site (198th) by the UNESCO in 1997. The entire area of the Sundarbans was also declared as the 560th Ramsar site in 1992. It is estimated that 30 percent of the gross area of Sundarbans are water bodies.

### 5.5.1 Sundarbans

The Sundarbans mangrove vegetation consists of over 224 plant species, 270 species of birds, 35 species of reptiles and 42 species of mammals including the Royal Bengal Tiger and 400 species of fishes are recorded. The vegetation form multilayered closed woodlands. The luxuriant forest attains the height of about 20m and above.

In the impact zone of Sundarban (in surrounding upazilas), 18 percent households are dependent on Sundarban resources.The proportion of Sundarban dependent households varies from four percent in Pirojpurdistrict to 27 percent in Khulna district. Among them are shrimp fry collectors (35%), fishers(33%), bawalies (22%), boatmen(4%), golpata collectors (3%),shell/crab collectors (2%), mawalies and medicinal plant collectors (SBCP, 2001). Sundarbans has also now valued one of the most popular destinations in the world. Besides supporting livelihood of million population ( bowalis, hone collector and artisinal fishers, thatching and fire wood harvesters), these forests serve as buffer zones against cyclones and tidal surges and provide the first line of defense to the life and property of the coastal population against natural hazards like tidal and storm surges, cyclones and tsunami generated tidal waves.

The Sundarbans mangrove forest, one of the largest in the world and a world heritage, perhaps saved millions of lives but in the process suffered significant damages as well. Many households depend on forest resources for their livelihood.

The World Bank mission after cyclone SIDR estimated that some 4-5 percent (20 -25 000 ha) of forest area has been severely damaged and nearly 15 percent (60 000 ha) partially damaged. Damages to infrastructure also follow the extent of damages to forests. Below standard buildings with highly inadequate facilities have in most cases been completely destroyed while the cement houses are partially damaged. Wireless communication facilities have also been destroyed.

Destruction of wildlife habitat in the Sundarbans has observed which may make some wild animals critically endangered. Local dwellers reported the less visibility of deer, wild boars and monkeys which might happen due to dislocation and temporary migration of the animals.

According to a news paper report the tourism industry based on the Sundarbans lost about 200 million taka due to SIDR event.

### 5.5.2 Coastal Plantation

Bangladesh is the pioneer in raising mangrove plantations in the newly accreted coastal lands. The Forest Department has so far planted 112,972 ha area with various mangrove plants species.(patuakhali-22,120 ha, Chittagong 15,971 ha, Bhola 27,523 ha, and Noakhali 47,358 Many poor households depend on planted forests in chars and islands in Patuakhali, Bholaand Noakhali for fuel wood and materials for house construction. They are to work amidst various insecurities corresponding to threats from wild animals, intimidation from pirates etc.

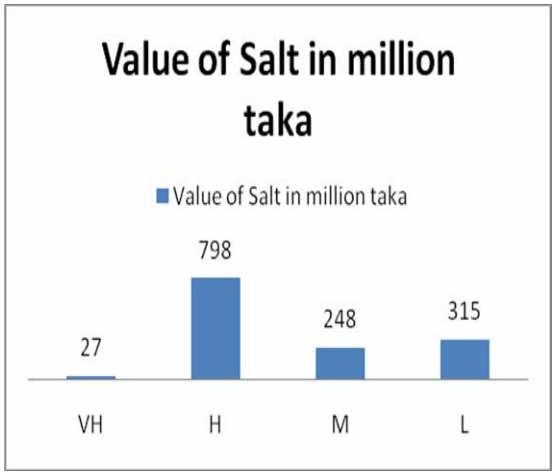
Green belt plantation has also made significant achievements over the past few decades, not only increasing the protective belt along the coastal areas, embankments, roads and railways but also significantly increasing tree planting in the homesteads.

The homestead gardens provide great protection against strong winds and cyclones but also are a significant source of income. Trees are also a good buffer stock and sold at times of hardship and when social expenditure is necessary.

Unfortunately, some of the alien species rain-tree and Chambal planted around the houses, along roads, railways and embankments also caused significant damages to lives and property.

## 5.6 SALT

Salt production is overwhelmingly concentrated in Cox's Bazar district where 15 percent of total rural households of the district are salt producers. As of June 2003, 38,328 salt producers operated on 23,735 ha of land in Cox's Bazar. Moheshkhali upazila has the highest concentration of salt producers. They meet bulk of the demand for raw salt in the country. About 60% of the salt production area is within very high to high inundation zone under. The value of the salt exposed to the risk area is about Tk.1.4 billion.



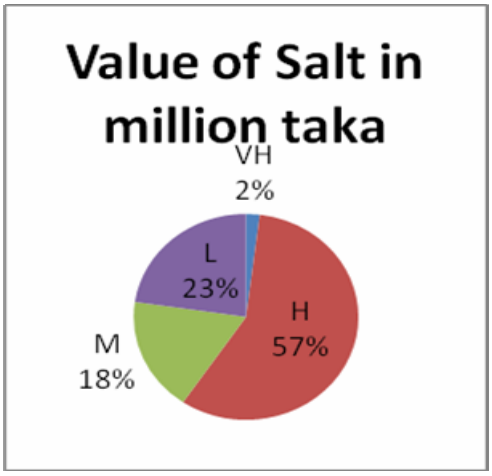




Fig 5.13 Fig 5.1

In the tsunami inundation area about 56% of the salt production area is exposed to high and moderate risk zone which is valued at Tk. 696 million.

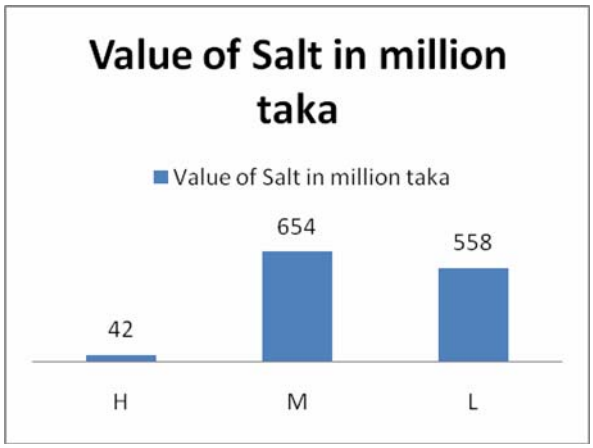



Fig 5.14

Salt production is a labour intensive work.Directly and indirectly about 200 thousand peopleare employed in this sector. The vulnerability of the sector other than livelihood of the dependent population is due to washing down of the stocked salt in the field, damage of the evaporation compartment of the production field. Sometimes the whole output is washed away by heavy rain and storm surge because of lack of storage facility. In the past there had been some attempts to provide credit support to the salt producers but due to in appropriate

recovery arrangement most of the salt growers failed to repay the loan money. They are now victims of the credit trap.

## 5.7 TOURISM

The tourism industry is contributing significantly to the socio-economic development in the region by earning foreign exchange and creating job opportunities. In recent years, private tour operators, in cooperation with the Forest Department, have developed systematic and structured ecotourism facilities in the Sunderbans. Some of the important tourist spots are Karamjal, Katka, Kochikhali, Dubla Island, Nikamal, Shekhertek temple, Mandarria, Notabeki, and Dobeki. The Sunderbans attract both local and foreign tourists—more than 0.1 million and around 1,500 per year, respectively. The sector is growing rapidly.

While Tsunami hazard is a very low probability event in Bangladesh the impacts of a cyclone disaster on a tourist area will generally be the obvious physical damage to the built and natural environments, and the immediate drop in tourist numbers including those that provide services to tourism operations (food suppliers etc.) and those that sell to tourists (craft roducers, handicrafts, guides etc. Adverse impact is also felt in reduced occupancy due to psychological set backs during early warning time. Less obvious but often more important is the sense of insecurity which may act as a deterrent to tourists long after the physical damage is repaired.

The SIDR damage study reported that private sector infrastructures were damaged by Sidr, which negatively affected eco-tourism. Sales of tourism packages to international visitors to the Sunderbans dropped immediately after Cyclone Sidr, affecting the tourism for the whole season. Estimated losses for the season was BDT 65 million (US$ 0.94 million), but fortunately, boats and other infrastructure had sustained no damage.

Potential damage to the tourism infrastructure all over coastal zone particularly hotels and restaurants are estimated at Tk15,371 million. The potential value of the subsector distributed in cyclone risk zones are 15% 25% 37% 23% in VH, H, M, and L zones respectively. The estimated value of the sector in tsunami inundation zones are 4% 8% 88% in H, M and lL inundation zones. The restaurants and other shop owners depend on loan from NGOs for their recovery.

## 5.8 CRITICAL INFRASTRUCTURE

Disasters exact an enormous toll not only on lives, but also on livelihoods, homes, basic social services and community infrastructure. These losses materially affect the prospects of disaster-prone countries for achieving the Millennium Development Goals (MDGs). Globally, the people farthest down on the economic ladder live disproportionately in the disaster prone areas. This is also true for Bangladesh coastal zone where the infrastructure facilities and the road communication network are generally poor. It was observed that access to sanitation facility which is critical for health has around 60 percent across all the livelihood groups. Even 56 percent of the households belonging to the paid employment community do not have access to hygienic sanitation facility. Access to electricity is also crucial for economic and social development. Coastal region has very low level of electricity connection across various livelihood groups as well as different zones. About 20 percent of the households have access to electricity. The critical infrastructures that are indicator of well being are subjected to washing down by tidal surges and knocking down by heavy winds.

The ERA report estimated that the welfare infrastructure is very low in the very high and high inundation areas. Although these infrastructures are relatively at lower risk but the population are served with lower number of essential infrastructure.

Uprooted crane in the Chittagong Port during 91 Cyclone

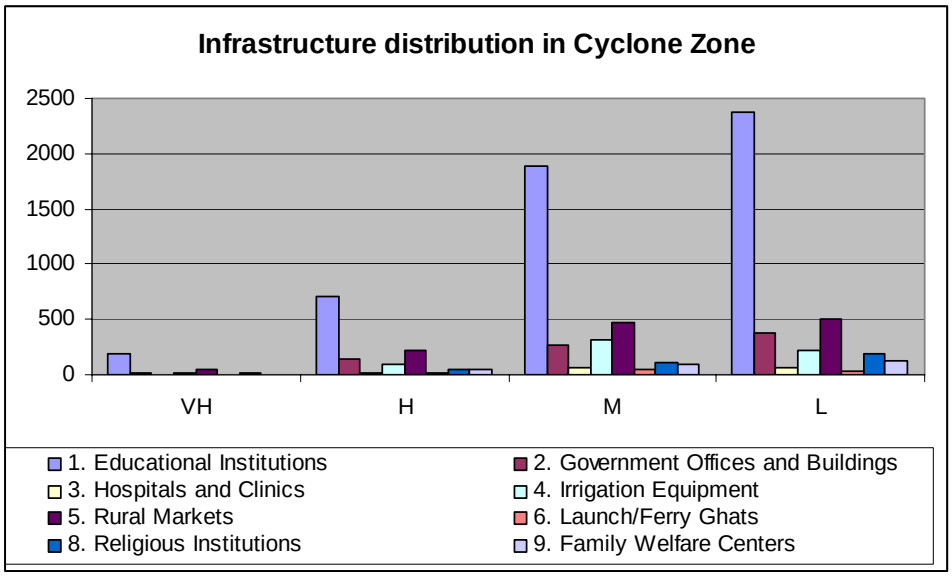



**Fig: 5.14 Distribution Infrastructure in Cyclone Risk zones**

Potential damage to such infrastructure will vary depending on the intensity of the cyclone/tsunami events. It was estimated that the average extent of flood damage to each educational institution at Tk.90,573 with duration of less than one week. Based on this estimate, educational institutions would be inflicted damages in the range of Tk.167 million to Tk.2.2 billion across different zones under cyclone categorization. Thus, rural markets and growth centers would be damaged to the extent of Tk.1.5 billion to Tk.16.5 billion across different cyclone zones. The irrigation equipment including deep and shallow tube wells, and low lift pumps would be damaged in the extent of Tk.1.8 billion in moderate and low risk cyclone zones if Islam's (2005) sectoral estimate is applied.

About 6000 km of dykes were constructed to protect the coastal areas of Bangladesh from Teknaf to Satkira during 1960s. The design consideration of these dykes had been only to protect the agriculture and settlements there in from tidal inundation due to normal high tides, not to withstand tidal surges (Chowdhury 2008). Due to poor maintenance and small breaches by shrimp farmers the entire coastal dyke system has put into severe vulnerable condition. The severity of the adverse impact of AILA has been attributed to such events. The severity of the impact would likely to exacerbate due to predicted increased cyclone frequency and sea level rise due to Climate Change.

Scene at Chottagong Port immediate after 91 cyclone

According to a study by Japan Society of Civil Engineering (JSCE) Embankment and Polder in Bangladesh seem to have the following weakness.

(1) Embankments and Polders do not provide the enough heights to prevent overtopping of cyclone storm surge. Entire overtopping had occurred in the coastal area and the Baleswar River area in this cyclone.

(2) Accuracy of construction for the side slope and surface of the structures is low. Irregular undulation is seen at any places.

(3) Many trees are planted in the surface layer of embankments and polders. A large number of these trees were blown down by the strong wind to cause the overturning or uprooting and the failure of embankment body

(4) Maintenance for the structures has scarcely been executed.

(5) Illegal habitation on the structures.

## 5.9 COMMERCIAL SECTOR

The commercial sector risk assessment in the ERA Report included the manufacturing industries, rural informal business and tourism sector. The distribution of the industries in

different cyclone inundation zone reveals that the high value industries particularly industries of the Chittagong and Karnafuli EPZ are located in the VH and High risk zones of the cyclone inundation. The cumulative investment in these two EPZ estimated to be US$7908. Total damage incured during ’91 cyclone in the industrial sector was US$ 388.27 million of which private sector industries other than EPZ was US$314 million (81% of total). It was estimated that other than investment in EPZ the value of other industries is about Tk.2, 276,000 million in all risk zone.

The impact of the commercial sector is felt due to destruction of premises, breakdown or loss of equipment, loss of inventory (raw materials, products), interruption of electricity, roads destroyed in some locations, isolating businesses and impeding flow of inputs and outputs

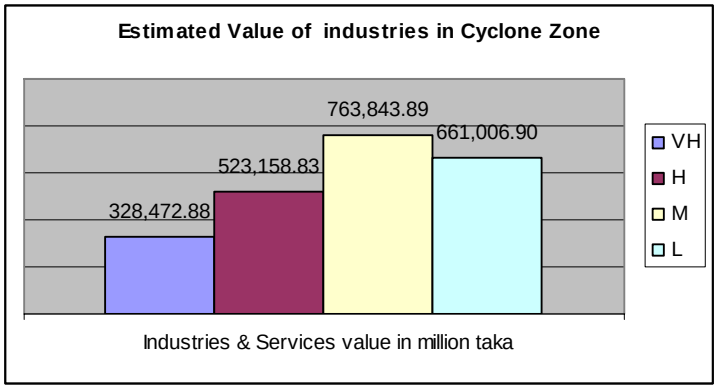



Fig: 5.13 Estimated Values of Industries in Ddifferent Cyclone Risk Zones

(except through waterways when feasible).The main kinds of business affected are mostly saw mills, rice mills, pottery factories and marketplaces and shops, and other (small hotels, restaurants, blacksmiths, etc). According to an estimate the super cyclone SIDR severely affect the livelihoods of about 45,000 business-owning families, not counting their employees (WB Report on SIDR).

# 6. RECOMMENDED RISK REDUCTION INTERVENTIONS

## 6.1 LIVELIHOOD RECONSTRUCTION

Livelihood concerns, being central to people's lives, Sustainable recovery or restoring the livelihoods of households and communities is a long-term process, in which the degree of the capacity of a given society (social groups) to absorb shocks and withstand the disastrous impacts of a tsunami can be assessed. Here, multiple factors come into play. These include first of all the degree of damage experienced (degree of exposure), e.g.the affected local income source (agriculture fishery and so on). But also socio-economic features that can be attributed to different social groups, such as landownership, type of occupation, financial assets (savings, insurance), access to social networks of mutual help (neighbourhood, family, formal and informal institutions) are important factors for the recovery potential of an area.

### 6.1.1 Economic Diversification and Livelihood Generation

Possession of wealth and assets gives households a wider range of options in times of crisis, and speeds their recovery from disasters. Economic diversification is central to poor people's strategies for reducing their vulnerability to external shocks. They seek to do this primarily by increasing their sources of income, building up a strong and diversified asset base, managing their money well and maintaining access to multiple sources of credit. This increases income overall and reduces dependency on individual sources: such dependency is a major contributor to vulnerability. The mitigation programmes implemented by members of the Citizens' Disaster Response Network in the Philippines is an example. They address a wide range of livelihoods issues, focusing on food security and nutrition and including: crop and livelihood diversification, propagation of disaster-resistant crops, supporting seed banks and plant nurseries, improving post-harvest facilities, encouraging better land-use management and sustainable agricultural practices, training community health workers, establishing village pharmacies and medicinal herb gardens, holding literacy classes and improving paths and footbridges. Thus, investment on strengthening and diversifying the sources of livelihoods of the coastal people can be the most effective strategy for the disaster risk reduction towards coastal livelihoods in the long term. It is important that such alternative options should be developed involving consultation and collaboration with coastal community and on the basis of in depth scientific research.

### 6.1.2 Promoting Gender and Social Inclusion

The findings of the HH survey suggest that the situation remains very difficult, particularly for marginalised women, and vulnerable children (children without parents, traumatized and mentally ill, disabled children, children at risk in relation to protection, children who have lost their livelihoods, children living on the street, etc.) vulnerable elderly and disabled people, and socially excluded groups (sex workers etc) after the cyclone.

To ensure equitable access to social services and address the needs of the vulnerable groups, a conducive policy environment is crucial for engaging all community stakeholder groups in a multisectoral post-disaster planning and rebuilding process. Special effort is required to ensure that the interests of the most vulnerable, including women, children, particularly orphans, older persons and persons with disabilities, are adequately included in the reconstruction effort. It is crucial to protect their right of access to safe water and adequate sanitation and to safe food, nutrition, health services, education and information, as well as their right to healthy environmental conditions, and to non-discrimination. They need to be prioritized to ensure food and housing security, and employment. This would allow them to then focus on alternative occupational options. Ensuring the cross cutting groups' involvement in early recovery development works and during community consultations. A national level policy can ensure that these groups are involved in livelihood, governance, risk reduction etc. Mainstreaming needs to occur at all levels of Government and civil society.

## 6.2 NATURAL RESOURCE MANAGEMENT

### 6.2.1 Agriculture

Agricultural sector reduction measure can be addressed both at preparedness before cyclone and also recovery after the cyclone.

Preparedness for cyclone in the agriculture sector can include early harvesting of crops if matured, safe storsge of the harvest ect. Irrigation canals and embankments of rivers in the riskzone should be repaired to avoid breaching.

For early recovery of the sector targeted distributions of agricultural supplies (field crop and vegetable seed + fertilizers Provision of farm equipment and mechanical machinery (power tillers, irrigation pumps, threshers) and other inputs

Facilitating the recovery of the farming system to pre-disaster levels is problematic. For reduction of risk in the long run the measures should be under taken for the Agriculture sector:

*Crop diversification & Planning*

The crop diversity is an essential prerequisite for productive agricultural ecosystem and sustainable livelihoods in developing countries (Bushamuka 1998; Anishetty and Hodgkin 1998). Growing different varieties and diverse crops helps farmers to fine-tune their farming systems to local environmental conditions, to maintain food security and to utilize crop related benefits (Bushamuka 1998).

New rice varieties may be developed to withstand high salinity and higher temperature and be grown and harvested during non-cyclonic period. Vegetable and rice seeds, fertilisers, purchased inputs for aquaculture (fish and shrimp), fodder and medication for livestock need to immediately be provided to targeted households in the severely affected sub-districts.

*Ensuring access to seeds and other agri equipment*

Establishment of seedbanks and nurseries at the community level can ensure a stable supply of seedlings, seeds, cuttings and other plant materials. Seed stocks can be used in time of energency for rehabilitation of damaged crops. Determined during the diagnostic stage, if germplasm is to be introduced into the community, it should closely resemble pre-disaster conditions. Thus if farmers have been growing only local varieties of target crops, then these should be the focus; if farmers were growing modern high-yielding varieties, then these should be provided (ODI 1996). However, in many post-disaster situations this is not always so straightforward.

Another methodology aiming to facilitate access to seeds is the creation of communal seed banks. Within seed banks stocks of seeds are grown, harvested and stored and can be accessed by the community in times of need. Benefits to this approach are that seed banks

can function with limited external assistance and they can serve as both a preventative measure before disasters and a post-disaster recovery measure.

Facilitating access to seed can also be achieved by strengthening existing social linkages with an emphasis on gender sensitivity.

Another approach aiming to strengthen existing social linkages and building seed security is to encourage the formation of small-scale seed enterprises through relief interventions. Constructed of farmers, entrepreneurs, or local institutions, the enterprise members are trained in methods of seed production and assisted in setting up the enterprise

Seed distributions are the post-disaster strategies that have the most direct impact on biodiversity. Although a small portion of this literature focused on farmers' participatory varietal selection for seed distributions, a larger portion focused on the debate between seeds from *in situ*/ *ex situ* sources, informal/formal sources and local/modern high yielding varieties. In addition to seed selection issues, the effects of social and economic variables on the management of biological diversity were also significant components of the literature explored.

*Better landuse and crop planning*

An strict landuse planning is necessary to promote ecologically appropriate agriculture and human settlement policy. Agricultural planning based on agroclimate and sensitive to disaster impact need to be adopted. Crop planning is also an useful tool to adopt agriculture system.

*Community capacity building*

The above measures require strong community support. Communitybased Risk Assessment process can be an useful tool for assessment and analysis of the risk and need for risk reduction intervention and the agricltural strategies to be adopted.

### 6.2.2 Fisheries Sector

Fisheries sector is one of the worst affected due to the cyclone which has rceived adequate attention in disaster recovery programme. There is great scope in Bangladesh to elevate vulnerability reduction in the fisheries sector to a new plane of significance. This has much to do with the overall environment that exists for disaster management in the area and

development of a number of strategic initiatives that are designed to reduce the vulnerability to hazards of all kinds.

As has been discussed earlier life and property of the fishermen is always at stake due to cyclone hazard. The future climate change will continue to increase the stress. Within the fisheries sector it must be realised that preparing for immediate threat of disaster is not enough. More long range planning is necessary. Disaster mangement must become an integral part of the fisheries planning process as well as a part of the national planning process. More emphasis should be given to risk assessment and vulnerability reduction within the sector.

*Rehabilitation of the Fishineries Sector*

Targeted provision of supplies to shrimp and carp farms (lime, fertilizer, fry & feed by February/March 08 (provision of supplies for carp farms also possible later); Assistance to groups of fisher folk (provision/repair of boats and provision of appropriate fishing nets and gear to assist groups of 5 and 10 fishers) + capacity building (boat building, fish processing, etc.).

The fisheries sector should be explicitly included in the national disaster response and preparedness institutional set-up and form an integral part of disaster preparedness plans. Such plans should be established by disaster-prone countries and the necessary capacities and capabilities for implementing them developed.

*Empowering Fishers*

Making provision for fishers' organization at local level may provide an opportunity for "empowering" the fishers, could than play a strong role in disaster planning for the sector. The development of strong fisher organization should be encouraged and facilitated. By working together in a cooperative relationship, fishermen may find it easier to access resources such as marine insurance and training oportunities. They would also be in a positionb to spread the risk normally associated with investment in the fisheries sector. They would also be able to offer mutual assistance to each other in several other aspects of disaster mangement.

*Improving the safety at Sea.*

Lessons learned from disaster impact and response should be systematically analysed and used to improve future interventions and preventive work at the national and international levels.

The fishermen in traditional fisheries are exposed to inherently high levels of risk and resulting accidents, for which there are few survival or rescue strategies; there is urgent need to address the multi-dimensional issue of sea safety for artisanal and small-scale fishermen on a regional basis and in a holistic manner. Strongly recommend the formulation and implementation of a regional sea safety programme, employing a consultative and participatory approach, building upon institutionally derived data, together with the operational experience of artisanal and small-scale fisher communities. This could be achieved through a regional mechanism such as the Inter Governmental Organization proposed by the BOBP member countries during the 24th meeting of the BOBP Advisory Committee at Phuket, Thailand. (The Phuket Resolution - October 1999);

- ✖ Effective early warning systems and other mechanisms for disaster mitigation such as cyclone shelters need to be developed and/or improved, as required. These need to take the specific requirements of fishing communities into consideration, e.g. covering migratory fishers and fish workers. Empowering fishers

- ✖ fisheries and maritime administrations enhance their knowledge of the operations and constraints of the artisanal and small-scale fisheries sectors in order to formulate effective guidelines, standards and regulations for the safety of fishing vessels, including the certification and training of crews;

- ✖ development and implementation of education, training and awareness programmes which satisfy regulatory requirements, while also building a culture of sea safety within artisanal and small-scale fishing communities;

- ✖ mandatory requirements for improving sea safety be supplemented by other strategies which involve the participation of the fisher communities, families, the media, and other stakeholders in order to promote the adoption of a wide range of safety measures;

- fisheries administrations consider the provision of financial and other incentives to encourage and ensure the widespread use of safety equipment, together with training in the use of such equipment;
- fisheries sector should be explicitly included in the national disaster response and preparedness, institutional set-up and form an integral part of disaster preparedness plans.
- The resilience of disaster-prone coastal communities should be strengthened, building on existing strengths, coping strategies and measures and local or indigenous knowledge
- Effective early warning systems and other mechanisms for disaster mitigation such as cyclone shelters need to be developed and/or improved, as required

### 6.2.3 Livestock Sector

The rural economy is very much linked to animal husbandry activities which not appropriately addressed in disaster risk reduction plan. The following short and long term measures need to be taken to reduce future risk in this sector.

*Short term measures*

Emergency provision of animal feed, multi-vitamin rich food concentrates/pellets, fodder and veterinary supplies to improve animal health (for poultry, water fowl, small and large ruminants); Provision of veterinary drugs, medicines, in support of mobile veterinary and surveillance teams

Careful restocking with poultry with due precautions being taken and active surveillance initiated ensuring no spread of Highly Pathogenic Avian Influenza (HPAI), and restocking with small ruminants (goats & sheep);.

No prompt action may result in Households (HHs) will restock with limited to no control which will result in increased risk of AI and other disease spread;

*Long term measures*

Every cyclone takes its toll of human and animal lives. The loss of livestock has serious consequences for the village communities. The cyclone shelters, numbering nearly 2500 which have been constructed in all the districts along the coast, came as great saviours of human life and the death toll was significantly reduced. The protection of livestock in the shelter has so far been ignored. To offset this situation, it is being increasingly felt that there is a need to provide community cattle shelters. The design of Mujib Killa adopted during 70s may be considered for high inundation risk areas.

After the cyclone disaster there is serious dearth of fodder due to saline intrusion. Alternative fodder production capacity of the population should be supported as long term measure to reduce the risk.

### 6.2.4 Forestry

The Sundarbans has a history of more than a century old tradition of a systemic forest management which is based on frequent inventory and monitoring of the growth of the forest. Since 80s the forest has attracted national and global concern for deteriorating its stocking particularly the growth of Sundri and Gewa. Unfortunately the conservation goal of the forest has been misrepresented limiting to a fit in all concept of “socialization of the forestry” based on alternative livelihood at the periphery of the Sundarbans. ADB funded multi million dollar projects like SBCP was lunched on the premises of such an ill conceived notion of alternative forestry ignoring management options based on appropriate understanding of the natural dynamics of the ecosystem. Disaster reduction measures for the Sundarbans can not be considered in isolation of the Ecosystem Management of the Sundarbans. The Forest Department collaboration in implementing the Comprehensive Risk Reduction Plan for the coastal zone would be useful first step in this regard.

Promoting social forestry through home based nurseries, replanting embankments, institutions, road sides and home-based with appropriate species and varieties of trees provide

cobenifit for improving asset base of the poor to be used after disaster and also getting protection during the disaster.

### 6.2.5 Education

Disaster risk awareness and education strategies should be aimed at promoting a culture of safety, so as to achieve changes in current patterns of human behaviour that influence the risk of large-scale damaging effects of natural hazards. While in the past educational efforts in this field have often been based on a rescue and relief-centric approach, the orientation should change to a holistic disaster management approach that includes catastrophic risk prevention and risk reduction education. It also be aimed at providing diversified livelihood. The ERA study revealed that the respondent having education are less vulnerable than the persons not having education.

This reorientation requires an emphasis on disaster risk reduction tools and strategies and a combination of individual and collective actions. Accurate and trustworthy information on hazards, vulnerability, risks and risk reduction measures and strategies provide the foundation for promoting a culture of safety. Providing vocational and other income earning training to the local people reduces future risks due the disaster.

## 6.3 COMMERCIAL SECTOR

### 6.3.1 Manufacturing Industries

The manufacturing industries also incur loss from the cyclone disaster events. Though the employees were covered by NGOs during distress but no finance were available for the recovery of the industries. The industry owners depend only on personal loan from friends or Money lenders.To protect industries from future risk it is important that industries should strictly follow the industrial safety guideline and adopt insurance measures.

### 6.3.2 Business

Local economic activity is key to disaster resilience in much of the world. Without the flows of money generated by such activity, the ability to continue living, let alone recover, is limited. The long-term reality for the survivors of local communities is the struggle to rebuild their lives and livelihoods.

However, for much of the world including some sectors within rich countries, understanding the informal economy (which may overlap with the household sector) is the key to understanding the livelihoods of some three quarters of the world's population (Shanin, 2002). Financial and economic recovery depend on making up the disrupted flows of goods, services and ultimately money that provide the affected people and enterprises with livelihoods. Insurance and aid are important mechanisms which act to spread the risk and costs of disaster. For major events, government sponsored plans and strategies will typically also play important roles. The affected people have shown flexibility and resilience through shifting sectors to take advantage of shortterm employment opportunities in the building and reconstruction boom, by sharing resources and work, and by harnessing their kinship networks within the immediate disaster area, within the country with its emphasis on the money flows that employ people and sustain local enterprises.

The informal sector rarely has access to formal financial recovery mechanisms such as insurance and national compensation packages. At the time of fieldwork, it appeared that few, if any, informal or small formal businesses had received post-tsunami assistance. The major strategic recovery plan for the tourism sector in Southern Thailand is the Phuket Action Plan. This plan was developed by the World Tourism Organisation with input from regional tourism bodies including the Pacific Asia Travel Association (PATA) and the Tourism Authority of Thailand (TAT). The Phuket Action Plan has received widespread support and endorsement at an international and regional level.

So far insurance has favoured large scale commercial enterprises, although insurance payouts have been limited given the extent of devastation (McNaughton, 2005). Many small businesses affected by the tsunami were either not insured, or did not have appropriate coverage (The Economist Intelligence Unit, 2005). What is needed most is a revitalisation of the local economy through transfer of funds to the local economy through both public and private sector initiatives.

Promoting a culture of safety among the industries both government and private enterpreneir is required to reduce the future risk. It is however a long-term and sustained strategy by governments and must be based on a strong commitment of all institutional actors.

- ✖ insurance to buildings and machineries

- supporting post-disaster recovery for the informal business sector through microcredit
- ensuring compliance to industrial safety code and contingency planning by industrial facilities and special economic zones
- Introducing building code
- landuse zoning

### 6.3.3 Tourism

Tourism sector in Bangladesh is still in organizing stage but experiencing rapid development in coastal areas particularly Coastal beaches of Cox's Bazar, St.Martin Isalnd and Kuakata region. An immediate requirement is a sound tourism policy addressing risk reduction as part of holistic tourism development.

The tourism infrastructure establishment should be limited to safer zones. Building code for different tourism structure based on scientific principles need to be incorporated in locally based tourism development plan.

Access to credit finance after cyclone for rehabilating the informal sector down stream business

Capacity building training for tourism stakeholders

The majority of tourists to the region are long haul international travellers—a sensitive and highly competitive market. Media reports and foreign perceptions about a region have the potential to cause further devastation to a disaster-affected destination because of the discretionary nature of travel: "the quest for paradise (can) suddenly transform into a dangerous journey that most travellers would rather avoid" (Cassedy, 1991: 4). An area can become stigmatised by a major disaster. Tourists have to see that the cleanup is complete and that the areas are safe. In reassuring tourists, the authorities have to counter travel advisories that exaggerate health and safety risks beyond what the World Health Organization believes.

## 6.11 Cross Cutting Issues

### 6.11.1 Financial mechanisms

Two kinds of financial instrument will be discussed in this section: micro-finance (especially micro-credit) and insurance.

**Micro-credit and other forms of micro-finance**

Micro-finance programmes are numerous and widespread in many developing countries, with a massive outreach numbering millions of people. Many NGOs run savings and credit schemes, which often form an important element in their development programmes. Such organisations are also developing a wider range of financial services for poor people. Although there are debates on the extent to which micro-finance contributes to poverty reduction and its influence compared to other factors, it is generally acknowledged to play a significant role. Micro-finance is also important in reducing vulnerability before disasters and supporting post-disaster recovery. Its considerable strategic potential in these areas is only now becoming understood and utilised. Organisations that manage savings and credit programmes for the poor – usually referred to as micro-finance institutions (MFIs) – should be more fully integrated in risk reduction initiatives.

Research shows that loans, which are primarily invested in productive enterprises that generate income, are also often used to cope with present or potential crises that threaten livelihoods – by laying in stocks of food, making improvements to farmland, repairing houses, buying tools or other productive equipment, digging wells and irrigation systems, acquiring new skills, or making gifts to family and friends so that reciprocal favours can be asked later.

After a disaster, credit is used by victims to speed recovery by replacing lost assets and helping them get back to work. Loans are often taken out to deal with household crises – especially those caused by sickness or death in the family (which has both emotional and economic consequences), but also by such shocks as food shortages, sudden price increases, loss of employment or theft.

Until recently, MFIs did not pay much attention to hazards and disasters. This position altered rapidly in 1998, when flooding in Bangladesh and Hurricane Mitch in Central America caused widespread death, injury and loss among members of savings and credit programmes

– and, as a result, damaged the programmes themselves. In Bangladesh, more than 30% of MFI clients lost their houses or moved to safe places; 65% suffered losses or damage to business assets; and over 90% had to suspend income-generating activities for more than three weeks. Loan recovery rates fell from 92% to 43%; MFI staff could not locate borrowers or mobilise them for group meetings. Since then, MFIs have begun looking at how to protect themselves and their clients against risk. A number of studies and good practice guidelines are now available. Most interest to date has been in dealing with the consequences of disasters. MFIs use a variety of methods to help those who are affected.

Rescheduling loans has become a common practice. Writing off loans is undesirable, because it undermines long-term commitment by clients to repay as well as being a loss to the microfinance scheme itself. The terms of rescheduling have to be varied according to a number of factors including the nature and timing of the disaster, the community's cash flow patterns and the MFI's own financial situation.Some MFIs provide emergency loan facilities to their clients to meet immediate needs for food, clean water or medicine. These too are made at lower interest rates or even without interest, although it seems that many clients prefer to borrow informally in such circumstances – from friends or relatives if they can, and from money-lenders if they cannot.

Even where savings and credit programmes are available, informal borrowing remains important in poor communities, especially if it is to be spent on consumption, rather than invested in productive activity (at times of crisis, families go to great lengths not to use up their savings or sell off their other livelihood assets). They are more likely to take up emergency loans from MFIs if these can be made rapidly and come with few or no restrictions on the purpose for which they can be used

MFIs can prepare for disasters in many ways. In Bangladesh, it is common practice for MFIs to put a percentage of clients' 'compulsory savings' into an emergencies fund, which can be made available quickly to disaster-affected borrowers in the form of emergency loans (compulsory savings are regular deposits made by borrowers to build up collateral against their loans: normally they cannot be withdrawn while loan repayments are still outstanding). Housing loans may be provided in normal times to help clients build in safer locations. The stricter the conditions attached to the use of compulsory savings, the more likely it is that poor people will turn to other sources of loans, including money-lenders. MFIs may introduce

preparedness and mitigation initiatives for their clients. This is more likely where the micro-finance programme or institution is part of a larger NGO's portfolio. Some MFIs in Bangladesh have made subsidised loans for emergency preparedness purchases such as food, fuel, water purification tablets and rehydration tablets.

**Insurance**

Insurance is a standard and effective method of sharing risk, especially in developed countries, where it has been in use for over 300 years. In theory, everyone benefits from insurance. Individuals and organizations buy it so that they can be compensated when hazards lead to death, injury or ill-health, and loss of property or income. Claims are paid quickly and without conditions attached. This gives policy-holders the promise of some financial stability, and hence the confidence to invest (e.g. in home improvement) or expand (e.g. a business enterprise).

**Insuring the poor against disasters**

There has been little attempt to develop wholly commercial insurance programmes targeted at poor and vulnerable people. Experience so far is not encouraging. Some experts question if it is even possible to provide insurance cover to the poor on a commercial basis. Where insurance schemes for poor groups and individuals have been successful, they have generally originated in development programmes that have aimed at financial sustainability rather than profit. Government has to intervene, either through state schemes (to protect farmers against crop losses, for example) or by making some kinds of insurance cover compulsory (such as employers' liability or motor insurance).

Other institutions can also force people to take out insurance: companies making loans to people to buy houses usually insist that they are insured. in developing countries. Insurance companies have shown hardly any interest in extending their coverage to such groups. Initiatives to develop more flexible insurance tools to support poor and middle-income groups are at an early stage; many work at national rather than local levels, and they do not necessarily encourage greater emphasis on measures to reduce the impact of future disasters. Although there is still a lot to learn about how to make such schemes work effectively and many of them are fairly new, recent research on the subject has documented some of these

experiences in detail and provides valuable lessons. Such schemes are run mainly by micro-finance institutions but also by NGOs, cooperatives, governments and even companies.

Micro-insurance can be used to stimulate mitigation activities. Health insurance is often linked to preventive and primary health care programmes run by the insurer concerned (if an NGO) or a partner organisation, and policyholders may be expected to use such services. Insurance can stimulate other risk reduction measures. Insurers may only provide cover in high-risk areas if governments ensure adequate mitigation measures and emergency management systems.

State crop insurance schemes may allow farmers to take the risk of planting different crops, leading to greater diversification and security against individual hazards.

One additional factor to consider is that many poorly constructed homes are owned by low-income families who cannot afford the costs of mitigation measures on their existing structure, or the costs of reconstruction should their house suffer significant damage from a natural disaster. Social considerations suggest providing this group with low interest loans and grants for the purpose of adopting mitigation measures or to relocate them to a safer area. Such subsidies can be justified from an economic perspective as well since low income victims are more likely to receive federal assistance after a disaster.

### 6.11.2 Protecting the Assets

'Pro-poor' development is not necessarily synonymous with vulnerability reduction, and greater wealth may not by itself reduce risk. Assets do not protect themselves against hazards: they have to be protected. When poor people borrow money to buy livestock, tools or raw materials that can be used for income-generating activities, they are increasing their livelihood assets, which, in the long run, will help them to become more resilient to many external shocks. But drought, tidal surges or other hazards can wipe out these assets before they have been able to generate much return on the initial investment. In such cases, those concerned actually become worse off: not only are they without assets, as before, but they also have a loan to pay back. Similar scenarios can be drawn for other development interventions – investment in a new house or workshop where there is a risk from severe tidal surge, for example, or construction of concrete irrigation channels across an unstable hillside. In some cases, poor and vulnerable people may make a conscious decision not to invest too

heavily in particular items, choosing those that can be replaced cheaply and easily. This is an important factor in technology choice.

Economic development and poverty alleviation programmes need to take the hazard context into account if they are to have a meaningful impact on vulnerability reduction in the long run.Taking steps to reduce future disaster risks and building safer structures are important components of building back better. Construction of embankments in the coastal area is another adaptation and protection measure that can be undertaken.

### 6.11.3 Building Cyclone Shelters

Bangladesh has undertaken a massive program for constructing cyclone shelters in the coastal region. The basis for selecting location and calculating number of cyclone shelters is the history of cyclone and storm surge in the region. Over time, multipurpose cyclone shelters have been constructed in 15 of 19 coastal districts in Bangladesh.

There are about 2,133 purpose-built shelters and perhaps 200 refuge sites (killas) for livestock during cyclones and storm surges. The existing shelter capacity, however, is grossly inadequate compared to the requirements. Shelters should be multipurpose buildings (for example, in education facilities) also connected to killas. The shelters should have water supply (or storage facilities for water), sanitation facilities, and storage for food and supplies needed for survival immediately after a disaster. They should be connected with the communication network for speedy evacuation and delivery of relief supplies during the disaster. As a matter of policy, all public buildings constructed in the high-risk zones should be multi-purpose and of shelter grade.

### 6.11.4 Early Warning System

Good progress has been made in developing early warning systems, but it is less clear whether safer houses and infrastructure are being built, livelihoods are becoming more resilient, better land use and environmental management practices are being utilized, and more effective disaster management systems are being created. Tsunami warning systems should be linked to other hazard warning systems and strengthened as part of an integrated disaster risk reduction approach. National plans for warning systems should address the

means to transmit warnings and should include disaster management, risk mitigation, public awareness, and community-based activities. Several governments have recently adopted or are considering legislation relating to disaster risk management. These processes should be accelerated, and governments should take advantage of the agency consortium offer of assistance to ensure effective national plans of action. Investment in Education, Training and Technology Knowledge and information is power. The rebuilding of coastal livelihood is a good time to address educational and training needs in coastal communities. Through restructuring education curriculums, new knowledge and skills should be integrated. New skills, such as computer literacy or vocational and technical training provide a wide range of future employment opportunities. Business management and entrepreneurship training can assist people in taking advantage of business investment opportunities. Training in disaster management and management of coastal resources should be made a part and parcel of coastal educational curriculum.

Greater attention to and investment in social and physical infrastructure that will improve the overall quality of life in coastal communities should be made. Paved road to coastal ommunities electricity, drainage, improved water and sanitation, community hall and schools are some of the investment that serves as a foundation for rehabilitation of coastal livelihoods. Access to telephone and the Internet can open world of communication and serve to expand livelihood options.

### 6.11.5 Environment, Health & Sanitation

Disaster not only affects life and livelihood it damages the natural environment on which the community thrives, and also causes pollution in the surrounding environment on which health and other lifeline of the community thrives. The risk reduction measures particularly the management of the Sundarbans has been discussed in section..In this section recommendations are provided to reduce the risk of health and sanitation of the community

Support to Environmental Recovery: environmental clean-up and rehabilitation, restoration of damaged environment and support for further protection,

Quick restoration of the health infrastructure ans providing additional arrangement for supply

Cleaning the affected ponds, recovering and replacing the tubewells and rehabilitation / construction of pond sand filters of safe drinking water

Continuation of temporary water supply in areas where longer-term facilities do not yet exist

Ensuring the supply of household latrines

Strengthen community WatSan committees in operation, maintenance, and management of water supply and sanitation

Water quality monitoring, and awareness raising campaign with the objective to prevent further damage to vulnerable environment.

# 7. IMPLEMENTATION GUIDANCE

## 7.1 GENERAL

In general, countries with well developed social and political institutions are considered to have greater adaptive capacity than those with less effective institutional arrangements. Improved institutional capacity is therefore very vital to ensure sustainable livelihood rehabilitation. Besides community organizations in the coastal region should be reestablished and revitalized. Risk reduction, is multi-faceted and requires a complex set of institutions, public and private, academic and civil society, to interact and cooperate. A comprehensive organisational framework that brings together the necessary actors for the integration of risk management into the recovery process is not always in place prior to a disaster. This cooperation needs to happen among the national, local municipal and community level organisations. As the tsunami as well as some tidal surges in the Indian sub- Continent and the Mekong Delta have revealed, at times institutional cooperation at the appropriate sub-regional level is also essential for the exchange of information and experiences.

## 7.2 IMPLEMENTATION STRATEGIES

The strategies and policy of the economic RR measures shall be guided by the differential vulnerability of the livelihood groups. Vulnerability will be considered as the first criteria to select the beneficiary The specific livelihood activities will be identified through community need assessment. The individual family profile of all house holds will be prepared as a base line and also be helpful to identify existing capacity and genuine need of every household

The need base capacity building activities will be carried out focusing on promotion, protection and retention of livelihood activities. While implementing the program, side by side, the institutional development related activities will be undertaken as far as possible Active participation of beneficiaries in every step (ie planning , decision making implementation , monitoring and evaluation) , their capacity building and appropriate resources mobilization will be taken as a key factor for the sustainability the program activities The cross cuttings issues like gender sensitivity, environmental issues, conflict sensitivity, advocacy, dissemination of RC, sustainability etc will be taken into account while implementing the program

## 7.3 INTEGRATED RISK REDUCTION

It is increasingly recognised that adaptation and DRR must be integral components of development planning and implementation, to increase sustainability. In other words, these issues need to be 'mainstreamed' into national development plans, poverty reduction strategies, sectoral policies and other development tools and techniques. At present CDMP activities are oriented towards main streaming DRR in the Development Planning Process. The wide range of hazards taking their toll on coastal communities requires that the response to these various issues must be holistic, integrated, and long lasting.

Bangladesh is the pioneer among the developing countries to adopt a comprehensive disaster management approach. A series of inter related institutions, at national, subnational and local levels have been created to ensure effective planning and coordination of disaster risks reduction and emergency response management The study proposes multifaceted action programs in order to protect the coastal people by securing alternative livelihood options which can withstand the negative shocks of natural disaster. The success of the program critically depends on the availability of certain institutions and infrastructure for the smooth functioning of coastal life. The immediate question is about the implementation plan. Since the actions needs huge investment, government is the major player to provide financial assets. We also recommend that government should focus on mobilizing resources from coastal region in order to fund the projects.

Private parties and NGOs should also be encouraged to initiate programs in the coastal region. National Commercial Banks (NCBs) and Private Banks should be asked to set up and

Agricultural and SME branches in the coastal region to support coastal livelihood. Particular industries like (Fisheries, Tourism and Industry) need Insurance Package against natural shocks. Government can only do that. An Inter Ministerial Task Force should be formed with immediate action comprising members from Ministry of Finance, Ministry of Food and Disaster Management, Ministry of Youth, Ministry of Water Resources, Ministry of Agriculture and Ministry of Industry. This task force should coordinate feasible actions to promote alternative livelihood options and set up critical infrastructure and institution in the coastal region. The task force should include the civil and professional society of the coastal region before going for any action since they inherit indigenous knowledge about coastal region and livelihood.

## 7.4 ROLE AND RESPONSIBILITIES OF THE IMPLEMENTING AGENCIES

The above economic risk reduction measures need to be complemented with an understanding of the key stakeholders that are concerned with extreme events. In this section we examine a set of interested parties and illustrate the types of programs that can be considered for reducing future losses and providing funds for recovery. By examining the perspectives of these individuals and groups, one can develop more effective risk management strategies for reducing potential losses from extreme events. Local community At the local level, communities enforce building codes and have developed economic incentives, such as tax relief, for those who retrofit. Local communities have developed programs to promote awareness, provide training, and encourage self-help actions through neighborhood emergency response teams. Owners of commercial and residential structures can choose from a range of risk management strategies to reduce losses. They can reduce their risk by retrofitting a structure to withstand wind or earthquake loading, transfer part of their risk by purchasing some form of insurance, and/or keep and finance their risk. They can also reduce their losses from natural disasters by adopting risk management plans. Government's Role The Ministry of Food and Disaster Management (MoFDM) of the Government of Bangladesh has the responsibility for coordinating national disaster management efforts across all agencies. In January 1997 the Ministry issued the Standing Orders on Disaster (SOD) to guide and monitor disaster management activities in Bangladesh. The Standing Orders have been prepared with the avowed objective of making the concerned persons understand their duties and responsibilities regarding disaster management at all levels, and accomplishing them.

The Comprehensive Disaster Management Programme (CDMP) has been designed as a long-term programme of the Ministry of Food and Disaster Management with multi-agency involvement was launched in November, 2003 to optimize the reduction of long-term risk and to strengthen the operational capacities for responding to emergencies and disaster situations including actions to improve recovery from these events. All Ministries, Divisions/Departments and Agencies shall prepare their own Action Plans in respect of their responsibilities under the Standing Orders for efficient implementation. The National Disaster Management Council (NDMC) and Inter-Ministerial Disaster Management Coordination Committee (IMDMCC) will ensure coordination of disaster related activities at the National level. Coordination at district, upazila and union levels will be done by the respective District, Upazila and Union Disaster Management Committees. The Disaster Management Bureau will render all assistance to them by facilitating the process. MFIs and NGOs Risk reduction initiatives are to a wide extent implemented in the field by a multitude of NGOs – local as well as international – through community-based activities. Developing and testing different approaches to DRR and the linkages to CCA in collaboration with field-based NGOs are mainly done by the CDMP Phase-1, with funding from UNDP and DFID and expected to reinvigorate during Phase-2 of the CDMP.

Insurers

An insurer provides protection to residential and commercial property owners for losses resulting from natural disasters. Losses from natural disasters can have a severe impact on an insurer's financial condition. Therefore insurers want to limit the amount of coverage they provide to property owners in hazard-prone areas. An important concern for insurers is the concentration of risk. Those who cover a large number of properties in a single geographic area face the possibility of large losses should a natural disaster occur in the area. An insurer views a portfolio with this type of highly correlated (or interrelated) risks as undesirable. Subject to regulatory restrictions, an insurer limits coverage in any given area and/or charges higher premiums in order to keep the chances of insolvency at an acceptable level. Other Private Sector Parties Lenders play a vital role in managing risks of extreme events. Except for the uncommon case where the owner pays for property outright, banks and other financial institutions enable individuals in the United States to purchase a home or business by providing mortgages. The property is the collateral in the event that the owner defaults on the mortgage. Lenders thus have a vital stake in the risk management process, as they are

unlikely to recover the full value of a loan on a piece of property destroyed by catastrophe. Real estate agents, developers, engineers, contractors, and other service providers also play a supporting, yet important role in the management of risk from natural disasters.

Table 7.1 Proposed Risk Reduction Measures and Implementation Framework

| ERR activities | Proposed Actions | Implementing agency | Supporting organizations |
|---|---|---|---|
| Policy and laws | Assistance to policy and decision makers in the reviewing, revising and applying regulatory frameworks and policies that are conducive to economic recovery and that remove bottlenecks | MOLPA | Local community, Private Business Community, Financial Institution, MFI, Insurance Company, LG |
| Mainstreaming ERR plann into national development plan | Integrating ERR plan with multihazard CRR Plans, Main streaming DRR in National Sector planning and implementation mechanisms | CDMP, MODF, MOP & Economic Division, | Sector Ministries, NGOs, Civic organizations (BEA), LG |
| Community resilence to cyclone/tsunami events | Predisaster poverty reduction and community resilience measures | MODF, MFI, NGOs, Local community | UN agencies, DevPartners, LG |
| | Participatory planning and capacity building for recovery and development | MODF, MFI, NGOs, Local community | UN agencies, DevPartners, LG |
| | Enabling local community to participate in DRR decision making | MODF, MFI, NGOs, Local community | UN agencies, DevPartners, LG |
| | Early recovery of livelihoods and businesses interventions | GOB | Sector Ministry, UN agencies, DevPartners, LG |
| | Capcity building of local community and private sector on livelihood diversity and other economic recovery interventions | MODF, MFI, NGOs, Local community | UN agencies, DevPartners, LG |
| | Capacity building of financial services providers, through training and technical assistance | MODF, MFI, NGOs, Local community | UN agencies, DevPartners, LG |
| | Establishment and strengthening of existing employment services centers | MODF, MFI, NGOs, Local community | UN agencies, DevPartners, LG |
| | Recovery of lost or damaged | MODF, MFI, | UN agencies, |

| | | | |
|---|---|---|---|
| | productive assets by providing cash grants | NGOs, Local community | DevPartners, LG |
| | Protect and increase skills and capacities of the most vulnerable | | |
| Financing and insurance | Creation of Disaster Fund | MODF | Sector Ministry, UN agencies, DevPartners, LG |
| | Food security and poverty safety net | MODF | Sector Ministry, UN agencies, DevPartners, LG |
| | Microcredit & Micro insurance | MOF, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| | Credit and Insurance for SMEs and other industries | MOF, MOI, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| | Loan/ incentives for disaster proof housing for poor and retrofiting | MOF, MOI, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| | Crop insurance | MOF, MOI, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| | Set up of emergency microfinance schemes | | |
| Protection and infrastructure development | Construction and retrofiting coastal embankments | GOB Ministries, | IFI |
| | Construction of Cyclone Shelter | GOB Ministries, | IFI |
| | Construction and retrofiting coastal critical facilities | GOB Ministries, | IFI |
| | Access to commercial financial services for micro and small businesses | MOF, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| Early warning | Forecast and prediction •Warning processing and dissemination •Response | MOF, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| Advocacy and awareness | Policy and decision makers are not aware of the opportunities for employment creation arising from recovery and reconstruction needs | MOF, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |

| | | | |
|---|---|---|---|
| | Official public awareness policy and programmes with associated material, guidelines and instructions•Media involvement in communicating risk | MOF, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| Education & Training | Inclusion of disaster reduction from basic to higher education (curricula, material development and institutions) •Vocational training •Dissemination and use of traditional/ indigenous knowledge. •Community training programmes | MOF, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, LG |
| Research and knowledge management | Comprehensive research agenda for risk reduction • Related methodological development including for planning and progress assessment•Regional and international cooperation inresearch, science and technology developmen | MOF, MFI and Insurance Company | Sector Ministry, UN agencies, DevPartners, United Nations and university researchers/experts |

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