



MINISTRY OF FOOD AND DISASTER MANAGEMENT
COMPREHENSIVE DISASTER MANAGEMENT PROGRAMME(CDMP)

Disaster Management and Relief Bhaban
92-93, Mohakhali C/A, Dhaka-1212.

Economic Risk Assessment Report Of The Coastal Livelihoods

REPORT

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I Introduction

1.1 Background of the Study

The coastal zone of Bangladesh consists of 19 districts and 147 upazilas comprising 31.99 percent territory and 28 percent population of the country. This region is subject to at least three natural calamities which govern the vulnerabilities of this area of Bangladesh. These calamities are tidal fluctuations, Salinities, (Soil, Surface Water or ground water) and cyclone.

The coastal region, which is prone to natural disaster, is rich in diversified natural resources. The total length of the coast is 710 km (from Sundarban to Technaf) out of which 120 km is sea beach – which is longest in the world. The fascinating natural beauty of sunrise and sunset in Kuakata and the world's single largest mangrove forest with spectacular wild life and bio-diversity are located in this coastal region.

But physical and biological diversity of the coast create both opportunity and threats for the people - particularly, for the poor people living there. But the often hostile nature and the complex ecosystems and their diversity do not lend themselves to large-scale commercial exploitation. Many of these resources remained open-access to all which creates opportunities for the poor to make a living by using traditional technology. Life of these people is mostly threatened during natural calamity. These complex elements create special challenges to policy makers attempting to develop effective policies which could help to protect any people and resources and exploit the later for the future benefit of the people of the region and the country.

Given this background, the study will concentrate the constrains and potentials of coastal zone, the livelihood patterns, physical and social diversity, vulnerability, within the coastal districts.

1.2 Objective of the Study

Accordingly, the objective of the study are the following:

- Present an overview of the livelihood at the coastal zone based on both primary and secondary data;
- Undertake analysis of the risk exposure of coastal districts to make a comparison of vulnerability of these districts based on secondary data; and
- An attempt will be made to highlight the extent of vulnerability of the livelihood pattern of different communities of the coastal region.

1.3 Methodology

The economic risk assessment of coastal livelihood to natural hazard integrates both economic and other social perspectives of vulnerability. The empirical research is carried out based on present day risk rather than scenarios of future risk. This report has explored the factors of social vulnerability to natural disaster in the coastal Bangladesh. the study estimates the actual risk exposure measured by household damage in the face of last disaster event experienced by each household enables us to highlight risk exposure of different livelihood groups.

1.3.1 Sampling and Coverage

It goes without saying that the economic risk assessment survey coverage must be of adequate size, relative to the goals of the study. It must be big enough so that an effect of such magnitude is of scientific significance as well as statistically significant. It is just as important, however, that the coverage should not be too big, where an effect of little scientific importance is too statistically burdensome. Sample size is important for economic reasons. An under-sized study can be a waste of resources for not having the capability to produce useful and representative results, while an over-sized one uses more resources than are necessary.

For the study, we propose to undertake a stratified random sampling strategy. The basic approach is to give equal chance to every household in the target area to fall in the

sample, but given the different sizes (in terms of number of households and population) of different areas it will be more efficient to draw the sample using appropriate weights.

The following table represent the survey coverage:

Table 1.1: Working area of Household Survey

Districts	Upazila	Union	
BAGERHAT	SARANKHOLA	1	Dakshinkhali
		2	Royenda
BARGUNA	AMTALI	3	Amtali Sadar
		4	Haldia
	PATHARGHATA	5	Patharghata Sadar
		6	Kalmegha
BARISAL	MEHENDIGANJ	7	Char Ekkaria
		8	Mehendiganj SADAR
BHOLA	CHAR FASSON	9	Char Kalmi
		10	Char Manika
	TAZUMUDDIN	11	Chandpur
		12	Chanchra
CHITTAGONG	BANSHKHALI	13	Katharia
		14	Saral
	PORT THANA	15	Paurashava (Two Ward)
	SITAKUNDA	16	Barakunda
		17	Muradpur
COX'S BAZAR	COX'S BAZAR SADAR	18	Khurushkul
		19	Chaufaldandi
	MAHESHKHALI	20	Dhalghata
		21	Kutubjhum
FENI	SONAGAZI	22	Sonagazi Sadar
		23	Char Chandia
KHULNA	DACOPE	24	Banishanta
		25	Sutarkhali
LAKSHMIPUR	RAMGATI	26	Char Ramiz
		27	Char Alexandar
NOAKHALI	COMPANIGANJ	28	Char Fakira
		29	Char Kakra
PATUAKHALI	DASHMINA	30	Dashmina
		31	Banshbaria
	KALA PARA	32	Khaprabhangha
		33	Lata Chapli
PIROJPUR	MATHBARIA	34	Tushkhali
		35	Bara Machhua
SATKHIRA	SHYAMNAGAR	36	Buri Goalini
		37	Atulia

The study also examines the impact of natural disaster on the coastal industries. For this three particular types are chosen which are: Manufacturing industries, Fisheries and Tourism Services in the coastal districts. The following table represent the survey coverage:

Table 1.2: Working area of Industry Survey

Working Region	Districts	UPAZILA
Tourism Industry	COX'S BAZAR	COX'S BAZAR SADAR
	PATUAKHALI	KALA PARA (Kuakata)
Fishing Industry	BAGERHAT	SARANKHOLA
	SATKHIRA	SHYAMNAGAR
	KHULNA	DACOPE
	COX'S BAZAR	MAHESHKHALI
Manufacturing Industry	BARISAL	MEHENDIGANJ
	CHITTAGONG	PORT THANA, SITAKUNDA, KOTOWALI, BAYEJID, POTIA, BAKULIA,
	KHULNA	RUPSA
	BAGERHAT	BAGERHAT SADAR, SARANKHOLA, MONGLA,
	COX'S BAZAR	COX'S BAZAR SADAR

1.3.2 Data Collection Instruments

Household survey questionnaire:

Information gathered from the relevant literature, discussions, and feedbacks from the field visits the questionnaire for the household survey is prepared. The questionnaire had been structured and pre-coded so that the collected data can easily be processed electronically. Household questionnaire is designed in a manner, which extracts information about socio-economics characteristics of a household, risk exposure levels at

the exogenous level and the experience they had about the catastrophic impact of last disaster on their life and livelihood.

Industry Survey Questionnaire:

Based on conventional literature on industrial economics and its risk towards climate change and extreme events these questionnaire are prepared so that we can harvest data on the economics and technological status of the particular industry and the risk exposure of the industry towards natural hazards.

1.3.3 Indicators to be used in the Risk Assessment Study

District Risk Analysis Indicators

- Per capita District GDP
- GDP per unit area,
- Composition of GDP
- Education status across different districts
- Percentage of agricultural labour as a percentage of Total households,
- Agricultural dependent household, as a percentage of total rural households.

Social Vulnerability Indicators for Different Livelihood Groups

- Average Monthly Income as a proxy for access to resources
- Poverty Status as a proxy for assessing the extent of marginalization.
- Savings behaviour as a proxy for preventive measures taken at the individual level.
- Flow of Remittance as a proxy for diversity of household income sources
- Housing Conditions
- Education of the Households Head

Economic Risk Assessment of Different Livelihood Groups

- Distance from River or Sea or Cyclone Shelter as a proxy for exogenous risk exposure of a particular household.
- Extent of Household Damage due to last disaster experienced by the household
- Perception about Risk of Different Natural Hazards to their Livelihood

1.4 Structure of the Report

The report starts with a simple description of the coastal Bangladesh. The “District Risk Analysis” section immediately follows this overview. Section three elaborates the aspect of social vulnerability towards different livelihood communities. Section four undertakes the task of economic risk assessment of coastal livelihood on the basis of primary data describing the experience of each household during the last disaster event. An attempt is then made to estimate the loss of particular coastal industries due to natural hazard to understand vulnerability of coastal firms. The report is finished with few concluding remarks

II. Overview of the Coastal Zone and its Livelihood

2.1 Coastal Geography

As has been hinted in the preceding chapter, the territory of Bangladesh may be roughly divided into two main physical divisions: (i) the vast alluvial plain and (ii) marginal hills in the East and South-east. The alluvial plain comprises nearly ninety percent of the land while leaving only ten percent mountainous or hilly areas. But each of these physical divisions entails peculiar features. The most significant feature of the flat plain is that, it is watered by a large number of rivers of the world. These rivers have carved out an intensive drainage pattern with the help of their tributaries and numerous distributaries. The flow and behavior of these rivers is of utmost importance in determining the economic condition of the people. The hill and the mountainous region is situated in the east and south-east of the country. The hills of the Sylhet contain no prominent peaks and their foothills degenerate into tillas (hillock). However, the soil condition is very fertile and these hills are covered with trees, bamboos, scrubs and forest. But the topography, climate and soils are suitable for tea, and 90 percent of the tea is produced in this hill areas. The other hill areas are located in Chittagong and Chittagong Hill Tracts. Now the

Chittagong Hill Tracts is divided and made three different districts namely – Cox's Bazar, Rangamati and Bandarban. The Hills of these areas are larger and with higher peaks than that of Sylhet.

There are hills also in Chittagong but they are tillas. Two hills of Chittagong also ran close to the coast. Part of Chittagong Port city also lies on the outlying hills or tillas or hillocks. The larger part of the coastal regions is both plain and hilly areas. It consists of 19 districts with about one-third of total territory of the country. But in this coastal region about 85 percent territory is plain land and the remaining land is hilly area, which are located only in Cox's Bazar, Chittagong and in the east part of Comilla bordering with India. The coastal geography and the ecosystem are characterized by a number of distinctive features. The outstanding distinction between various parts of the coastal area is the character of the river, tidal waves and nature of inundation. Coastal area is affected by seasonal changes both on land and at Sea. The seasonality is manifested in the weather patterns, current and water temperature and the availability of various crops and aquatic resources.

The conditions of soil vary significantly because of differing hydrological changes. Overwhelming proportion of the soils are drift soils (Ahmed, N., 1968). The parent materials of the alluvial soil are the deposited silt brought with the flow of rivers. So, the flow of rivers contributed significantly with the physical condition of the area. The lands of the coastal zone are low elevation, about 2 to 4 meters above the sea level (Haque, M. I., 2008).

The Ganga and Brahmaputra with hundreds of distributaries flowing towards the Sea, formed series of estuaries of different sizes – big and small. These estuaries have varying degree of salinity in their water depending on the extent of the quantity of the sweet water

coming from the upland source (Haque, M. E., op.cit.) The estuaries created by the distributories of Ganga and Brahmaputra rivers flow into coastal areas deposit silt and create new land either permanently or temporarily. The silt deposit carried from the uplands source of the river and Brahmaputra formed the entire coast land and offshore islands, except the Southern part of the Sea front of Cox's Bazar district. Hatia, Sandip and Bhola are the major islands in the region which have been formed by silt deposits of the river. The soil conditions of these islands are similar to those of main land (Haque, M. I. op.cit). On the other hand, the islands of the Southeastern part of the coastal zone named St. Martins, Sonadia, Moheshkhali and the Southern part of Kutubdia lay on the high ridges which are developed from tectonic folds (Haque, M.E., op.cit.).

As was mentioned earlier, climate and physiographic have contributed significantly to the formation morphology and a agronomic properties at the soils. For example, among the properties to be distinguished in the soils of this mostly alluvial area are color, texture, composition, consistency and human content. (Ahmed, N.I. 1968).

So, within the coastal zone, differences in climate and physiography have helped the formation of soil condition. Differences in texture of soil are primarily due to the shifting actions of the water by which they deposit the soil particles in varying intensites. Besides, humidity, railfall and temperature introduced many variations in the new alluvium itself. Given these existing differences, the soil of the hilly areas of the Southeast of the coastal region is mixed with coarse sand and clay. Its colour is yellowish. The slopes of these hills are places of tropical forests. (Haque, M.I., op.cit.).

The soil of the coastal plains of both Southeast and South including the Sundarbans and the coastal islands is yellowish and marine clay. The blackish water of the sea influences these areas. The situation has been aggravated by the withdrawal of water from Farakkha Barrange. The withdrawal of water from Ganges increased the salinity of the ground water causing heavy consequences on the coastal districts of Jessore, Khulna and Satkhira.

2.2 Coastal Demography

The total coastal zone covers 31.99 percent of the country's territory . According to the population census 2001, the total population of the coastal area is estimated 35 million out of which 18 million male and 17 million female. They together make 28 percent of the total population, the average family size accounts for 5.1 person as against 4.9 of the national average. The average density of population 742 km². which is less than the national average 839. But the density varies among the districts. The district of Chandpur experiences the highest density with 1315 km² while Bagerhat has the lowest with 383. Out of 19 districts 48 upazilas are exposed to coast and 99 upazilas are considered at the interior coast.

Table 2 1: Structure of Population by Districts of the Coastal Zone

District	Total Population	Average Family Size	Density of Population	Ratio of Rural-Urban Population
Bagerhat	1516820	4.7	383	84.16
Barguna	845060	4.7	462	89.11
Barisal	2348440	4.9	843	83.17
Bhola	1703200	5.2	500	85.15
Chandpur	2241020	5.3	1315	86.14
Chittagong	6543860	5.3	1239	50.50
Cox's Bazar	1759560	6.0	706	87.13
Feni	1205980	5.7	1300	86.14
Gopalganj	1151800	5.3	773	91.9
Jessore	2469680	4.7	962	83.17
Jhalakathi	692680	4.8	925	83.17
Khulna	2357940	4.8	537	47.53
Laxumipur	1486540	5.2	1021	85.15
Narail	694900	5.0	702	90.10
Noakhali	2570640	5.6	714	89.11
Patuakhali	1464800	5.2	455	92.8
Pirojpur	1099780	4.7	841	84.16
Satkhira	1745120	4.7	478	93.7
Sariatpur	1080680	5.1	914	91.9
Coastal Zone	35078500	5.1	743	77.23
Bangladesh	123851120	4.9	839	77.23

Source: BBS, 1997, 2002.

About one-third of the population of coastal region live in area exposed to coast. Density of population in this area is 482 as against 1012 in the coast region (The Coastal Region, 2005). Average growth rate is estimated at 1.36 which is lower than national average. In

the coastal zone 77.23 percent people live in rural areas while 22.77 in the urban centers which equals the national average Table-1. However, significant variations exist among districts in the extent of urbanization.

According to the estimation of 1998, the average longevity of the people of Bangladesh is 60.7 for male and 60.5 for female which could be 63 for male and 63.2 for female by 2016. However, no separate statistics on the longevity of the coastal region is available.

In the coastal region, 99 percent of the population is Bengali. The Population Census of 1991 estimated that are 2 lacs ethnic minority people live in this area. The prominents among them are Rakhain, Pundra-Khatrion, Munda and Mahato. The largest group is Rakhain live in Patuakhali, Barguna and Amtoli in Ukhia of Cox's Bazar and Tekhnaf. Most of them are landless and earn their living by day labour, small business and service. Mahato people live in Koira which is close to Sundarban. Most of them own agricultural land and live on cultivation. The Munda upazila also live in Koira but unlike Mahato most then are landless and earn their living by fishing and day labour. The Pundra Khatrion, live in Dumuria of Khuna and their principal occupation is cultivation and fishing and day labour.

Coastal Economy

The coastal region contributes significantly to the economy of Bangladesh. The agriculture still remains the mainstay at the economy contributing 20.87 percent to GDP and provides employment for 48.4 percent of the total labour force (FY 2007-08). But the coastal region is more depended on agriculture. Disaggregated data on coastal agriculture are not available. However, in FY 1999-2000 shows that the share agriculture of the coastal region to GDP was 29 percent against the national average 26 percent while

contribution of industrial sector was 25 which were same as the national average Table-2.

In 1999-2000, the coastal region shared 29 percent of the GDP (base year 1995-96).

Table 2.2: Sectoral Contribution to the Economy of the Coastal Districts at Current Price (1999-2000 in %)

Districts	Agriculture	Industry	Service
Bagerhat	40	14	46
Barguna	46	12	42
Barisal	29	18	53
Bhola	43	13	44
Chandpur	35	17	44
Chittagong	11	36	53
Cox's Bazar	39	19	41
Feni	30	20	50
Gopalganj	34	16	49
Jessore	31	24	45
Jhalkathi	31	16	53
Khulna	22	21	57
Laxumipur	42	13	45
Narail	45	13	43
Noakhali	36	17	48
Potuakhali	45	12	43
Pirojpur	34	15	50
Satkhira	38	18	44
Sariatpur	37	17	46
Coastal Zone	29	22	49
Bangladesh	26	25	49

Source: BBS, 2002.

The growth and expansion at trade during the last two decades has significantly increased the importance of Chittagong Port. Export and import together make up almost 40 percent of our GDP. About 90 percent of foreign trade is carried out through Chittagong and Chalna Port and both of the ports are located in the coastal region. Besides, some of the sub-sectors whose importance has been growing day by day are located in the coastal region. For example, Shrimp cultivation and marine foods, tourism, salt industry and forest. But within the coastal districts there are substantial variations in production, sectoral contribution and economic activities, which have also impact on level of economic development. The table 2 shows that Chittagong district ranks highest in

industrial contribution while lowest in agriculture. Barguna, Patuakhali, Laxmipur and Narail rank lowest in industrial performance but agriculture of these districts contribute nearly half at the GDP or more than double than the national average.

Table 2.3 : Socio-Economic Indicators by Districts of the Coastal Region

Districts	Per capita income (in Tk)	Level of poverty	Level of absolute poverty	Literacy		Child mortality (less than 5 years)
				Years 7+	Years 15+	
Bagerhat	16839	69	37	58	61	87
Barguna	16901	52	22	54	56	94
Barisal	14377	44	19	57	60	87
Bhola	16090	44	23	37	39	90
Chandpur	12763	60	32	50	54	99
Chittagong	28113	50	26	55	59	103
Cox's Bazar	19676	40	19	29	31	80
Feni	12661	56	20	53	58	98
Gopalganj	13457	43	21	51	55	96
Jessore	18588	46	17	51	52	84
Jhalakathi	12883	38	18.2	66	70	87
Khulna	23135	55	26	57	61	90
Laxmipur	15518	72	39	43	47	95
Narail	16249	41	14	48	52	94
Noakhali	13938	65	34	50	54	89
Patuakhali	18137	46	14	52	54	97
Pirojpur	13936	44	21	63	68	94
Satkhira	12936	43.6	21.4	45	47	96
Sariatpur	16077	55	14	38	41	87
Coastal Zone	18198	52	24	51	54	10-103
Bangladesh	18269	49	23	45	47	90

Source: BBS , 1994, 1996, 2001, Banglapedia, 2003.

Considerable variations exist in different socio-economic areas of development. Difference in terms of per capita income between coastal and non-coastal regions is not very big. However, significant variations exists in per capita income among the districts within the coastal zone. With Tk.28133,Chittagong enjoys the highest per capita income

and Feni the lowest with 12662. Surprisingly, Jhalkathi enjoys the lowest level of poverty with highest literacy and one of the lowest child mortality rate but in terms of per capita income, it ranks one of the lowest among the districts of the coastal region. Regarding literacy rate as a whole, the coastal region has a larger share than the non-coastal region. In this case also, there exist significant variations among the coastal districts. As the table-3 depicts Jhalkathi has the highest 66 and 65 score in education for 7 years and 15 years, much above the national rate of 45 and 41. On the other hand, Cox's Bazar has the lowest 29 and 31 percent respectively. Child mortality rate for every thousand is estimated at 80-103 for the coast and against 90 for Bangladesh. There are no significant variations among the districts.

2.3 Coastal Livelihood Pattern

Livelihood can be defined as the bundle of different types of assets, abilities and activities that enable a person or household to survive (Stamoulis, K. and Zezza, A. 2003). These assets include physical such as infrastructure and household items; financial assets such as saving, stock of money, pensions, natural assets such as access to public resources; social assets which are based on cohesiveness of people and societies; human assets on the status of individuals and access to education and skill. (Ibid)

The main characteristics of the coastal region which differentiates from the other areas is its complexity. This complexity is manifested in the diversity and dynamic nature of the livelihoods of the people especially the poor. Although agriculture is still the mainstay of the economy in coast and non-coastal regions of Bangladesh, the coastal zone provides some particular sources of livelihood which are less or at all not available in other parts of Bangladesh. For example, nearly two lacs people eke out their by collecting honey, wax, wood and leaves of trees from Sundarban. In coastal area, 14 percent of the people or nearly double the share of national figure earn their living by fishing. Since soil conditions vary considerably because of differing hydrological conditions, the cropping intensity also vary accordingly. For example, non-saline tidal flood plain has a good

agricultural land than that of saline tidal flood plain. Barisal, Bhola, Chandpur, Pirojpur, Chittagong, Gopalganj have more than 50 percent of two crop land and Chandpur and Bhola have 29 and 25 percent three crop land (Table 4). Nearly one-third or 32.57 percent of the crop land and HYV which is much lower than the national 53 percent. Besides, the coastal agriculture is still far below in irrigation. Only 29.9 percent of the coastal agricultural land came under irrigation as against more than fifty percent of non-coastal region.

Table 2.4: Coastal Livelihoods: Few Indicators

	Landless	Agri-Labour (%)	Per capita land	Fisher men (%)	One crop land	Two crop land	Three crop land
Bagerhat	49.3	36	0.09	12	95	3	2
Barguna	49	32	0.11	38	56	37	7
Barisal	49	33	0.08	7	38	49	14
Bhola	55	47	0.08	14	19	52	29
Chandpur	56	32	0.04	7	15	60	25
Chittagong	64	22	0.02	7	29	54	17
Cox's Bazar	62	33	0.08	18	19	27	13
Feni	54	12	0.13	19	17	69	13
Gopalganj	37.9	32	0.09	1	37	50	13
Jessore	48	41	0.08	10	-	-	-
Jhalkathi	55.4	26	0.09	26	45	38	17
Khulna	49	40	0.05	40	-	-	-
Laxmipur	56	35	0.06	35	26	59	15
Narail	41	31	0.09	31	43	44	13
Noakhali	54	33	0.09	33	45	40	16
Patuakhali	56.3	31	0.11	31	59	37	4
Pirojpur	53.2	32	0.09	32	36	57	7
Satkhira	47.3	31	0.07	31	50	28	-
Sariatpur	54	46	0.07	46	47	42	11
Coastal Zone	53.5	33	0.06	14	-	-	-
Bangladesh	52.6	36	0.07	8	-	-	-

Source: BBS 2003; Coastal Region, WARPO, Table 10.6, District Gazette, 2005.

The principal sources of livelihood are agriculture and agro-based activities. Per capita land is only 0.07 which equals to that of national average. In the highly urbanized areas of the coast districts such as Chittagong, Khulna, scope of employment generation in industry and services is higher than the other coastal districts. In the offshore island a large number of people are dependent for their livelihood on natural resource. In this backdrop, the sources living can be divided on two major groups:

- (i) ***Natural resource based activities or occupation:*** Natural resource based works are, agriculture – including cultivation as a farmer or labour; fishing – includes fishing, fish cultivation and fry collection; salt production; firewood and honey collection from the forest and mollusc collection from the sea coast.
- (ii) ***Human resource based activities*** The Human resource based occupation or activities include – cattle ranching, poultry rearing, boat and furniture making; net making, tailoring, working in the industries, trade and services.

In both of these occupations, the people can work as wage labour or self-employed. But the pattern of occupation varies depending on the location. For example, in the sea-shore or sea beach area, the people are mostly engaged in salt production, (Cox's Bazar) marine fish collection and cultivation, shrimp fry collection, shrimp cultivation in saline water, scorpion and mollusc collection, collection of honey, beeswax, wood and leaves from Sundarban.

In the upland areas, people are mostly engaged in agriculture, trade industry and services. However, the natural resources of the coast face multiple and critical problems including non-sustainable resource uses and natural calamities. The people whose livelihood is

depended on these resources in the coast is most vulnerable than the other areas of the coastal region. These variation in occupations and the extent vulnerability contribute significantly to the livelihood pattern.

2.4 Industrial Landscape in the Coastal Zone

Institutional set up in the The industrial sector has undergone significant changes during the last two and half decades. The industry comprising (i) manufacturing, (ii) construction, (iii) mining and quarrying and (iv) services industry including gas, electricity and water supply – together contributes 29.67 percent to the GDP. Out of this, the manufacturing sector shares 17.77 percent. Following by construction 9.14 percent and the contribution of other two sub-sectors is insignificant. Among these industrial sub-sectors, the role of manufacturing is significant and the country development largely depends on the growth and of manufacturing sector. Until the beginning of 1980s, the contribution of export to the GDP was very small. In 1973-74 the share of export to GDP was only 6 percent which rose to 18 percent in 2007-08. This achievement was attained by the growth of garments which emerged only in early 1980.

The Chittagong city is the 2nd largest concentration of garments and almost cent percent of the garment products is exported through the Chittagong port. Besides, the export-processing zones played a significant role in increasing export and industrialization as a whole. Of the 8 EPZ, 4 are located in the coastal zone. The first EPZ was established in Chittagong which alone contributed half of the export income of EPZs and provide nearly half of the two lacs labours. Apart from the garments, some of the industries are exclusively the monopoly of the coastal region. For example, salt industry, ship breaking,

ship-building, fish processing, shrimp cultivation, container stocking, tourism industry are mostly concentrated in the coastal region. A large number of industries are directly depended on the facilities provided by the port of Chittagong. Apart from the export and import of the industrial raw materials and products, these two ports are the principal source of export and import of foods medicines and many other essential commodities.

In this coastal region about one-fifth of the industrial enterprises is located accommodating 16 percent of the country's industrial labour force.

Frozen food industry is the fourth largest export item and located in this area. Ship breaking employ nearly 0.2 million people and nearly 400 re-rolling mills of the country are depended for their raw-materials on these industries. These re-rolling mills are not only contributing to the economy by employing people and saving foreign currency, but protecting environment from deforestation as the woods and trees are usually used instead of the production of these re-rolling mills.

However, like the development of other sectors, industries are also highly unequally concentrated. One of the main indicator of industrialization is the GDP industry ratio. Chittagong ranks highest with 36 percent much higher than national average of 29.67 followed by Khulna 21 percent. The lowest industrialized district is the Khalkathi whose industry contributes only 11 percent and with 17 percent living in urban areas.

2.5 Infrastructural Overview Coastal Zone

The infrastructural facilities include power supply, transport and communication, industry and commerce related services, health, educational institutions etc. But coastal zone requires additional facilities due to its distinct characteristics. These include

building dams and poulder to prevent coastal erosion, intrusion of saline water, creation cyclone shelter, erection of green belt, creation of tourism facilities etc.

Coastal zone is a geographically delineated area which is distinctly characterized by the aggregation of interacting coastal environments and corresponding natural and man-made system (Bangla Pedia 2003). Because of the distinct characteristics, a number of public institutions and organizations have been involved for implementing various infrastructural programs. Among these BWDB (Bangladesh Water Development Board), LGED (Local Government and Engineering Department), Fisheries Department, Agriculture Extension Department, Forest Department, Department of Environment, Disaster Management Bureau, BIWTA (Bangladesh Inland Water Transportation Authority, Bangladesh Coast Guard Board etc.

As regard to the local government institution the coastal zone has the similar structural hierarchy as that of non-coastal zone. These are - City Corporation, Municipality, District Council, Upazila Parishad (Council), Union Council and Village Government or Local Government.

The coast zone comprised of 19 districts, 147 thana, 67 municipalities, 2094 union, 14636 mouza/ward, and 17618 villages.

Table 2.5: Infrastructures in the Coastal Bangladesh

District	Sanitation	Tube well active (km ²)	Hospital bed in hr.of people	Electricity connection	urbanization	Density of Market
Bagerhat	33.24	4	4465	27	16	102
Barguna	36.97	6	3243	26	11	80
Barisal	58.66	10	2065	31	17	65
Bhola	27.39	3	6198	11	15	122
Chandpur	53.87	12	9166	29	14	47
Chittagong	56.62	8	39008	56	56	73
Cox's Bazar	29.18	6	6472	16	13	76
Feni	63.94	15	5141	47	11	46
Gopalganj	44.22	9	577.7	13	9.29	75
Jessore	36.78	8	5479	39	17	63
Jhalkathi	59.02	13	3882	22	17	54
Khulna	59.24	4	2131	42	53	116
Laxmipur	45.48	9	10936	24	15	66
Narail	40.73	8	6322	20	10	66
Noakhali	43.47	7	6094	29	11	116
Patuakhali	23.19	3	4717	14	8	114
Pirojpur	47.59	10	5223	10	16	57
Satkhira	36.65	4	4875	9.28	9.28	49
Sariatpur	36.36	11	6595	18	7	102
Coastal Zone	45.60	7	4637	31	23	80
Bangladesh	36.87	7	4276	31	23	70

Source: BBS 2003; Coastal Region, WARPO, Table 10.6, District Gazette, 2005

There are few private organization for promoting trade and industries and service activities. Among them – Bangladesh Frozen Food Export Association, Bangladesh Salted and Dehydrated Foods Export, Association, Tour Operators of Bangladesh and one organization of the sea-going ship ownership. Besides, a large number of NGOs such as Coastal Fisheries Community Network, Khulna Sanjok and Coastal Development Partnership, Chittagong Southern Development Forum, Patuakhali based Coastal NGO Forum etc. and many localized NGOs.

As was mentioned earlier, disaggregated statistics on coastal region is lacking and for that reason, the scope of comparing the extent of concentration of physical and social infrastructure is limited. Nonetheless, from the existing information whatever available we can compare the level development of coastal areas. For example, 31 percent of the household enjoys the electricity connection which equals the national average. There are 11783 public primary schools (2001) out of 37671 in the country and the teacher-student ratio is 50 against 55 in the country. So, the region enjoys a better position than that of the national average. Number of active tube-well per square km is both coastal zone and Bangladesh is 7.

Under the disaster management program, 259 unions of 30 upazillas under 11 districts have been brought under Cyclone Warning Program and accordingly 2133 Cyclone Shelter has been built. Among them the largest number in Cox's Bazar followed by Chittagong (455). There are 29 public hospitals out of 105 of the country and region has one bed for 4637 people against 4276 nationally. At the upazila level, the region has 120 Health Centre against 417 in Bangladesh. Regarding roads construction, the density per square is 0.76 against the national average 0.72. However, in the rural and peri-urban areas, the coastal region enjoys a better position regarding access to marketing facilities. In the coastal region, there is one market in every 70 km² as against 80 in Bangladesh. For every 4637 persons have one hospital bed – much about the national figure 4276. With one bed for every 2131 persons, Khulna occupies the most favourable position while with one bed for 10936 people; Laxmipur is the most backward among the coastal districts. The table-5 depicts that 45.60 percent of the population have sanitation facilities – much above the national rate at 36.87 percent. Usually industrialization and urbanization go hand in hand. So, 56 percent population at Chittagong lives in urban areas while the national average is only 23 percent.

But the concentration of market varies significantly depending on physical constraints. For example, in Patuakhali the density is one in 114 km.² while Chandpur has one in 49 km². The same picture is the case of density of roads and communications.

III. District Risk Analysis

Disaster is considered as the integrated result of interaction between natural environments on the earth's surfaces harmful events and vulnerability of socio-economic systems (Shang et al, 1998, Shi et al, 2002). Coastal region of Bangladesh is frequently exposed to catastrophic events, which can bring serious damages to local economy and society. Over time the frequency and strength of these unwanted events are increasing. Therefore, coastal part of Bangladesh requires special attention in terms of disaster management programs. In order to initiate special programs to withstand the cost of catastrophic events, it is important to analyze the dimension of vulnerability across different part of the coastal zone.

Vulnerability plays a critical role in the disaster process. By definition, vulnerability is the lack of response capability to external risk or even disaster (Chambers et al, 1998; Kelly JM et al, 2000; Bogandi T. et al 2002) indicating the sensitive degree of individuals, groups or systems to environmental changes or risk. This section aims to assess few indicators at the district level to conclude about vulnerability at the regional level. It is indeed of great importance to expound the vulnerability of different coastal districts to assist the government to improve their capabilities to adopt with extreme climate change events.

This section uses the few socio-economic parameters to understand vulnerability. To gauge overall vulnerability for each coastal district we use per capita District GDP, GDP per unit area, share of agriculture to GDP, share of industry to GDP and share of service sector to GDP, education status across different districts, percentage of agricultural labour as a percentage of Total household, Agricultural dependent household, as a percentage of total rural households.

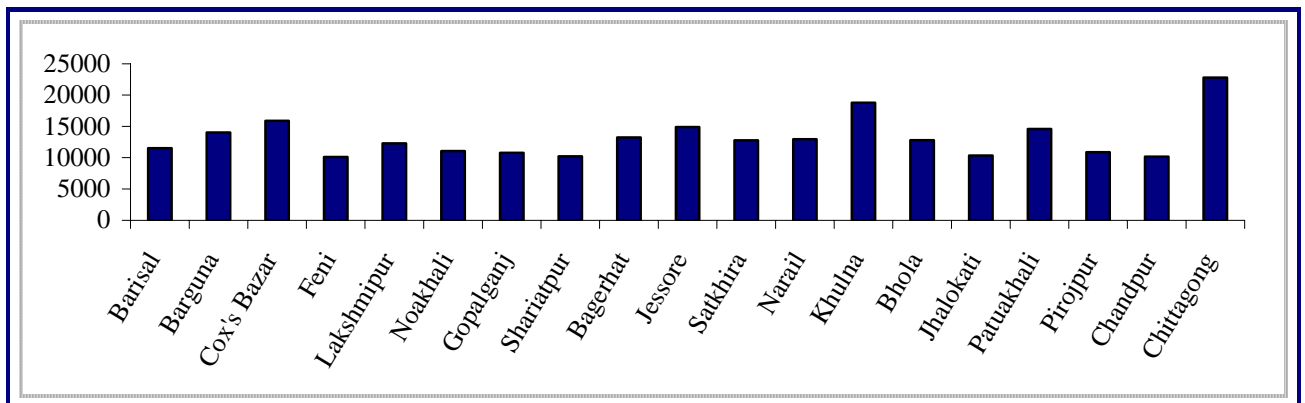
3.1 Socio-economic Profile of Coastal Districts

The comparison of these Socio-economic factors of coastal districts is helpful to determine the response capability of these districts to disaster and assess the spatial pattern of risk vulnerability.

3.1.1 Per Capita GDP and GDP per Unit Area

Under any uneven catastrophic event, an economically developed region with high GDP can more effectively make use of local plentiful resources to avoid or combat disaster. Although the absolute economic losses in the developed region may be higher than those of the developing one the developed region has stronger capacity to cope with the disaster and the damage can be recovered more easily and quickly. So, it can be summarized that the higher the per capita District GDP or GDP per unit area, the lower the vulnerability of the district. The following table distinguishes the coastal districts between two groups. The green shaded box contains 12 coastal districts, which have lower level of per capita GDP than the national average. The blue part of the table consists the remaining 7 affluent districts with Chittagong being the highest in the coastal region.

Figure3.1: Per Capita District GDP of the Coastal Districts



Source: BBS , 1994, 1996, 2001, Banglapedia, 2003

Table 3.1: Districts Above and Below the Average Coastal GDP (BDT13166)

DistrictsPCGDP	
Feni	10135
Chandpur	10163
Shariatpur	10231
Jhalokati	10355
Gopalganj	10779
Pirojpur	10872
Noakhali	11077
Barisal	11516
Lakshmipur	12294
Satkhira	12786
Bhola	12806
Narail	12953
Bagerhat	13229
Barguna	14038
Patuakhali	14567
Jessore	14911
Cox's Bazar	15887
Khulna	18770
Chittagong	22790

Source: BBS , 1994, 1996, 2001, Banglapedia, 2003

The next table summarizes the GDP per unit area of the coastal region. In the region, Bagerhat has the lowest level of GDP per unit area (5.61). Chittagong has the highest level of GDP per unit area, which is around 5 times higher than that of Bagerhat. Most of the coastal districts have low level of GDP per unit area indicating low disaster response capability of most coastal districts.

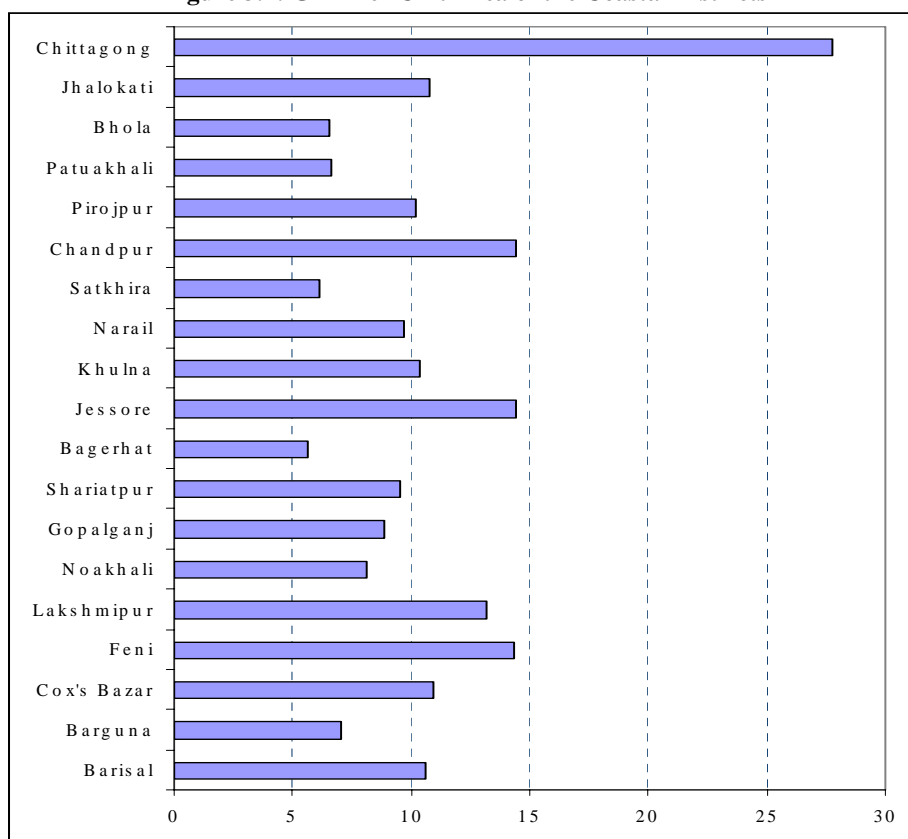
Table 3.2: GDP Per Unit Area of the Coastal Districts

District	District GDP	Area (Skm)	GDPPAREA
Barisal	29615.4	2785	10.63
Barguna	12834.8	1831	7.01
Cox's Bazar	27191.8	2492	10.91
Feni	13281.2	928	14.31
Lakshmipur	19177.4	1456	13.17
Noakhali	29260.8	3601	8.13
Gopalganj	13184.4	1492	8.84
Shariatpur	11212.4	1181	9.49
Bagerhat	22220	3959	5.61
Jessore	37077.2	2567	14.44
Khulna	45632.2	4394	10.39
Narail	9559.8	990	9.66
Satkhira	23773.2	3858	6.16
Chandpur	24523.4	1704	14.39

Pirojpur	13338.6	1308	10.20
Patuakhali	21414.2	3221	6.65
Bhola	22289.6	3403	6.55
Jhalokati	8044.8	749	10.74
Chittagong	146672.8	5283	27.76

Source: BBS , 1994, 1996, 2001, Banglapedia, 2003

Figure 3.2: GDP Per Unit Area of the Coastal Districts



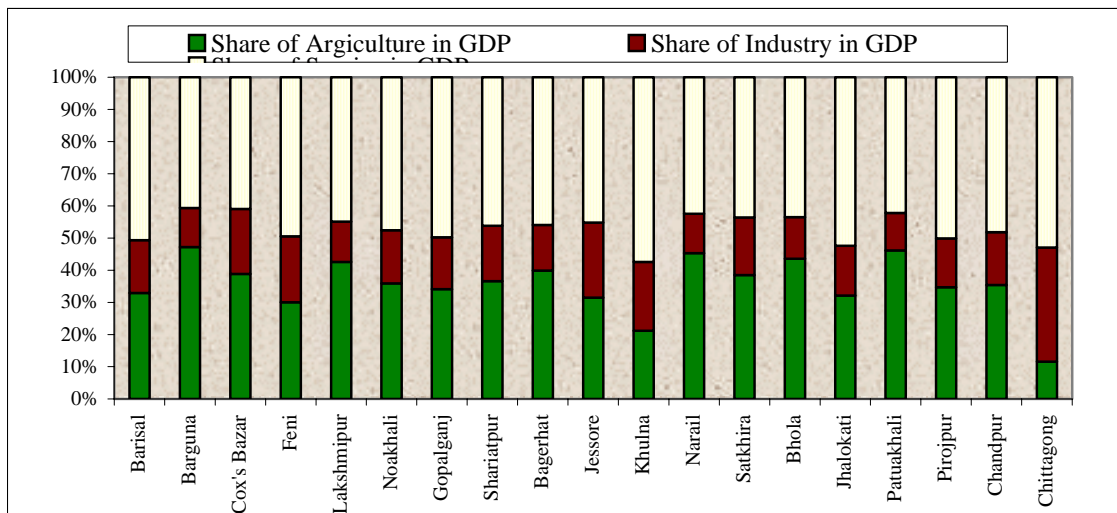
Source: BBS , 1994, 1996, 2001, Bangla pedia, 2003

3.1.2 Composition of GDP

The source from where GDP comes from helps us to understand the strength of a particular district to fight disaster. Disaster implies uneven environmental condition. Therefore the most vulnerable economic activities against the backdrop of such odd condition are related to agriculture. Whereas share of output generated from industrial activity and that from service are relatively stable even in adverse environmental situation. Often times such catastrophic blows have the impact in increasing aggregate demand for output generated by industry and service sector. However agricultural activities being dependent on natural resources, face physical challenge from such event. In this light,

Barguna (47.17%), Patuakhali (46.17%), Narail (45.29%), Bhola (43.55%), and Laxshmipur (42.61%) are the districts in which more than 40% of GDP comes from agriculture. They might suffer severe economic loss due to any catastrophic event. Where as Chittagong (11.59%) is the district which depend the least on agricultural. However, most of the coastal districts display similar feature in terms of the share of industry in GDP. Service sector remains the dominant source of GDP for every coastal district like the national economy.

Figure 3.3: Comparison of Different Sectors to GDP



Source: BBS , 1994, 1996, 2001, Banglapedia, 2003

3.1.3 Education Status

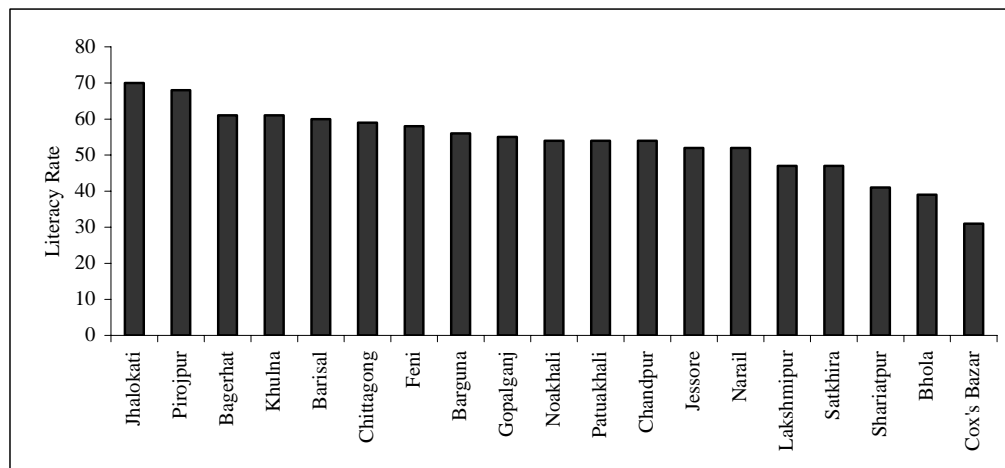
Social vulnerability can be disaggregated into district aspects: *individual vulnerability* and *collective vulnerability*. Individual vulnerability is determined by a host of factors like access to education, diversity of income sources etc. within a community. Access to education helps the individual to secure stable income generating occupation. It also enables the individual to make the best use of information. Therefore a district where literacy rate among the 15+ populations is higher, is more capable to adapt the extreme climate conditions. Among the coastal districts Cox's Bazar (31%) remains the most vulnerability in the terms of this parameter. Laxshmipur, Satkhira and Bhola are the other three coastal districts where less than half of the population agings 15+ are literate. Jhatokati (70%) is top of the list in terms of educational ability.

Table 3.3: Educational Status of the Coastal Districts

Districts	Literacy Rate (% of 15+ Pop)
Jhalokati	70
Pirojpur	68
Bagerhat	61
Khulna	61
Barisal	60
Chittagong	59
Feni	58
Barguna	56
Gopalganj	55
Noakhali	54
Patuakhali	54
Chandpur	54
Jessore	52
Narail	52
Lakshmipur	47
Satkhira	47
Shariatpur	41
Bhola	39
Cox's Bazar	31

Source: BBS , 1994, 1996, 2001, Banglapedia, 2003

Figure 3.4: Educational Status of the Coastal Districts



Source: BBS , 1994, 1996, 2001, Banglapedia, 2003

3.1.4 Employment Proportion of Primary Industry

The primary resources dependent activities are those associated with agriculture, fisheries and aquaculture. Other activities particularly those associated with wage labour, also dependent on climate. The higher the employment proportion of primary industry, the

more the labour concentrate in environment, therefore the stronger the vulnerability to disaster. On the contrary, if the employment share of agriculture of a district is low and more labour are taken by the secondary and tertiary industries then the district would be more capable to defend disaster risk and hence the corresponding vulnerability is lower.

The following table indicates that in Barisal and Barguna 79% of the total rural households depend on agriculture. Jhalokati, Noakhali, Gopalganj and Bagerhat are the districts where three forth of the rural households rely on agriculture. These districts are considered to be vulnerable compared to other districts in the region. In Pirojpur only 18% of rural household depend on agriculture. Therefore Pirojpur is the least vulnerable district in this parameter.

Table 3.4: Agricultural Dependent Households as Percentage of Total Rural Households of the Coastal Districts

Districts	Agricultural Dependent Households as Percentage of Total Rural Households	Agricultural Labour as a percentage of the Total Household
Barisal	79	33
Barguna	79	33
Cox's Bazar	57	33
Feni	69	12
Lakshmipur	77	35
Noakhali	75	33
Gopalganj	75	32
Shariatpur	77	31
Bagerhat	76	36
Jessore	71	41
Khulna	69	40
Narail	74	31
Satkhira	60	46
Bhola	66	47
Jhalokati	75	26
Patuakhali	26	31
Pirojpur	18	32
Chandpur	70	32
Chittagong	52	22

Source: BBS , 1994, 1996, 2001, Banglapedia, 2003

The individual indices for vulnerability analysis discussed above gives a general idea about the spatial disparity of vulnerability and response capability. The comparison shows that region with favorable economic development are less vulnerable. High proportion of primary industry employment and agricultural income cause the high vulnerability to disaster while high proportion of per capita GDP or GDP per unit area and literacy rate would decrease this vulnerability.

IV Disaster, Coastal Livelihood and Social Vulnerability

4.1 Conceptualizing Social Vulnerability:

Social vulnerability is the exposure of individuals or groups to stress as a result to of social and environmental change, where stress refers to unexpected changes and disruptions to livelihood (Adger, W. N. 1999). This definition emphasizes the social dimension of vulnerability to natural hazards. This is in contrast to the predominant views on vulnerability, which concentrate on the physical dimensions of the issue. The essential features of social vulnerability to extreme climate change events are that it focuses on social aspects of the phenomenon. Social vulnerability has two aspects: “individual vulnerability” and “collective vulnerability” The two aspects of vulnerability are obviously interlinked. “Individual vulnerability” is determined by access to resources and the diversity of income sources as well as the social status of individual or households within a community. Collective vulnerability of a nation, region or community is determined by institutional and market structures, such as prevalence of informal and formal social security and insurance and by infrastructure and income.

4.2 Understanding Coastal Livelihood:

Human life and livelihood are at risk from natural phenomenon such as flood, draught, cyclones, tsunamis and so many other hazards. Previously vulnerability has been used to describe the state of exposure, usually associated with geographical location rather than with individuals or social groups. The radical reversal suggested by Hewitt (1983) and others, was to emphasize economic and social structure as a cause of vulnerability. The

central insight brought by such views of social scientists to the process of understanding *vulnerability* is that it (*vulnerability*) is socially differentiated. Vulnerability is a state of well-being and is not same for different populations living under different environmental condition or faced with distinct social norms, political institutions and resource endowments, technologies and inequalities.

The status of coastal livelihood groups in our country can best be described as fragile. With a high dependency on natural resources, few livelihood groups have found sustainable route out of poverty. For such livelihood communities, natural disaster can bring intolerable burden. Recent research and practice in coastal community development suggest that is extremely important to understand the diversity of coastal people's livelihood and the sources of their vulnerability. An analysis of coastal livelihood helps government choosing policy options in order to revitalize and strengthen structure, mechanism and institution to rebuild livelihood that have long-term sustainability.

The first step is to list the coastal livelihoods. Then careful diagnosis would be undertaken to understand the socio-economic profile of coastal livelihood groups. The last segment then unfolds the indicators to understand vulnerability of different livelihood groups. The first table explores the variation of livelihood options in the coastal region of Bangladesh. We categorize the diverse individual occupations into five broad livelihood groups. The following box provides the detail of every group.

Box -1

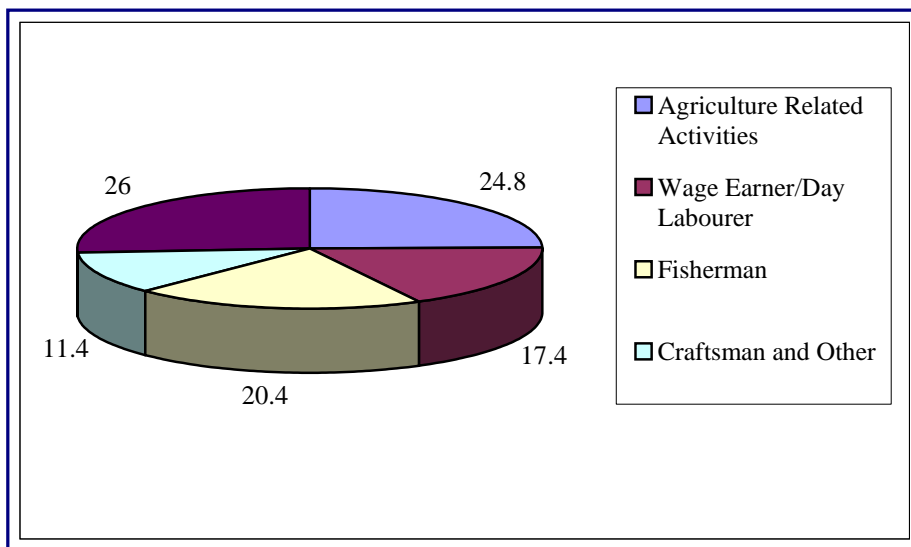
Agriculture Related Activities	Farmer, Share Cropper, Agricultural Labor
Wage Labourer	Day Laborer, Rickshaw/Van puller
Fisherman	Fisherman and Aquaculture
Craftsman and other	Potter, Craftsman and Other low skilled base Workers
Permanent Employment and Business	Paid Worker, NGO Worker, Government Employees and Business.

Coastal region has no dominant livelihood group which employs significant proportion of coastal population. Agriculture related activities absorb around 25% of coastal labour force. Fishermen community is 20% total coastal workforce. One fourth of the working population have either permanent employment or have business opportunities for earning livelihoods. Wage labourer and craftsman community comprise 17% and 11% of the labour force respectively.

Table 4.1: Distribution of Livelihood Groups in the Coastal Bangladesh

Livelihood	Frequency	Percent
Agriculture Related Activities	111	24.8
Wage Earner/Day Labourer	78	17.4
Fisherman	91	20.4
Craftsman and Other	51	11.4
Permanent Employment and Business	116	26.0

Figure 4.1: Distribution of Livelihood Groups in the Coastal Bangladesh



To further understand dependence on natural resources for earning bread and butter, we categorize two group of livelihood from the five major livelihood groups. The following box defines these two groups.

Box-2

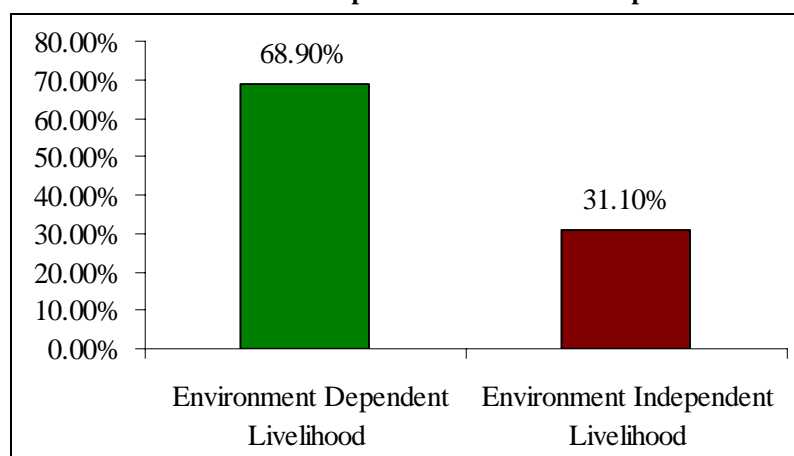
Environment Dependent Livelihood		<ul style="list-style-type: none"> • Agriculture Related Activities • Fishermen & Aquaculture • Wage Laborer
Environment Livelihood	Independent	<ul style="list-style-type: none"> • Craftsman and Other • Permanent Employment and Business

This categorization is done to isolate livelihood groups based on dependence on environmental resources. The hypothesis is that the more people depend on primary for earning livelihood the more they are risky lowered natural disaster. We find that in the coastal region around 68% of total workforce depend on environment intensively for livelihood purpose. Only 31.1% of the populations have livelihood options which hardly depends on environment resources and conditions.

Table4.2 : Distribution of Environment Dependent Livelihood Groups in the Coastal Bangladesh

Livelihood	Frequency	Percent
Environment Dependent Livelihood	308	68.9
Environment Independent Livelihood	139	31.1

Figure 4.2: Distribution of Environment Dependent Livelihood Groups in the Coastal Bangladesh



4.3 Socio-economic Profile of Coastal Livelihood Groups

It is important to focus not only on the livelihood groups but also on the whole range of socio-economic characteristics both across and within each livelihood community. The study aims to discuss the vulnerability of natural hazards on different coastal livelihood groups. To explore the vulnerability to disaster we have to analyze the socio-economic characteristics of these people.

4.3.1 Income

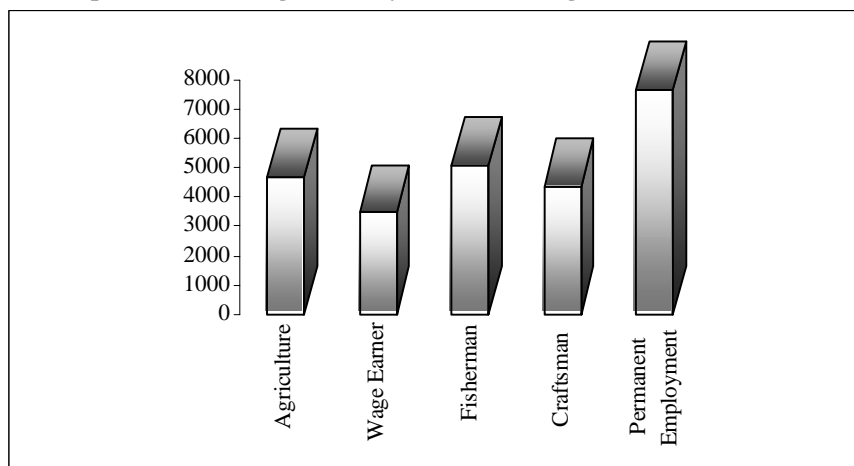
It is argued that income is a proxy for access to resource in its multifaceted form. Livelihood group with high average monthly income is strong and well off. Therefore the corresponding vulnerability is relatively weak.

Among the livelihood groups the permanent employment and business, as expected, has the highest average monthly income (7643.70) where as the most vulnerable group in this parameter is the wage labourer community. Fishermen community has on average 5094.57 taka income per month. An agriculture dependent household earns on an average 4710 taka per month.

Table 4.3: Comparison of Average Monthly Income Among Different Livelihood Communities

Livelihood	Average Monthly Income
Agriculture Related Activities	4710.13
Wage Earner/Day Labourer	3467.96
Fisherman	5094.57
Craftsman and Other	4355.88
Permanent Employment and Business	7643.70

Figure 4.3: Comparison of Average Monthly Income Among Different Livelihood Communities

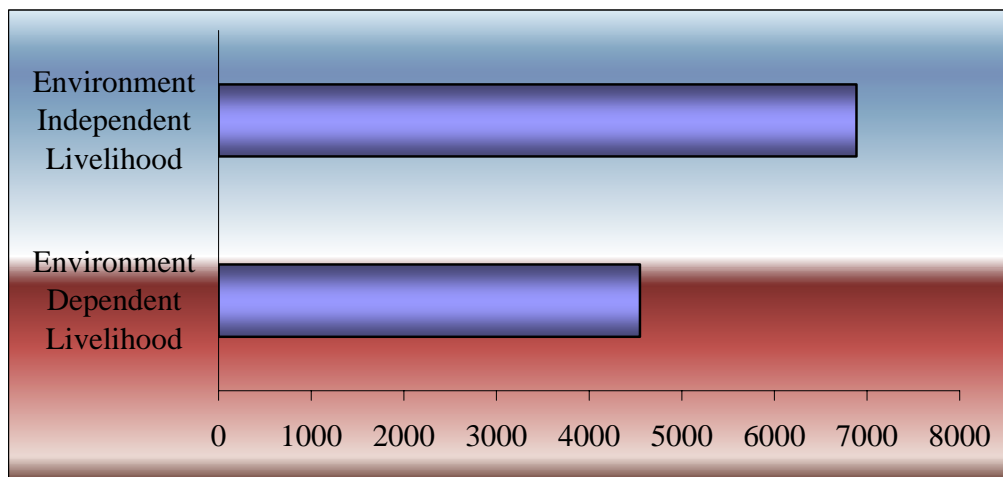


The average monthly income of the environment dependent livelihood groups fall short of that of environment independent livelihood group by around 2300 taka. This difference in income is statistically significant at one percent level.

Table 4.4: Comparison of Average Monthly Income Among Environment Dependent Livelihood

Livelihood	Average Monthly Income
Environment Dependent Livelihood	4547.8214
Environment Independent Livelihood	6885.6331

Figure 4.4: Comparison of Average Monthly Income Among Environment Dependent Livelihood



4.3.2 Poverty

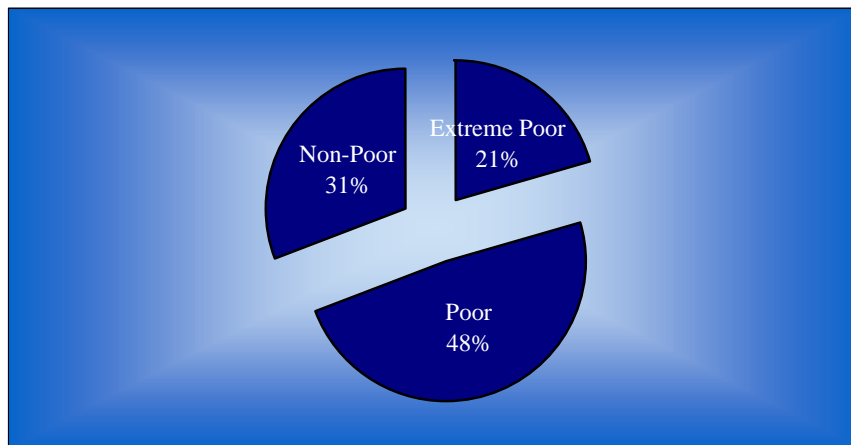
Poverty is an important aspect of vulnerability. Poorer people tend to live in “marginal” and more hazardous conditions. Poor people do not have entitlement to fight extreme events be it natural or man made. For this study we do not define poverty on the basis of popular *Cost Of Basic Need* or *Calorie Intake Method*, rather we use an operational definition of poverty. We assume 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”.

According to this definition, in the coastal region only 20% household remain below extreme poverty line. This might seem very promising but it is not to refer the actual level of poverty since we estimate that only 30% of the coastal households remain above poverty line. This result is quite devastating.

Table 4.5: Poverty Status in the Coastal Bangladesh

Poverty Status	Frequency	Percent
Extreme Poor	117	20.6
Poor	275	48.5
Non-Poor	175	30.9

Figure 4.5: Poverty Status in the Coastal Bangladesh

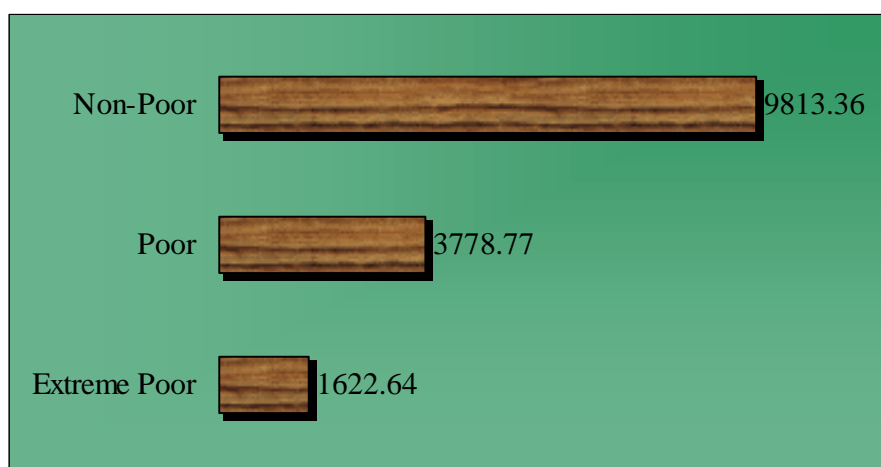


The average income of the extreme poor household is 1622 taka only. Moderately poor household earns on an average 3778 taka per month. The average monthly income of the non-poor household group is close to 10,000 per month.

Table 4.6 : Average Monthly Income of Households

Poverty Status	2 Average Monthly Income
Extreme Poor	1622.64
Poor	3778.77
Non-Poor	9813.36

Figure4.6: Average Monthly Income of Households



Among the broad livelihood group wage labourer is the group where 86% of the household group remain below poverty line. Then comes the craftsman community where 75% households belong to poor households. Around 30% of agriculture and Fishermen community households are non-poor. In case of permanent employment and business around 50% households remain above poverty line. 43.9% of the households, who depend least on environment for livelihood, are non-poor. Whereas only 26.9% households are non-poor who extensively use natural resources for livelihood.

Table4.7 : Poverty Status of Different Livelihood Groups

Livelihood	Poverty Status			3	Total
	Extreme Poor	Poor	Non-Poor		
Agriculture Related Activities	18.9%	49.5%	31.5%		100.0%
Wage Earner/Day Labourer	33.3%	52.6%	14.1%		100.0%
Fisherman	15.4%	53.8%	30.8%		100.0%
Craftsman and Other	13.7%	60.8%	25.5%		100.0%
Permanent Employment and Business	6.9%	44.0%	49.1%		100.0%

Figure4.7: Poverty Status of Different Livelihood Groups

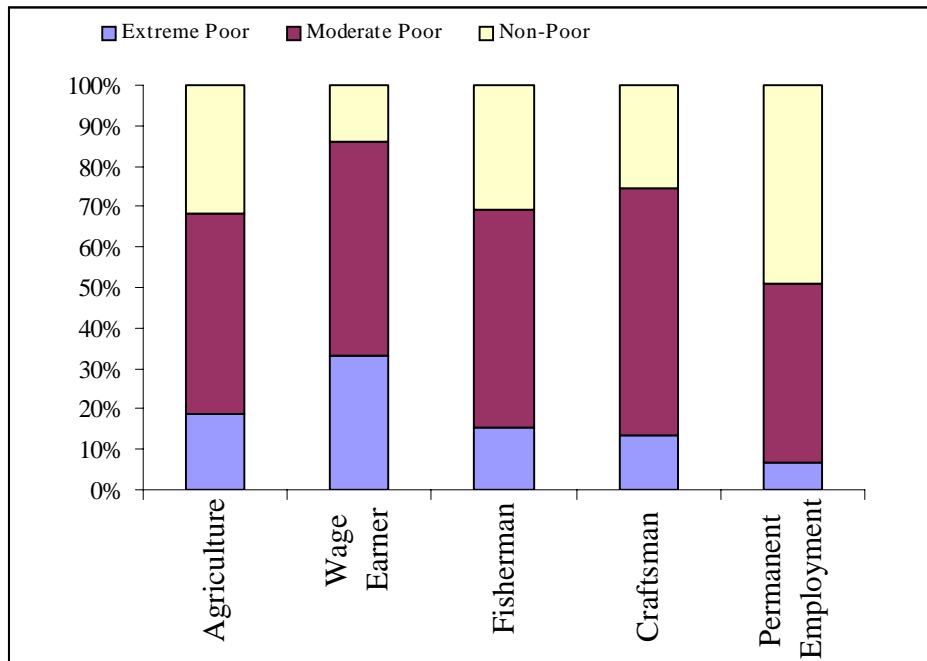


Table4.8 : Poverty Status of Different Environment Dependent Livelihood Livelihood Groups

Livelihood	Poverty Status			Total
	Extreme Poor	Poor	Non-Poor	
Environment Dependent Livelihood	21.4%	51.6%	26.9%	100.0%
Environment Independent Livelihood'	7.2%	48.9%	43.9%	100.0%

4.3.3 Education

Knowledge and information is power However, in the coastal region many people are barely literate and this increases their vulnerability and limits livelihood options. In the study area we find only 5% of households heads who have education beyond primary level. This holds true across all the livelihood groups. Surprisingly the permanent employment and business category has the lowest level of education (no education = 14.7%). Around 85% - 95% household heads have primary education across all the livelihood group. There is symmetric educational distribution among the poor and non-poor also. This finding is alarming. Since the education level of coastal region is very loss across all the livelihood groups.

Table 4.9 : Education Status in the Coastal Bangladesh

Education	Frequency	Percent
No Education	22	3.9
Primary Education	513	90.5
Above Primary Education	32	5.6

Table 4.10: Education Status of Different Livelihood Groups

Livelihood	Education Status			Total
	No Education	Primary Education	Above Primary Education	
Agriculture Related Activities	.0%	91.9%	8.1%	100.0%
Wage Earner/Day Labourer	.0%	96.2%	3.8%	100.0%
Fisherman	1.1%	92.3%	6.6%	100.0%
Craftsman and Other	.0%	94.1%	5.9%	100.0%
Permanent Employment and Business	14.7%	81.9%	3.4%	100.0%

Table 4.11: Education Status of Different Environment Dependent Livelihood Groups

Livelihood	Education Status			4 Total
	No Education	Primary Education	Above Primary Education	
Environment Dependent Livelihood	1.6%	92.5%	5.8%	100.0%
Environment Independent Livelihood'	9.4%	85.6%	5.0%	100.0%

Table 4.12: Poverty and Education

Poverty Status	Education Status			Total
	No Education	Primary Education	Above Primary Education	
Poor	2.6%	91.5%	6.0%	100.0%
Middle Income	3.6%	89.5%	6.9%	100.0%
Non-Poor	5.1%	91.4%	3.4%	100.0%

However, the correlation coefficient between education status of household head and household income turns out to be positive and significant at the one percent level. However the magnitude of the correlation coefficient is low.

Table 4.13: Correlations Between Education and Household Income

	Household Income	Education Level of HH Head
Household Income	1	0.438(**)
Education Level of HH Head	0.438(**)	1

*Pearson Correlation

** Correlation is significant at the 0.01 level (2-tailed).

4.3.4 Household Member

In the study are a we dose not find wide divergence across the livelihood groups in both the categories in terms of average member of household members. The value is on average 5 for all the livelihood groups.

4.4 Status of Well Being

4.4.1 Food Security:

Food security is an important parameter of household well- being. The following table reveals that permanent employment category is better off compared to other livelihood groups in this aspect. Households belonging to this occupational group have stable food supply for 10 month on an average. Where as the wage labourer and craftsman group are

worse off as they have only 5 months of stable food supply. Fishermen and Agriculture related households have on an average 7.6 month of smooth food supply in a year.

Table 4.14: Food Security Across Different Livelihood Groups

Livelihood	Average of Secure Months in a Year
Agriculture Related Activities	8.01
Wage Earner/Day Labourer	5.45
Fisherman	8.00
Craftsman and Other	5.88
Permanent Employment and Business	10.21

4.4.2 Safe water:

Coastal households across all the livelihood categories are well off in terms of having water from safe sources. Only around 20% of the households do not have access to safe water. For every livelihood category except the permanent employment and business community (12.9%).

Table 4.15: Access to Water across Different Livelihood Groups

Livelihood	5 Access to Safe Water		Total
	Water From Safe Sources	Water From Unsafe Sources	
Agriculture Related Activities	82.7%	17.3%	100.0%
Wage Earner/Day Labourer	83.3%	16.7%	100.0%
Fisherman	81.4%	18.6%	100.0%
Craftsman and Other	80.0%	20.0%	100.0%
Permanent Employment and Business	87.1%	12.9%	100.0%

4.4.3 Sanitation:

Sanitation is another indicator of household well being which is critical for health. But the following table shows in at around 60% of household across all the livelihood group, do not have access to hygienic sanitation facility. Ever for the permanent employment community, 56% of households don't have access to hygienic sanitation facility.

Table 4.16: Access to Sanitation Different Livelihood Groups

Livelihood	Access to Sanitation		6	Total
	Do Not Have Access to Sanitation	Access to Sanitation		
Agriculture Related Activities	38.7%	61.3%		100.0%
Wage Earner/Day Labourer	42.3%	57.7%		100.0%
Fisherman	35.2%	64.8%		100.0%
Craftsman and Other	33.3%	66.7%		100.0%
Permanent Employment and Business	44.0%	56.0%		100.0%

4.4.4 Electricity:

Access to electricity is also crucial for economic and social development. Coastal region has very low level of electricity livelihood groups. On an average 20% household have access to electricity. This region calls for immediate intervention in providing electricity to greater proportion of it population.

Table 4.17: Access to Electricity Different Livelihood Groups

Livelihood	Access to Electricity		Total
	Yes	No	
Agriculture Related Activities	20.0%	80.0%	100.0%
Wage Earner/Day Labourer	15.6%	84.4%	100.0%
Fisherman	19.8%	80.2%	100.0%
Craftsman and Other	19.6%	80.4%	100.0%
Permanent Employment and Business	20.0%	80.0%	100.0%

4.4.5 Housing:

In order to get idea about housing status of coastal livelihood groups we develop two aspects: *number of house* and *building material*. Households, having 3 houses are defined to be having *subsistence level of housing*. Households who have more than that are said to be having *sufficient housing*. Around 80% - 90% households of each livelihood group own only substance level of housing. The permanent employment group have 15.5% household who have sufficient housing.

Table 4.18: Housing Status across Different Livelihood Groups

	Housing Status		Total
	Subsistence Housing	Sufficient Housing	
Agriculture Related Activities	90.1%	9.9%	100.0%
Wage Earner/Day Labourer	83.3%	16.7%	100.0%
Fisherman	91.2%	8.8%	100.0%
Craftsman and Other	88.2%	11.8%	100.0%
Permanent Employment and Business	84.5%	15.5%	100.0%

In terms of building material we define house made by tin and brick to be *strongly built*. The houses with any other building material are said to be *vulnerable housing*. Around 45% of the households of permanent livelihood group have strong houses; which is highest. On an average, around 60% - 70% households live in vulnerable houses of the other livelihood groups.

Table 4.19: Housing Condition across Different Livelihood Groups

	Housing Condition		Total
	Vulnerable Housing Condition	Strong Housing Condition	
Agriculture Related Activities	69.4%	30.6%	100.0%
Wage Earner/Day Labourer	60.3%	39.7%	100.0%
Fisherman	61.5%	38.5%	100.0%
Craftsman and Other	56.9%	43.1%	100.0%
Permanent Employment and Business	66.4%	33.6%	100.0%

4.4.6 Savings:

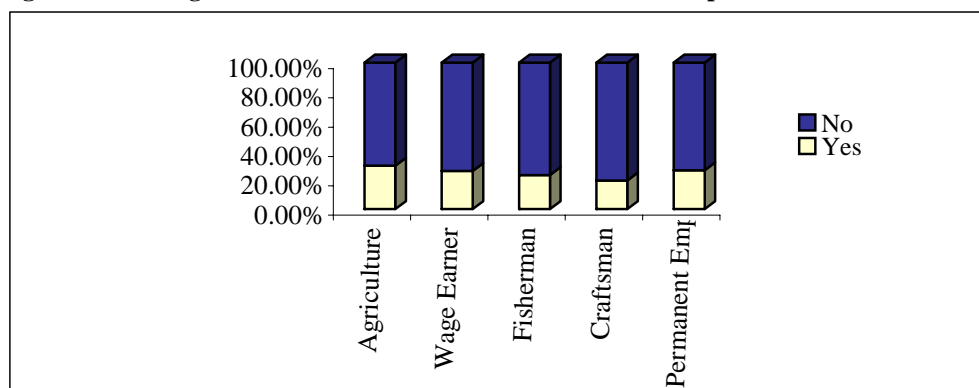
Savings is the means, which helps people in adverse conditions. Propensity to save is very useful for unforeseen events for any individual. Around 26% of household of permanent employment group report that they use to save. Around 29.6% of agriculture

dependent households also save. However, on an average 70% household do not have any saving irrespective of any livelihood groups which is an alarming picture.

Table 4.20: savings Behaviour across Different Livelihood Groups

	Savings		7	Total
	Yes	No		
Agriculture Related Activities	29.6%	70.4%		100.0%
Wage Earner/Day Labourer	26.0%	74.0%		100.0%
Fisherman	23.3%	76.7%		100.0%
Craftsman and Other	19.6%	80.4%		100.0%
Permanent Employment and Business	26.5%	73.5%		100.0%

Figure 4.8: Savings Behaviour across Different Livelihood Groups



4.4.7 Remittance:

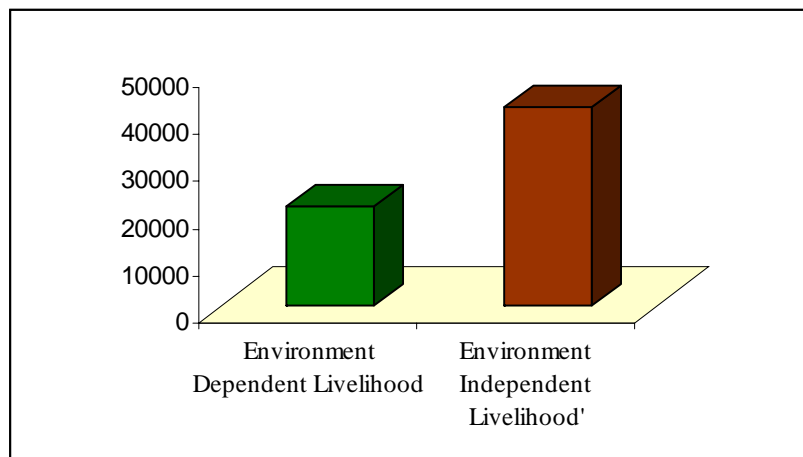
The diversity of income sources, and the variability of those income sources is an indication of vulnerability at the household level. It is hypothesized that the greater the diversity of income, the greater the resilience of household to disruption. Remittance therefore is a proxy for such diversity of household income sources. It is found that about 15.7% of craftsman livelihood household receive remittance. Around 14.4% agricultural household receives remittance. However, the average yearly remittance is highest for the permanent employment households. Other livelihood groups are fall sort significantly. The difference between environment dependent and environment independent livelihood group in this respect is wide and statistically significant.

Table 4.21: Flow of Remittance across Different Livelihood Groups

Livelihood	Average Yearly Remittance	Percentage
Agriculture Related Activities	14812.5	14.41
Wage Earner/Day Labourer	16275	10.26
Fisherman	12971.43	7.69
Craftsman and Other	16150	15.69
Permanent Employment and Business	75090.91	9.48

Table 4.22: Flow of Remittance across Different Environment Dependent Livelihood Groups

Livelihood	Average Yearly Remittance
Environment Dependent Livelihood	21151.51
Environment Independent Livelihood'	42070.58

Figure 4.9: Flow of Remittance across Different Environment Dependent Livelihood Groups

This section describes so many aspects of “*social vulnerability*” of different livelihood groups living in the coastal part our country. All this figures are extracted from the household survey and does not necessarily represent the national representative figures. Even though this findings would be useful for researchers and policy makers since these indices provide them valuable insight about the socio-economic status across different livelihood communities and identify their vulnerability. This findings can be intensively used while drafting policies for long term capability building of vulnerable livelihood groups of coastal Bangladesh.

V. Economic Risk Assessment of Disaster towards Coastal Livelihood

This section presents the indicators for assessing and mapping the risk for every livelihood group from natural hazards. Disaster risk exposure levels for different livelihood community are measured in this study in different ways, including distance from river or sea or from cyclone centers, and corresponding household damage due to the last catastrophic event. Not all the area are exposed to risk of damage in a symmetric way. Therefore distance from river and sea indicates the risk exposure of a particular household. It is also important to estimate the loss of life, asset and other objects which can be a proxy for the assessment risk towards such natural calamity. From the review of the existing research literature we extract these indicators for assessing risk not only towards livelihood groups but also livelihood assets and extent of risk exposure of other key element of life of people such as loss of school days of the school going children, health cost of people, the pattern of distress sale in the wake of such vulnerable situation. The study also embraces the perception of people from different livelihood group about risk from various disaster events.

5.1 The Study Area

The topography along with many other all embracing features of the coastal region, are provided in the previous section. However, it is worthwhile to know the propensity of disaster event in the study area. An adhoc measure can be used to identify the dominant risk factors of the coastal zone.

About 80% of our respondent perceives that for the coastal zone Cyclone carry greater risk compared to other forms of natural bouncers. The next threat of comes from “Flood”. Around 20% of coastal respondents indentify flood as the frequent event in the coastal zone. This finding is consistent with next table which summarizes the answers of respondents about the last event of disaster which caused damage towards their household. More than 90 percent have reported about cyclone and tidal surge. 9% have been affected by flood.

Table 5.1: Perception of the Respondents about Disaster Propensity

Natural Disaster	Percent
Flood Prone	19.8
Drought Prone	.7
Cyclone Prone	79.5

Table 5.2 Type of the last disaster experienced by the respondents

Natural Disaster	Percent
Flood	9.0
Tidel Surge	12.2
Cyclone	78.8

However, the event of flood took place in the distant past, where as memory about recent experience of cyclone or tidal surge happens to be quite fresh. Therefore the damage profile from cyclone or tidal surge has been more accurate than those obtained from flood affected people. However, we do not refer the damage profile belonging to any particular calamity. None the less 91% of the respondents experienced cyclone events and damage from cyclone or tidal surge are more available in the report. We have not isolated damage from particular natural event to differentiate them since our object of analysis is to undertake economic risk assessment procedure towards coastal livelihood. The study incorporates damage profile of several livelihood groups, then break down of damage, to identify risk of asset in particular. The starting point of our analysis is to identify the exogenous disaster risk exposure of particular livelihood group.

5.2 Exogenous Disaster Risk Exposure of livelihood

The level of risk exposure faced by a household depends on two main factors: an exogenous and an endogenous element. The former refers to facts and factors which are beyond an individual's locus of control, and the latter to the fact that people can take actions which reduce the likelihood of undesirable events occurring and reduce the cost of the event to them, if it occurs. In the previous section we incorporated the savings behavior and housing condition based on building materials of several livelihood groups element. This section includes the exogenous risk exposure which is measured through the distance people live from river or sea. Different livelihood group living at different distance from river or sea, have different exogenous risk exposure level dependent upon their location. It is found that Fishermen community lives close to river or sea. Permanent employment and business community use to live furthest from river and sea. As expected,

there exists a significant positive relationship between the distance people live from sea or river and household income. This implies that households with greater income, install houses for from sea and river. However the vulnerable people, having less choice about choosing location because of financial constraint, live close to river or sea which threaten their life and asset greatly. The broadly defined environment dependent livelihood groups live closer to sea and river than the household group which has environment independent livelihood options.

Table 5.3: Risk Exposure of Different Livelihood Groups

Livelihood	Distance From River	Distance from Sea	Distance from Forest	Distance From Cyclone Center
Agriculture Related Activities	1.4685	26.3964	22.3086	1.9914
Wage Earner/Day Labourer	1.3458	32.8160	31.2712	2.4024
Fisherman	1.2679	25.5934	11.7033	1.8159
Craftsman and Other	1.8794	35.6569	27.9608	1.9127
Permanent Employment and Business	1.9867	33.0114	24.1119	2.0239

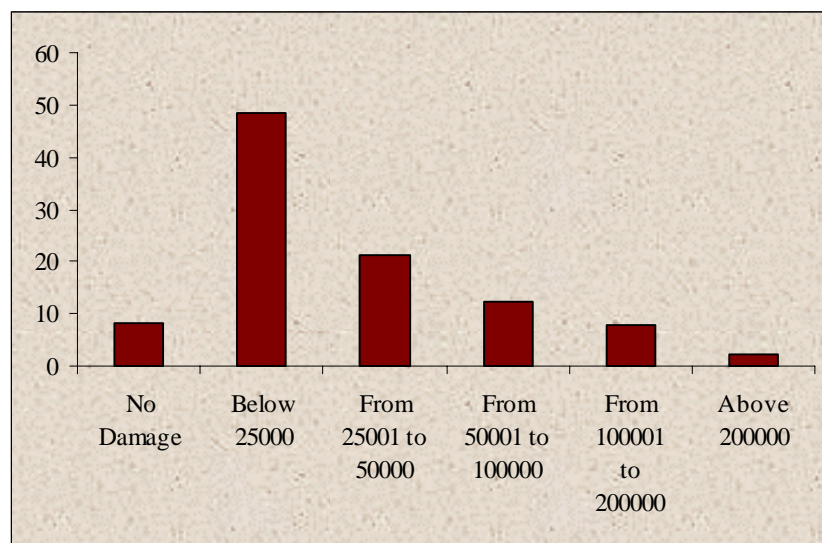
5.3 Household Damage Profile

The consequence of risk exposure, measured through economic damage costs per livelihood. Comparing the magnitude of household damage across different livelihood groups. We can ideality the vulnerability of these livelihood groups.

Only 8.1% people survive any form of economic loss in the face of natural disaster. 78.5 %, that is around half of the coastal households suffer economic loss below 25,000 taka 21.2 % households suffer economic loss in between 25,000 to 50,000 taka. 12.2% households incur financial damage less than 1,00,000 but more than 50,000 taka. Less than 10 percent households suffer high economic loss (more than 1,00,000) .

Table 5.4: Damage Category

Category	Frequency	Percent
No Damage	46	8.1
Below 25000	275	48.5
From 25001 to 50000	120	21.2
From 50001 to 100000	69	12.2
From 100001 to 200000	44	7.8
Above 200000	13	2.3



The following table entails all kinds of loss of asset due to natural disaster. It enlists the number of people in possession with particular asset, number of households suffering loss of these assets, average cost of damage per household. In order to better understand the loss of asset we categorize these assets into few needs. We find 23% households face crop damage. But only 1% household suffers loss of agricultural asset. 13% of coastal households suffer from damage in fisheries 22% households are hurt by the asset of fisheries. Live stock and damage of trees damage in quite prevalent among coastal households. One third of the coastal households suffer any form of household assets.

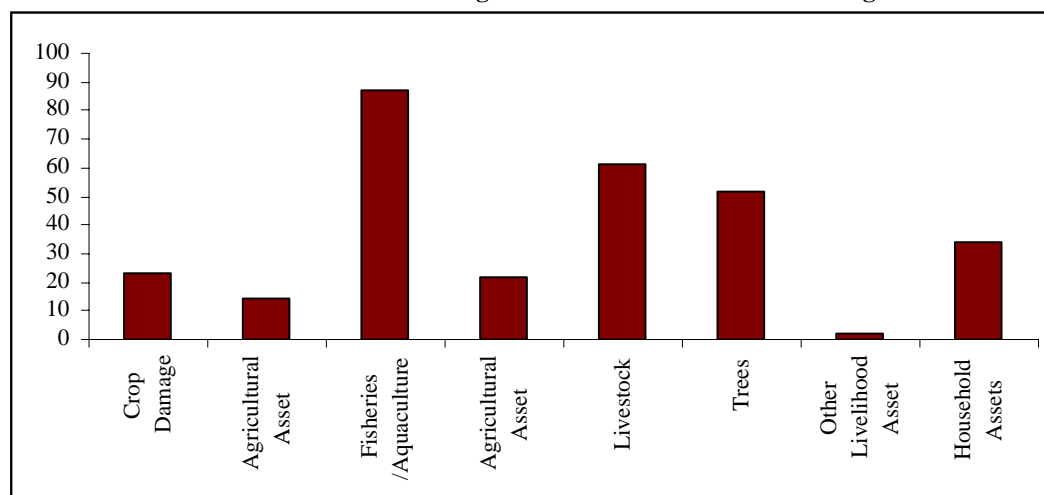
Table 5.5: Item wise Average Damage Per Household

Items	Possession	Affected Households	Percentage	Average Damage
Damage of Rice	143	122	85.31	13747.76
Damage of Vegetable	60	35	58.33	2291.63
Damage of Shrimp	8	5	62.50	30400.00
Damage of Fisheries		48		15702.32
Damage of Aquaculture	60	55	92	15052.58
Damage of Cow	128	88	68.75	23972.40
Damage of Goat	150	118	78.67	8454.14
Damage of Poultry	357	322	90.20	2297.30
Damage of Tree	299	278	92.98	31800.00
Damage of Tractor	4	3	75.00	10062.61
Damage of Machine (<i>Tush</i>)	7	3	42.86	2495.25
Damage of Water Pump	10	3	30.00	27533.33
Damage of Fishing Net	147	90	61.22	8294.99
Damage of Machine (Fishing)	15	12	80.00	11478.60
Damage of Boat (Fishing)	111	94	84.68	26434.94
Damage of Radio	87	30	34.48	1506.78
Damage of TV	72	28	38.89	10071.13
Damage of Bicycle	40	5	12.50	3325.00
Damage of Rickshaw	24	8	33.33	4604.93
Damage of Van	12	3	25.00	8846.75
Damage of Mobile Phone	143	14	9.79	5039.95
Damage of Refrigerator	23	7	30.43	22236.04
Damage of Almira	161	83	51.55	5585.54
Damage of Dressing Table	45	37	82.22	6312.96
Damage of Bed	355	153	43.10	3792.71
Damage of SofaSet	40	18	45.00	14725.00
Damage of Jewellery	206	28	13.59	9626.06
Damage of Motorcycle	7	1	14.29	83171.70

Table 5.6: Item wise Average Damage Per Household

	% Of Households Affected	Average Cost Per Household
Crop Damage	23	13115.18
Damage of Agricultural Asset	14	20056.98
Damage of Fisheries /Aquaculture	87	24611.86
Damage of Agricultural Asset	22	27320.73
Damage of Livestock	61	10959.81
Damage of Trees	52	31799.01
Damage of Other Livelihood Asset	2	5761.78
Damage of Household Assets	34	13222.92

Distribution Percentage Of Households Item Wise Damage

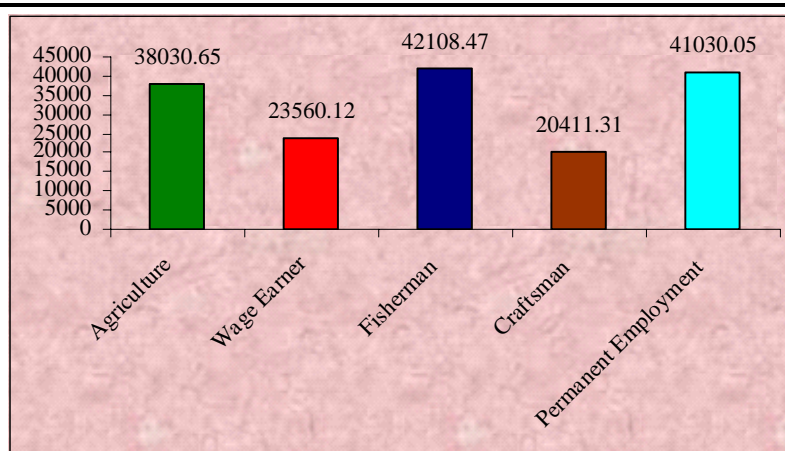


5.4 Damage of Different Livelihood Groups

This section estimates the average household damage of different livelihood groups. It is found that permanent employment and business group on an average suffer greatest economic loss. This is expected result since permanent employment group is the highest income earning group, they possess more asset and more assets owned by them come across natural hazard. Therefore, they suffer the highest. The average damage is lowest for the people belonging to craftsman and wage laborer group.

Table 5.7: Damage of Different Livelihood Group

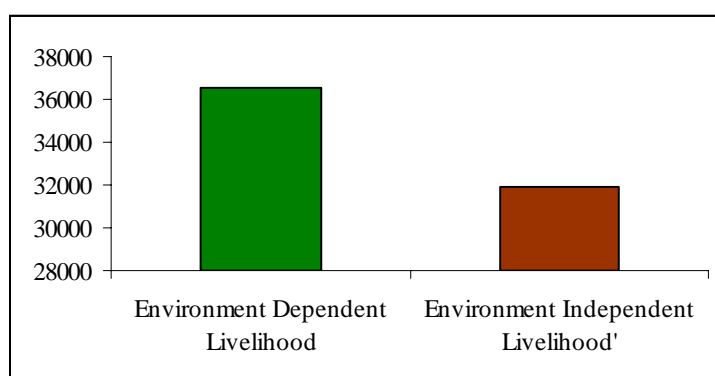
Livelihood	Average Damage Per Household
Agriculture Related Activities	38030.65
Wage Earner/Day Labourer	23560.12
Fisherman	42108.47
Craftsman and Other	20411.31
Permanent Employment and Business	41030.05



But the next table reveals striking feature which shows that on an average, environment dependent livelihood group suffer greater economic loss compared to environment independent livelihood group.

Table 5.8: Damage of Different Livelihood Group based on the dependence on Environment

Livelihood	Average Damage Per Household
Environment Dependent Livelihood	36534.89
Environment Independent Livelihood'	31932.94



Another interesting finding in higher education level household have lower damage compared to those who have lower educational attainment. This suggest that the well established that household with higher education level can fight disaster and therefore capable of minimizing lost of disaster.

Table 5.9: Damage and Education Level

Educational Status	Average Damage Per Household
No Education	41656.34
Primary Education	37302.77
Above Primary Education	35573.52

5.5 Other Aspect of disaster damage

The overall measure of economic damage is useful to identify actual risk exposure of different livelihood groups. However, there are so many dimensions of suffering during natural hazard events. Homelessness, health hazards, loss of school days, falling into the credit trap, are few of them. This sections attempts to highlight few of these deprivations and compare them across livelihood groups.

5.5.1 Homeless Ness

Data reveals that around three forth households become homeless as on immediate outcome of the disaster. Around 70% from each livelihood group become homeless. However, the average duration of remaining homeless is lowest for the permanent employment group. The duration is highest for the fishermen community which is also reflection that this community is the closest to river or sea. There is variation in the cost of reconstruction of houses. This is highest for the permanent employment community. The environment dependent livelihood group has lower cost to rebuild their houses compared to the environment independent livelihood group.

Table 5.10: Homelessness or not

Homelessness	Percent
Yes	75.3
No	24.7

Table 5.11: Homelessness Across Different Livelihood

Livelihood	Homelessness or not		Total
	Yes	No	
Agriculture Related Activities	71.17%	28.83%	100
Wage Earner/Day Labourer	72.64%	27.36%	100
Fisherman	82.42%	17.58%	100
Craftsman and Other	72.55%	27.45%	100
Permanent Employment and Business	69.32%	30.68%	100

Table 5.12: Average Duration of Homelessness across Different Livelihood

Livelihood	Average Duration of Homelessness (Days)
Agriculture Related Activities	2.14
Wage Earner/Day Labourer	2.11
Fisherman	4.62
Craftsman and Other	2.00
Permanent Employment and Business	1.32

Table 5.13: Average Cost of House Reconstruction Across Different Livelihood Groups

Livelihood	Average Cost of House Reconstruction (taka)
Agriculture Related Activities	7618.38
Wage Earner/Day Labourer	6125.28
Fisherman	7494.07
Craftsman and Other	7614.51
Permanent Employment and Business	10575.91

Table 5.14: Cost of House Reconstruction Across Different Environment Dependent Livelihood Groups

Livelihood	Average Cost of House Reconstruction (taka)
Environment Dependent Livelihood	7756.10
Environment Independent Livelihood'	9489.35

5.5.2 Cost of the health Hazard

43% of household suffer some form of health problem as the aftermath of natural disaster. Cost to overcome such health adversity indicate the severity of health hazard. Lower cost incurred by permanent employment group thus indicates that their health suffering is minimum.

Table 5.15: Average Health Cost Across Different Livelihood

	Average Health Expenditure (taka)
Agriculture Related Activities	1466.6667
Wage Earner/Day Labourer	2116.8571
Fisherman	1382.8571
Craftsman and Other	2150.8333
Permanent Employment and Business	1303.4697

Table 5.16: Average Health Cost Across Different Environment Dependent Livelihood

	Average Health Expenditure (taka)
Environment Dependent Livelihood	1716.4202
Environment Independent Livelihood'	1346.1233

5.5.3 Loss of School Days

After any natural disaster, school going kids may suffer loss in schooldays. The magnitude is an indication of how quick the corresponding household can adapt the natural blow and come back to normal life. The following table shows that children from permanent employment group has the lowest number of loss in school days whereas children from wage labourer and agriculture related workers have highest number of loss in school days representing their incapacity to adapt to adverse conditions. Children from environment independent livelihood group have significantly lower number of loss in school days than their counterpart from environment dependent households.

Table 5.17: Loss of School Days Across Different Livelihood

	Average Loss of School Days
Dependent	33.81
Agriculture Related Activities	29.03
Wage Earner/Day Labourer	29.44
Fisherman	24.90
Craftsman and Other	22.61
Permanent Employment and Business	12.88

Table 5.18: Loss of School Days Across Different Environment Different Livelihood

	Average Loss of School Days
Environment Dependent Livelihood	26.09
Environment Independent Livelihood'	16.61

5.5.4 Credit/Loan

Credit is the means through which people, if needed, fight odd conditions. The more vulnerable individual or group would demand more credit. The following table suggests that agricultural livelihood group, on an average, takes highest amount of credit. On the contrary, permanent employment group takes, on an average, lowest credit. The environment dependent households on an average borrow more money than environment impendent livelihood group.

Table 5.19: Average Credit Taken by Different Livelihood Group

Livelihood	Average Credit Per Household (taka)
Agriculture Related Activities	23407.00
Wage Earner/Day Labourer	13412.48
Fisherman	12730.00
Craftsman and Other	8933.38
Permanent Employment and Business	10334.91

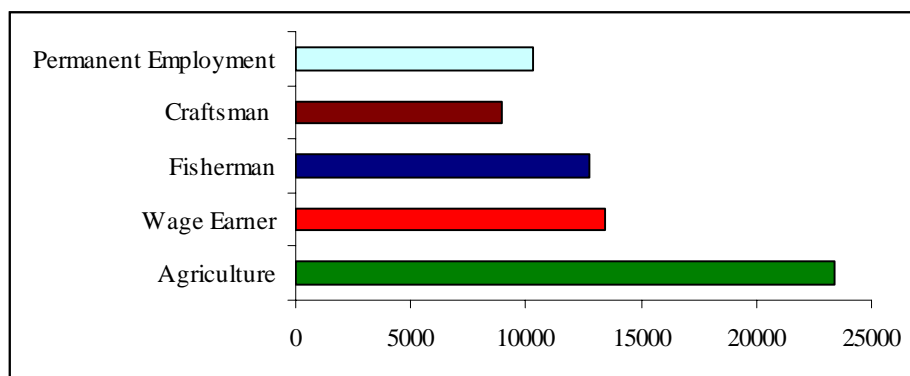
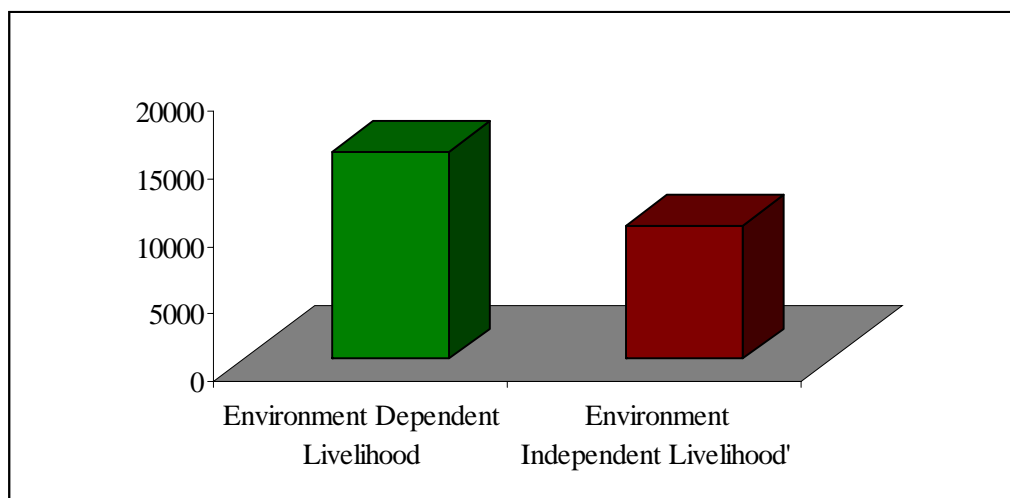


Table 5.20 Average Credit Taken by Different Environment Dependent Livelihood

Livelihood	Average Credit Per Household (taka)
Environment Dependent Livelihood	15321.2946
Environment Independent Livelihood'	9819.6383



5.5.5 Distress Sale

Distress sale is the last way out for any household to sustain against adversity. We intend to identify the type of commodities which households use to sale. Usually they receive lower price than the original market value of the good. It is found that one forth of coastal households undertake any form of distress sale indicating the overall vulnerability of the region. Most people use to sale livestock and trees.

Table 5.21 Distress Sale

Items	% Of Household
Van/Rickshaw	1.8
Boat	.2
Cow/Bull	6.9
Poultry	1.9
Trees	8.1
Land	2.5
Goat	1.2
Jewelary	.4
Paddy	1.8

5.6 Perception about Disaster Events by Different Livelihood Groups

Coastal region is more prone to cyclone events. This is once again skewedly distributed. People had been asked to rank the natural disasters by assigning points to them. 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 flood to be most risky event. Around 67.6% people

categorize flood 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. This findings help us to deduce that cyclone and flood appear to be major threats for all the livelihood groups.

Table 5.22: Perception of the Coastal People about Different natural Disaster

	(Percentage of Respondents)			
	Cyclone Perception	Earthquake Perception	Drought Perception	Flood Perception
Least Risky	1.5	44.7	66.4	.5
Moderately Risky	1.9	40.5	30.1	5.5
Risky	13.9	11.5	2.1	67.6
Most Risky	82.7	3.3	1.1	26.4
Total	100	100	100	100

Table 5.23: Perception of the Coastal Livelihood about Flood

Livelihood	Perception about Flood				Total
	Least Risky	Moderately Risky	Risky	Most Risky	
Agriculture Related Activities	.9%	.9%	63.1%	35.1%	100.0%
Wage Earner/Day Labourer	.0%	5.1%	70.5%	24.4%	100.0%
Fisherman	.0%	4.4%	76.9%	18.7%	100.0%
Craftsman and Other	.0%	3.9%	80.4%	15.7%	100.0%
Permanent Employment and Business	.9%	6.9%	63.8%	28.4%	100.0%

Table 5.24: Perception of the Coastal Livelihood about Cyclone

Livelihood	Perception about Cyclone				Total
	Least Risky	Moderately Risky	Risky	Most Risky	
Agriculture Related Activities	1.8%	2.7%	16.4%	79.1%	100.0%
Wage Earner/Day Labourer	1.3%	.0%	11.5%	87.2%	100.0%
Fisherman	.0%	2.2%	12.1%	85.7%	100.0%
Craftsman and Other	.0%	2.0%	7.8%	90.2%	100.0%
Permanent Employment and Business	1.74%	0.87%	13.91%	83.48%	100%

Table 5.25: Perception of the Coastal Livelihood about Earthquake

	Earthquake				Total
	Least Risky	Moderately Risky	Risky	Most Risky	
Agriculture Related Activities	45.5%	41.8%	10.0%	2.7%	100.0%
Wage Earner/Day Labourer	51.3%	33.3%	7.7%	7.7%	100.0%
Fisherman	45.1%	36.3%	14.3%	4.4%	100.0%
Craftsman and Other	37.3%	41.2%	21.6%	.0%	100.0%
Permanent Employment and Business	43.5%	47.0%	9.6%	.0%	100.0%

Table 5.26: Perception of the Coastal Livelihood about Drought

Livelihood	Perception about Drought				Total
	Least Risky	Moderately Risky	Risky	Most Risky	
Agriculture Related Activities	67.6%	27.9%	2.7%	1.8%	100.0%
Wage Earner/Day Labourer	57.7%	41.0%	1.3%	.0%	100.0%
Fisherman	63.7%	34.1%	2.2%	.0%	100.0%
Craftsman and Other	74.5%	25.5%	.0%	.0%	100.0%
Permanent Employment and Business	72.4%	23.3%	1.7%	2.6%	100.0%

VI Disaster and Economic Risk towards Specific Industries

Fishing industries comprise of fish culture, production, process etc. About 48% of the fishing industries were involved in fish cultivation, which was the highest in our sample study. This was followed by fish processing (14.6%). The manufacturing industries include flour mill, saw mill, saw processing, *bidi* factories etc. Tourism industries include residential hotel, small businesses, and restaurant. On an average about 6 people was employed as permanent staff per the fishing industry whereas 17 people worked as temporary staff per fishing industry. The finding indicated that temporary staff was three times higher than that of permanent staff. On an average 4 permanent staff permanent staff lost their job due to natural shock per fishing industry whereas this is 11 for the temporary staff. On an average about 29 people was employed as permanent staff per

the manufacturing industry whereas 21 people worked as temporary staff per manufacturing industry. The finding indicated that temporary staff was one and half times higher than that of permanent staff. On an average 7 permanent staff permanent staff lost their job due to natural shock per fishing industry whereas this is 20 for the temporary staff. So what the important finding here is that in the case of manufacturing industry, all the temporary staff lost their jobs due to the natural shocks, which include Sidr, Tidal surge and Cyclone. In the case of tourism industry, 8 people were found working as permanent staff per tourism industry whereas 3 people were found as temporary staff. Due to disaster, on an average 3 permanent staff lost their jobs whereas this figure was 2 for the temporary staff per tourism industry. Based on the employment status, it could be concluded that manufacturing industries have the highest contribution in both cases, i.e., permanent and temporary status. However, it is also worth mentioning that this type of industries also badly struck by the natural shock which results in loss of jobs for all temporary staff. These findings are summarized in the following table.

Table 6.1: Employment Status of Industries and loss of employment due to natural shock

Industry Type	Permanent employment	Average employment per industry	% loss of permanent employment	Temporary employment	Average employment per industry	% loss of temporary employment
Fishing (N=41)	241	6		588	17	
			30.29			24.15
Manufacture (N=51)	1474	29	13.98	789	21	72.75
Tourism (N=30)	230	8	17.83	44	3	47.73

Due to natural disaster, the sum total of monthly loss amounts to Tk. 8.9 million for fishing industries considered in our study. On an average, each fishing industry lost 0.2 million Tk. For the manufacturing industry, the lost amount stood to Tk. 5820 million, which is 654 times higher than that of fishing industry. On an average, each manufacturing industry lost Tk. 114 million. Figure is missing for tourism industry as we did not collect data on a monthly basis for the tourism industry. Distress sale was found

for manufacturing and tourism industry. Two types of distress sales were considered in this study, e.g., sales of ownership and properties. Ownership sales were significantly higher than that of property sale. On an average, each manufacturing industry sold out of Tk. 0.5 million as ownership and for the property sale, this figure was Tk. 0.0016 million. But for the tourism industry, both type of sales happened to the same extent. Due to the natural shock, tourism was badly affected in terms of days lost. On an average one day lost was found per fishing industry whereas it is 3.2 for the manufacturing industry. Each tourism industry lost 7 days due to that shock. Loss in Tk. Due to close of the industry, the highest figure for loss was found for the manufacturing industry, followed by the tourism industry. The least loss due to the same reason was found for fishing industry. From the findings it is clear that despite the highest number of days lost was found for the tourism industry, the highest loss was not found for that type of industry. In terms of property sales, highest sales were found for the fishing industry. In that sense, it could be say that fishing industries are the most vulnerable.

Table 6.2: Loss and Distress Sale of Coastal Industries

Type of Industry	Monthly loss of Sum Total (Million Tk.)	Distress sale		Closed in days	Loss due to close (Million Tk.)
		Ownership Sales of Sum Total (MillionTk.)	Properties' Sales of Sum Total (Million Tk.)		
Fishing	8.9	-	1.45	41	0.39
Manufacture	5820	23.7	0.08	166	1.8
Tourism	-	0.85	0.85	210	0.48

VII Concluding Remarks

The economic risk assessment of coastal livelihood to natural hazard integrates both economic and other social perspectives of vulnerability. The empirical research is carried out based on present day risk rather than scenarios of future risk. However, the study is also novel in applying these findings in the context of long-term environmental challenges. This report has explored the factors of social vulnerability to natural disaster in the coastal Bangladesh. In general coastal livelihood communities can be best described as fragile. Low level of income, lack of income diversity, poor level of educational attainment, insufficient safeguard against uneven shocks and lack of access to institutions puts them in a risky situation and contributes to their inability to respond natural disaster

process successfully and sustainable. This study also provides the district risk analysis “in order to understand the spatial difference of vulnerability among coastal districts. This would be instrument for policy prescription at the macro level. In the end the study estimates the actual risk exposure measured by household damage in the face of last disaster event experienced by each household enables us to highlight risk exposure of different livelihood groups. The result shows that livelihood communities who use the environmental or primary resources intensively suffer disproportionately in comparison with other group which is least dependent on environment for livelihood.

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