Collective Action to reduce climate disaster risks and enhancing resilience of the vulnerable coastal communities around the Sundarbans in Bangladesh and India

Contract No. DCI-ENV/2010/221-426



Baseline Report of 2011-2012

Funded by



Collective Action to reduce climate disaster risks and enhancing resilience of the vulnerable coastal communities around the Sundarbans in Bangladesh and India

July 2013

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Project implemented and data collected by staff of DRCSC, NRM (Wetland) Team Written by Prof. Mainak Mukherjee in association with Malabika Roy Data compiled by Mr. Somnath Mitra Photos by members of NRM (Wetland) Team & Field Staff, DRCSC Designed by Abhijit Das, DRCSC

Published by

Development Research Communication and Services Centre 58A Dharmotala Road, Bosepukur, Kasba, Kolkata 700 042 Phone : 033 2442 7311, 2441 1646, e-mail : drcsc.ind@gmail.com Website : www.drcsc.org

ACKNOWLEDGEMENT

We would like to express our deepest appreciation for all those who made it possible to complete this report. Our special gratitude to Prof. Mainak Mukherjee for writing, Mrs. Malabika Roy for working as an associate and Mr. Somnath Mitra for the compiling of this report. Our sincere gratitude to all the villagers and Panchayat representatives of the study area for extending their support and cooperation for the baseline survey. We are also grateful to the surveyors for taking immence pains to travel through the villages to collect the valuable data. We are thankful to all the associate project & field staffs for their continuous assistance. We sincerely convey heartfelt gratitude to BCAS, Bangladesh for guiding us in the whole process. We are also grateful to DRCSC's Production & Publishing team, for helping in designing & publishing the report.

FOREWORD

Sunderbans, the largest mangrove forest in the world with associated flora and fauna diversity, is presently under threat due to many adverse changes including climate change factors. Mangrove forest ecosystems are already characterised by a low level of development, lack of infrastructure, prevalence of extreme poverty, high unmet energy demand and high incidence of vector and water borne diseases. The assessments of natural and anthropogenic changes in this sensitive ecosystem of Sunderbans clearly bring out certain trends, which are expected to continue in future and make the system more vulnerable. Therefore, it needs to be addressed with due importance and on emergency basis.

Considering the above scenario the CCDRER project envisages to reduce climatic disaster risks and enhance resilience of the coastal communities around the Sundarbans by building capacity of the vulnerable communities, local actors and stakeholders through sustainable natural resource management and disaster risk reduction for promotion of livelihoods as well as by advancing community adaptation to climate change. Therefore, it becomes imperative to identify community needs and priorities to address the climate change impacts as well as to reduce the associated risks and vulnerability. The baseline survey has been the primary requisite to understand the present state of the community. It will not only help us to access some numeric information about the project area but also help us to plan for better implementation and assess the progress as well.

The report has highlighted some key areas based on the objectives of this project such as livelihoods, demographic structure, vulnerability etc. For example most of the targeted communities have diversified livelihood strategies with major focus on agriculture, agricultural labour, non-agricultural labour for men and household work for women. Communities were found to be highly dependent on the Sunderbans; the dependency is evident in income generation activities, fire wood collection, honey collection etc. and most importantly almost all the targeted households can anticipate that climate is changing and that the intensity of different natural hazards would change in the near future.

Somjita Chakraborty Secretary, DRCSC

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Executive Summary

The detailed finding of the baseline study is presented in 8 separate chapters; some of the key highlights of the study are as follows:

- Majority of the targeted population were found to be illiterate and/or can sign only, which we address here as almost illiterate.
- Target communities have diversified livelihood strategies with major focus on agriculture, agricultural labour, non-agricultural labour for men and household work for women.
- Most of the surveyed households have thatch or tin shaded houses; households have more daily
 essential goods in their houses than luxury goods.
- Over three-fourth of the surveyed households are living below poverty status.
- The incidence of indebtedness is rampant in these regions. Moreover, nearly 24-25 p.c. indebtedness is still lying with informal sector. 45-58 p.c. of loans are supplied by institutional agencies such as banks and 18-30 p.c. of loans are semi-formal such as loans from *samitis* formed by NGOs.
- The surveyed household members were found to be highly dependent on the Sunderbans; the dependency is evident in income generation activities, fire wood collection, honey collection etc. Average number of months in a year for which people depend on Sunderbans has been estimated as 4(four). On an average 25-30 p.c. of family income has been observed to have originated from Sunderbans.
- Access to fresh water (for drinking and chores) is limited for the targeted households and females are more involved in collection of water from different sources.
- The surveyed households are exposed to various types of natural and climate induced hazards which create adverse impact on household's food security.
- The respondents were found to have moderate understanding of the concept of weather and climate change.
- Almost all the targeted households can anticipate that climate is changing and the intensity of different natural hazards would change in the near future.
- The targeted households do not have proper future strategies for water and sanitation, livelihoods, shelter and health sectors to cope with or to adapt to climate induced change.
- Roughly half of the targeted respondents have received some assistance after disaster in the recent
 past; among those who have received support, received it from NGOs and government.
- Almost all women members of targeted households are not involved in any DRR related institutions; and women are mostly not encouraged by their household to participate in such forums.
- Almost half of the targeted women members of household do not go to shelter upon receipt of early warning due to various reasons including space constraints, poor communication facilities and inadequate space for women, improper sanitation, and lack of space for animals. Women's

contribution in family income varies widely across the regions. The major sources of women's income are selling of fry, selling of vegetables and income from daily wage labour.

It is worthy to mention here that the above presented list is neither comprehensive nor it intends to be; the mere reason for providing this is to provide a quick understanding about different dimensions of the surveyed households.





CHAPTER ONE

Demographic Profile

1.1.	a: Age	wise	Distribution	of Ho	useholds	Members

			Study Area			
(Year)	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Up to 4	7	5	8	7	7	7
5-14	24	19	22	24	22	22
15-30	31	32	30	31	33	31
31-45	21	22	15	21	17	19
46-60	10	14	20	10	8	12
61+	7	8	5	7	13	8
Total	100	100	100	100	100	100

Chart1. 2 : Age-wise distribution of population in Hingalgaunj



Chart1. 3 : Age-wise distribution of population in Sandeskhali



3



Chart1. 4 : Age-wise distribution of population in Sandeskhali 1

Table 1.1. b : Age-Sex Distribution of Households Members

_		Study Area														
Age-	BASANTI			HINGALGUNJ			PATH/	AR PR	ATIMA	SAND	ESHK	(HALI I	SAND	ESHK	HALI II	All
Group	М	F	Total	М	F	Total	М	F	Total	М	F	Total	М	F	Total	Total
Up to 4	4	3	7	3	2	5	4	4	8	4	3	7	5	2	7	7
5-14	11	13	24	12	7	19	12	10	22	11	13	24	12	10	22	22
15-30	15	16	31	17	15	32	20	10	30	15	16	31	17	16	33	31
31-45	10	11	21	11	11	22	10	5	15	10	11	21	7	9	17	19
46-60	5	5	10	5	9	14	8	12	20	5	5	10	3	5	8	12
61+	4	3	7	3	5	8	2	3	5	4	3	7	7	6	13	8
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

From our first hand experience we can accept the working population for these regions to belong in the age group of 5-60 yrs. Work force is constituted by population within the age group of 5-60 years. It is true that the children belong to the age less than 14 years should be treated as child-labour and ethically as well as legally they should not be considered in the work force category. However the hard reality compelled them act as agent to supplement the family income. Again persons belong to the age group of 61 and above may be exempted from working population because of the general physical inability that are quite natural for the undernourished mass of the regions. Given this back drop we may be allowed to consider persons in the age-group of 5-60 years as income earners. It is observed from the surveyed population the dependent population (belong to less than 5yrs and more than 60yrs) is around 13p.c to 14 p.c in all regions except Sandeskhali I where it is around 20 p.c. No significant variation in the age-wise distribution exists across the sexes.Chart:1 depicts this.

Within the surveyed household age group wise sex distribution reveals some interesting features. In present day "Development Studies" Female-Male Ratio (FMR) is used as an important tool to explain the gender issues in the society. As expected, the F.M.R (800) is biased in favour of male for children below four years of age, taking all five regions taken together. However there exists wide variation across the regions in this age group, F.M.R appears to be maximum (1000) as well as ideal in Pathar Pratima. While F.M.R registered lowest value (as low as 400) in this age group in Sandeshkhali II. In the age group of 15yrs-14yrs this F.M.R is 1104 may be because of already established biological reasons. In the age groups of 15yrs-30yrs and 31yrs-45yrs the F.M.R is slightly biased in favour of male population (869 & 979) in our study-area as a whole. However this ratio is in favour of female i.e. 1385 &1000 respectively in the age group. The following table would reveal some idea. In Basanti and in Sandeskhali F.M.R is relatively most favorable in almost all age groups except in the dependent groups i.e. in below five years and in above sixty years.

Table 1.1.c:

	Basanti	Hingalgaunj	Patharpratima	Sandeskhali I	Sandeskhali II	All
Less than 4yrs	750	667	1000	750	400	800
5yrs-14 yrs	1182	584	833	1182	833	1104
15 yrs-30yrs	1067	882	500	1067	941	869
31yrs-45yrs	1100	1000	500	1100	1286	979
46yrs-60yrs	1000	1800	1500	1000	1667	1385
Above 60yrs	750	1667	1500	750	857	1000

Table 1.1.d : Educational Status of Households Members

	Percentage											
Educational Status	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All						
Illiterate	41	29	26	41	29	33						
Can sign only	13	23	23	11	23	19						
Can read and write only	16	13	15	19	13	15						
Primary	4	3	3	4	3	4						
Primary school pass	8	15	15	5	15	12						
Secondary	13	9	9	14	9	11						
Secondary school pass	3	5	6	3	5	4						
SSC pass	0	0	1	0	0	1						
HSC pass	1	1	1	1	1	1						
Bachelor and above	0	1	1	0	1	1						
Total	100	100	100	100	100	100						

 Table 1.1. e : Educational Status of Households Members by Gender

	Percentare																	
							DATU		Jennage	0.4.1		~	0.4.110	501114				
	DASANTI		N I I	HINGALGUNJ		PATH	PATHAR PRATIMA		SANDESHKHALIT		SANDESHKHALI II							
	M	F	Total	M	F	Total	Μ	F	Total	M	F	Total	M	F	Total	М	F	Total
Illiterate	17	24	41	15	14	29	12	14	26	17	24	41	15	14	29			
Can sign only	7	6	13	13	10	23	13	10	23	5	6	11	13	10	23			
Can read and write only	9	7	16	8	5	13	10	5	15	12	7	19	8	5	13			
Primary	2	2	4	3	0	3	3	0	3	2	2	4	3	0	3			
Primary school pass	5	3	8	10	5	15	10	5	15	2	3	5	10	5	15			
Secondary	8	5	13	5	4	9	5	4	9	9	5	14	5	4	9			
Secondary school pass	1	2	3	3	2	5	4	2	6	1	2	3	3	2	5			
SSC pass	0	0	0	0		0	0	1	1	0	0	0	0	1	1			
HSC pass	0	1	1	1		1	1		1	0	1	1	1		1			
Bachelor and above	0	0	0	1		1	1		1	0	0	0	1		1			
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100			

Illiteracy is rampant in our study area and it varies substantially between 41 p.c. (in Basanti as well as in Sandeskhali I) and 26 p.c. in (Patharpratima) while in Hingalgaunj and Sandeskhali II it is 26 p.c., Persons who can sign only their name can also be considered as almost illiterate. Their percentage share in total population is also very substantial. In fact it varied between 11 p.c. (in Sandeskhali I) to 23 p.c. (in Hingalgaunj, Patharpratima and Sandeskhali II). In Basanti it is also13 p.c. On the other extreme it is found in all five regions separately only 1 p.c. of surveyed population have crossed the higher secondary level. In Basanti and Sandeskhali I we found no persons having graduation degree, however in Hingalgaunj, Patharpratima and Sandeskhali II, the study found 1 p.c. of surveyed population with a bachelor degree.

If we club **illiterate** and **almost illiterate** (who can sign only) in to a single bracket then we could found that its incidence is relatively higher among male in all most all regions except Basanti (where it is 24 p.c. for male and 30 p.c. for female) and Sandeskhali (22 p.c. among male and 30p.c. among female). In all other three regions incidence of illiteracy including almost illiteracy is relatively greater among male than that of female. However percentage of population crossed the primary level is consistently higher among the male. It is further interesting an observation that no female graduate has been found in our study area.. This implies that spread of formal education is not only insignificant in our study area but also significantly gender biased in favour of male.

Main	Percentage											
Occupations	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All						
Agriculture	8	27	22	8	27	18						
Agro labor	18	12	10	18	12	14						
Non agro labor	23	14	12	23	14	17						
Share cropper	0	9	7	0	9	5						
Household work	24	1	1	24	1	10						
Service	0	19	15	0	19	11						
Business	0	0	1	0	0	0						
Rickshaw/van puller	0	1	3	0	1	1						
Fishing	0	6	7	0	6	4						
Shrimp fry collection	2	2	2	2	2	2						
Fry business	12	1	2	12	1	6						
Shrimp culture	0	0	1	0	0	0						
Fish culture	0	3	4	0	3	2						
Fish business	1	0	2	1	0	1						
Poultry/duck rearing	1	1	1	1	1	1						
Bawali	0	0	2	0	0	0						
Crab collection	0	3	3	0	3	2						
Crab culture	0	0	0	0	0	0						
Nursery	0	0	0	0	0	0						
Other	10	0	5	10	0	5						
Total	100	100	100	100	100	100						

Q1.	.1.f	÷	Main	Осси	pations	of	House	holds
~			mann	0000	pationo	01	1100000	noido

As a whole for the entire study area 'agriculture', 'non-agricultural labour', 'agricultural labour', 'service 'and 'household labour' comes serially as **main occupation** category. However the relative importance of these categories varies widely across the regions. As **main occupation 'agriculture'** comes first in three regions namely Hingalgaunj (27 p.c.), Patharpratima (22 p.c.) and Sandeskhali II (27 p.c.). But **'household work'** registered first position in **main occupation** in Basanti (24 p.c.) and Sandeskhali I (24 p.c.). The second position in **main occupation** is occupied by **'non-agricultural labour** in Basanti (23%) and Sandeskhali I (23%), by '**Service sector**' in Hingalgaunj (19%), Patharpratima (15%) and Sandeskhali II(19%). Third **main occupation** is recorded by '**agricultural labour'** in Basanti (18%) and in Sandeskhali (18%) and by 'agricultural labour' in Hingalgaunj (14%), Patharpratima (12%) and in Sandeskhali (18%) and by 'agricultural labour', 'non- agricultural labour' service' and 'household work' constitute the major categories of Primary occupation work in all five regions. In fact if they are taken together their combined share will vary within 67 p.c. (Patharpratima) to 82 p.c. (Hingalgaunj & Sandeskhali II), in Basanti and Sandeskhali their combined share is 73 p.c. Chart: 1.5 to Chart: 1.10 will give us a pictorial impression of this.

	Percentage																	
	В	ASAN	TI	HIN	GALG	UNJ	PATHA	R PR	ATIMA	SAND	ESHKH	IALI I	SANDESHKHALI II		All		.II	
	М	F	т	М	F	т	М	F	т	М	F	Т	М	F	т	М	F	т
Agriculture	58	13	8	13	13	27	20		20	58	13	8	13	13	27			18
Agro labor	121	49	18	9	3	12	15		15	121	49	18	9	3	12			15
Non agro labor	197	19	23	10	4	14	15		15	197	19	23	10	4	14			18
Share cropper	1	2	0	8	2	9	3		3	1	2	0	8	2	9			5
Household work	12	211	24	1	0	1	15		15	12	211	24	1	0	1			13
Service	0	0	0	0	19	19	9		9	0	0	0	0	19	19			10
Business	3	0	0	0	0	0	6		6	3	0	0	0	0	0			1
Rickshaw/van puller	4	0	0	1	0	1	1		1	4	0	0	1	0	1			1
Fishing	12	7	2	1	4	6	1		1	12	7	2	1	4	6			3
Shrimp fry collection	24	87	12	2	0	2	1		1	24	87	12	2	0	2			6
Fry business	2	0	0	0	1	1	5		5	2	0	0	0	1	1			1
Shrimp culture	0	0	0	0	0	0	2		2	0	0	0	0	0	0			0
Fish culture	4	1	1	0	3	3	1		1	4	1	1	0	3	3			2
Fish business	1	0	0	0	0	0	1		1	1	0	0	0	0	0			0
Poultry/duck rearing	1	9	1	1		1	1		1	1	9	1	1		1			1
Bawali	0	0	0	0		0	4		4	0	0	0	0		0			1
Crab collection	1	2	0	3		3			0	1	2	0	3		3			1
Crab culture	0	0	0			0			0	0	0	0			0			0
Nursery	0	0	0			0			0	0	0	0			0			0
Other	46	45	10			0			0	46	45	10			0			4
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100			100

Table 1.1.g: Main Occupations of Households Members by Gender

In all five regions **'agriculture'** constitutes the most important **'Secondary Occupation'**. However it varies slightly across the regions, in Basanti and Sandeskhali its share is highest 65p.c. while the corresponding share in Hingalgaunj and Sandeskhali 1 is lowest, 54p.c. **Shrimp collection** has been registered as the next important secondary occupation in all five regions and approximately 19 p.c. of the work-force are normally engaged in this working category except in Patharpratima where the corresponding share is slightly less (15 p.c.).Nearly 10 p.c. of work force have taken 'non-agricultural labourer' as their secondary occupation in all five regions.

It is observed in our study area that a large number active population is not engaged in employment. In Basanti and Sandeskhali I, only seventy-five person of active population are employed. In Patharpratima it is lowest; only 50 p.c. active household members are engaged. In Hingalgaunj and Sandeskhali II such percentage share is approximately 67. p.c.



Main			Percer	ntage		
Occupations	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALII	SANDESHKHALI II	All
Agriculture	3	35	32	3	35	22
Agro labor	22	7	5	22	7	12
Non agro labor	13	11	14	13	11	12
Share cropper	0	8	7	0	8	5
Household work	24	8	7	24	8	14
Service	0	0	1	0	0	0
Business	0	0	1	0	0	0
Rickshaw/van puller	0	3	2	0	3	2
Fishing	4	7	7	4	7	6
Shrimp fry collection	24	1	1	24	1	10
Fry business	0	0	1	0	0	0
Shrimp culture	0	9	10	0	9	6
Fish culture	1	1	1	1	1	1
Fish business	0	0	1	0	0	0
Poultry/duck rearing	4	1	1	4	1	2
Bawali	1	1	1	1	1	1
Crab collection	1	0	0	1	0	0
Crab culture	0	0	1	0	0	0
Nursery	0	0	2	0	0	0
Other	er 2 7		5	2	7	5
Total	100	100	100	100	100	100

 Table 1.1.h: Secondary Occupations of Households Members

As a whole, as tertiary occupation the relative importance **agriculture**, **household work** and **shrimp collection** appeared as most important categories. However there exists, but some differences in inter regional distribution. Like main occupation and secondary occupation category, tertiary occupation categories also, '**agriculture'** plays a less importance in occupation distribution in Basanti and Sandeskhali I. This implies that '**agriculture'** may be due to soil and climatic reason is less feasible in these two regions. However for households heads agriculture receives highest priority in almost all regions except Sandeskhali II region for both main occupations as well as for secondary occupation.



ANNEXURE-I

Main	Percentage												
Occupations	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All							
Agriculture	3	56	50	3	5	24							
Agro labor	14	4	5	14	4	8							
Non agro labor	8	5	5	8	5	6							
Share cropper	0	6	8	0	6	4							
Household work	15	5	5	15	35	15							
Service	0	0	0	0	0	0							
Business	0	0	0	0	0	0							
Rickshaw/van puller	2	1	3	2	1	2							
Fishing	15	3	3	15	3	8							
Shrimp fry collection	25	4	4	25	4	12							
Fry business	0	0	0	0	0	0							
Shrimp culture	0	3	7	0	3	3							
Fish culture	2	0	0	2	0	1							
Fish business	0	10	10	0	4	5							
Poultry/duck rearing	11	0	0	11	0	4							
Bawali	3	0	0	3	0	1							
Crab collection	1	0	0	1	0	0							
Crab culture	0	2	0	0	2	1							
Nursery	0	0	0	0	0	0							
Other	2	0	0	2	28	6							

Table 1.1.i: Tertiary Occupations of Households Members

Table 1.1.j: Main occupations of Households Heads

Main	Percentage						
Occupations	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All	
Agriculture	47	52	52	47	4	40	
Agro labor	5	6	5	5	4	5	
Non agro labor	15	3	10	15	3	9	
Share cropper	16	3	16	16	3	11	
Household work	0	5	0	0	45	10	
Service	1	0	1	1	0	1	
Business	2	0	2	2	0	1	
Rickshaw/van puller	2	5	2	2	5	3	
Fishing	2	6	2	2	6	4	
Shrimp fry collection	4	4	4	4	4	4	
Fry business	1	0	1	1	0	1	
Shrimp culture	1	3	1	1	3	2	
Fish culture	2	0	2	2	0	1	
Fish business	2	10	2	2	4	4	
Poultry/duck rearing	0	0	0	0	0	0	
Bawali	0	0	0	0	0	0	
Crab collection	0	0	0	0	0	0	
Crab culture	0	2	0	0	2	1	
Nursery	0	0	0	0	0	0	
Other	0	0	0	0	15	3	
Total	100	100	100	100	100	100	

Secondary	Percentage							
Occupations	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
Agriculture	64	54	58	64	54	59		
Agro labor	0	0	0	0	0	0		
Non agro labor	10	10	10	10	10	10		
Share cropper	1	4	1	1	4	2		
Household work	0	0	0	0	0	0		
Service	0	0	0	0	0	0		
Business	0	0	0	0	0	0		
Rickshaw/van puller	0	4	0	0	4	2		
Fishing	0	0	0	0	0	0		
Shrimp fry collection	19	19	15	19	19	18		
Fry business	1	1	1	1	1	1		
Shrimp culture	1	1	1	1	1	1		
Fish culture	0	0	0	0	0	0		
Fish business	0	0	0	0	0	0		
Poultry/duck rearing	4	4	9	4	4	5		
Bawali	0	0	5	0	0	1		
Crab collection	0	0	0	0	0	0		
Crab culture	0	0	0	0	0	0		
Nursery	0	3	0	0	3	1		
Other	0	0	0	0	0	0		
Total	100	100	100	100	100	100		

Table 1.1.k: Secondary Occupations of Households Heads

Chart1.1: Age-wise distribution of population in Basanti



Chart1. 2: Age-wise distribution of population in Hingalgaunj







Chart1. 4: Age-wise distribution of population in Sandeskhali 1











Chart: 1.7: Distributions of Main Occupations in Hingalgaunj



Chart: 1.8: Distributions of Main Occupations in Patharpratima







Chart: 1.10: Distributions of Main Occupations in Sandeskhali 1





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CHAPTER TWO

Characteristics of Households

	Percentage							
Relationship	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
HHH (own)	6	5	5	6	5	5		
Wife	60	54	52	60	54	56		
Son	24	20	18	24	20	21		
Daughter	5	4	4	5	4	4		
Mother	1	3	4	1	3	2		
Father	40	1	4	0	2			
Brother	0	0	0	0	0	0		
Sister	0	0	0	0	0	0		
Sister in law	0	0	0	0	0	0		
Nephew	0	8	9	0	8	5		
Niece	0	1	1	0	1	1		
Grand son	0	1	1	0	1	1		
Grand daughter	0	0	0	0	0	0		
Others	1	4	5	1	4	3		
Total	100	100	100	100	100	100		

Table 2.1: Relationship of Respondents with Households Heads

Table 2.1 shows that most of the respondents are women and are wives in relationship with the household heads. The second highest number of respondents is sons in relationship with the household heads.

It is observed from the surveyed households that average number of active members per family is on an average four(4) In Basanti, Patharpratima and Sandeskhali I, however it is slightly less (three) in Hingalgaunj and Sandeskhali II. It is further observed that entire active population is not employed, in Basanti and Sandeskhali I average number of employed person per household is 3, i.e. 25 p.c. of active population per family is unemployed. In Patharpratima this rate of unemployment is highest (50 p.c.). In Hingalgaunj and Sandeskhali II such rate of unemployment among active population per family is 33.3 p.c. As whole for the entire study region unemployment rate is found to be nearly 50 p.c.

Table 2.2: Average Number of Active and Employed Person Per Household

	Study Area					
Type of land	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Average Number of Active Person Per Household	4	3	4	4	3	4
Average Number of Employed Person Per Household	3	2	2	3	2	2

 Table 2.3.a : Percentage Distribution of Household Owning Different Types of Land

Type of land	Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
Homestead	52	42	58	52	42	49		
Agriculture	10	15	10	10	15	12		
Garden	14	14	12	14	14	14		
Pond	10	10	6	10	10	9		
Shrimp gher	7	12	7	7	12	9		
Grave yard	0	0	0	0	0	0		
Fallow	4	4	4	4	4	4		
Others	3	3	3	3	3	3		

From table 2.3.a it is found that land for homestead occupied highest rank in the distribution of land for different purpose. For the entire surveyed region 49 p.c. of land is occupied for homestead. It is maximum in Patharpratima (58%) and minimum in Hingalgaunj & Sandeskhali II (both 42%). On an average 14 % of total land is distributed for garden, then comes agriculture, which on an average occupies only 12 % of total land. However some inter regional variation exist in this category. In Hingalgaunj and Sandeskhali II, it is 15 % where as in Basanti, Patharpratima and Sandeskhali I it is only 10%. Land for shrimp Gher is relatively higher in Hingalgaunj and Sandeskhali II.

Table 2.3.b: Average Land Size per Household

		In Decimal				
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Average Land Size Per Household	25	24	22	25	24	49.2

Our study reveals that average land holding is significantly low in our study area. In fact the average land holding in Bezant and Sandeskhali I is 25 decimal only, in Hingalgaunj and Sandeskhali II, the average land holding per household is even lower, 24 decimal only. The average land holding is lowest in Patharpratima (22 decimal). The much more interesting fact is the distribution of land across the different land use purpose. The lion's share of total land is occupied by "Homestead" (52% in Bezant and Sandeskhali I, 42% in Hingalgaunj and Sandeskhali II and58% in Patharpratima). The relative share of "agriculture" varies between 10% to 15%. This reveals why agriculture did not appear as a major occupation in this region. The share of pond& shrimp gher taken together occupies 13p.c. of total holding Patharpratima, 17p.c. in Bezant and Sandeskhali I and 22 p.c. in Hingalgaunj and Sandeskhali II.

Table 2.3.c : Average Land Size	e That was Shared out,	Shared in, Lease	d out and Leased i	n Per Household
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Type of land	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALII	SANDESHKHALI II	All	
Share out	8	10	8	8	10	9	
Share in	42	50	44	42	50	45	
Lease out	16	12	14	16	12	14	
Lease in	35	28	34	35	28	32	

It is further observed that, our surveyed household cultivates mainly others land, their operation holding exceeds their ownership holding, this is made possible mainly by leasing-in and sharing-in of others land

Table 2.3.d : Average	Number of Rooms Per Household
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Study Area						
Type of land	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Average Number of						
Rooms per household	2	2	3	2	2	

Average number of rooms per household in this area is two, and 90 p.c. of these houses are made of soil (mud), however there exist minor variation across regions. The presence of soil made houses is maximum in Basanti and Sandeskhali I (96%) and relatively less in Patharpratima. *Puckka* (concrete) construction is almost invisible in this region, 5% in Hingalgaunj and Sandeskhali II, 3% in Patharpratima and 2% in Basanti and Sandeskhali I. Walls are also made of soil in 68% to 73% of houses in this region. In 10% to 15% of houses walls are made of fences. Roofs are either made of '*Golpata*' (varies between 61 p.c. to 48p.c.) or 'Tin' (varies between 35p.c. to 42p.c.).In our surveyed area as a whole the walls of residential units are generally made of soil-mud (70 p.c.) or of fences (13 p.c.).

As a whole we can say that only six percent of the residential units in our surveyed region is made of concrete (*Puccka*), it is slightly higher (8p.c.) in Patharpratima and slightly less (6p.c.) in Basanti and Sandeskhali I. On an average 87 p.c. of residential units are thatched in our surveyed region however slight variation exists in inter regional distribution. In Basanti and Sandeskhali I it is relatively higher (91p.c.) and relatively less in Patharpratima (80p.c.).

ANNEXURE-II

	Study Area							
Structure of Floors	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
Soil	96	85	82	96	85	89		
Around brick and middle soil	2	10	15	2	10	8		
Pucca	2	5	3	2	5	3		
Wooden	0		0	0	0	0		
Total	100	100	100	100	100	100		

Table 2.5.a: Percentage of Housing by Floor Materials

Table 2.5.b : Percentage of Housing by Wall Materials

		Study Area					
Structure of Walls	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All	
Soil	73	68	70	73	68	70	
Tin	1	4	4	1	4	3	
Fence	12	15	10	12	15	13	
Wood	6	7	7	6	7		
Pucca	8	6	9	8	6		
Total	100	100	100	100	100	100	

Table 2.5.c: Percentage of Housing by Roof Materials

	Study Area						
Structure of Roofs	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All	
Straw	1	2	2	1	2	1	
Golpata	61	48	55	61	48	55	
Tin	38	42	35	38	42	39	
Pucca	1	8	8	1	8	5	
Total	100	100	100	100	100	100	





CHAPTER THREE

Income, Expenditure, Assets and Indebtedness of Households For consideration of household assets twenty-seven items were selected and enquired from household regarding their presence in the household. This discloses the extent of acute poverty in this region. Even aluminum cooking pots are available in 18p.c. to 30p.c. households across regions and aluminum food plates are available in only 7p.c. to 18 p.c. households. 'Agricultural tools', 'fishing gears' are almost absent in household assets. Assets like Rickshaw van or Normal boat are also not present in the asset of any households; however, they could play a crucial role in rural infrastructure. Radio /T.V. / Mobile phone could play a very important role in the spread of meteorological information related to the common mass. In our study area, these assets are almost absent in household.

In the preceding section we have observed that holding of landed asset is insignificant as well and this coupled with major unemployment (almost 50 p.c.) rate among active population has culminated in acute poverty which is reflected in the owning of household assets. In the subsequent section we shall be observing the income, expenditure and indebtedness of the households to identify the causes behind the insignificant asset base and incidence of poverty.

— (11	Study Area								
Type of Houses	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Pucca	4	6	8	4	6	6			
Semi pucca	4	5	10	4	5	6			
Tin	1	2	2	1	2	2			
Thatch	91	87	80	91	87	87			
Total	100	100	100	100	100	100			

Table 3.1.a : Percentage Distribution of Households by Type of Houses

		Study Area						
Type of Livestock	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
Cow	16	15	20	16	15	16		
Goat	16	20	16	16	20	17		
Poultry	56	55	56	56	55	56		
Duck	4	5	4	4	5	4		
Sheep	8	4	5	8	4	6		
Buffalo	0	1	0	0	1	0		

 Table 3.1.c : Average Number of Livestock Per Household

	Study Area								
Type of Livestock	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Cow	1	2	2	1	2	2			
Goat	1	2	2	1	2	2			
Poultry	2	3	3	2	3	3			
Duck	1	1	1	1	1	1			
Sheep	2	1	1	2	1	1			
Buffalo	0	0	0	0	0	0			

15-20 P.C. house hold has 'goat'& 'cow' and 55-56 p.c. of household have poultry livestock in our study area. However the average number of livestock appears to be too insignificant (1-2 cows, 1-2 goats &2-3 chicks) particularly in respect to the family size.

It is further revealed from the survey that majority of household leaves under acute poverty in all five regions. 79 p.c. of household in Basanti & Sandeskhali I, 82 p.c. in Hingalgaunj & Sandeskhali II and 75 p.c. in Patharpratima has annual income less than Rs. 3,000/- , 15 p.c. of household in Basanti & Sandeskhali I, 12p.c. of Hingalgaunj& Sandeskhali II and 20 p.c. of Patharpratima have annual income in the income bracket Rs. 3,000- Rs. 10,000. The rest belong to the income bracket Rs.10,000- Rs. 20,000. This implies the entire surveyed population is lying below the poverty line according to norms set by Government of India. Annual expenditure has also followed the identical distribution pattern as it followed in the case of Income.

It is found from the survey that there are four major sources of Income generation namely-sales proceed from vegetable produce (roughly 30 p.c.), cereal products (roughly 15 p.c.), shrimp culture(approximately 10 p.c.) and wage income from working as non-agricultural labour(10 p.c.).

The distribution of income as well as of expenditure compels us to believe that the incidence of indebtedness is rampant in these regions. It is found in the study that nearly 24-25 p.c. indebtedness is still lying with informal sector, constituted mainly by rural money lender; however a section of the respondent were hesitant in exposing the source of their informal credit may be because of the economic, social and political dominance of these money lenders in their day to day life. . 45-58p.c. of loans are supplied by institutional agencies such as banks and 18-30 p.c. of loans are semi-formal such as loans from *samitis* formed by NGOs.

Annual Income	Study Area								
(Rupees)	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
1-3000	79	82	75	79	82	79			
3001-10000	15	12	20	15	12	15			
11000-20000	6	6	5	6	6	6			
	0	0	0	0	0	0			
	0	0	0	0	0	0			
	0	0	0	0	0	0			
Total	100	100	100	100	100	100			

 Table 3.3 : Percentage Distribution of Households by Annual Income

Percentage Distribution of Households by Annual Income reveals that there exists no household having annual income more than Rs. 20,000/-. It is further revealed that on an average 79 p.c. of total households having annual income within Rs. 3,000/-, however that in Hingalgaunj and Sandeskhali II is 82p.c. The incidence of acute distress is relatively less in Patharpratima where 75p.c. of total households are within the income bracket of Rs. 3000/-. The poor income generation may be ascribed to the fact agriculture is poor and unstable in this region. Moreover, there exist no stable alternative opportunity for income generation. The major source of income generation appeared as sales proceed from vegetable (on an average 30p.c. of total income) in all five regions, however, there exists slight variation in its relative contribution. The second important source of income of the households is cereal crops(14p.c.) closely followed by non-agriculture labour(10p.c.) and shrimp culture(10p.c.). Other sources of income are almost absent in all five regions.

Table 3.3.a : Percentage Distrib	oution of Households by	/ Annual Expenditure
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Annual Income	Study Area							
(Rupees)	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
1-3000	82	80	75	82	80	80		
3001-10000	15	14	15	15	14	15		
11000-20000	3	6	10	3	6	6		
	0	0	0	0	0	0		
	0	0	0	0	0	0		
	0	0	0	0	0	0		
Total	100	100	100	100	100	100		

Distribution of annual expenditure in the surveyed areas show that nearly 80 p.c. of the total households having annual expenditure within Rs.3, 000/-, it is to be noted that the number of income earners in this income bracket was 79p.c. implying at least 1p.c. of total households in this income bracket are deficit in absolute terms and are obviously exposed to the trap of debt. In Basanti their numbers are relatively higher.

It is observed from table3.4 below that the major source loan for indebted households is Banks, on an average 50p.c. of total indebted households are getting their loans from the commercial banks, 25 p.c. of indebted households are getting their loan from quasi-institutional agencies such as NGOs/Samitis etc. Remaining 25 p.c. of indebted households has approached to non-institutional sources Like Mahajans and others. This observation, at the first impression, may create some confusion- firstly the percentage of house hold approaching informal credit appears to be too small; we have already provided a tentative explanation. It is the dominance of rural moneylenders in rural society that has influenced the respondents to not expose the exact source of the credit flow. Secondly when percentage share of household may be less it does not necessarily imply that percentage share of loan is also low.

		Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Bank	45	52	58	45	52	50			
NGO/Summitty	30	24	18	30	24	25			
Mohajan/Relatives/Friends	15	14	18	15	14	15			
Others	10	10	6	10	10	9			

 Table 3.4 : Percentage of Households Having Loan from Different Sources

Table 3.5 Percentage Distribution of Households by Wealth Status

Wealth Status			Area			
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Very poor	45	45	50	45	45	46
Poor	18	30	25	18	30	24
Middle class	35	15	20	35	15	24
Upper middle class	2	10	5	2	10	6
Rich	0	0	0	0	0	0
Total	100	100	100	100	100	100

Referring Income and Expenditure and distribution of household wealth (Table: 3.5), we can conclude that on an average forty-six percent of total household are extremely poor, the extent of extreme poor is highest in Patharpratima, nearly 50 p.c. of total house hold belonged to this category. The 'poor' category comes next in the ascending order, in our study area, on an average nearly 24 p.c. of household belonged to this category ,however, in Hingalgaunj and Basanti II, they are roughly 30 p.c. The presence of middle class has been estimated as 24 p.c. in our study area, though its distribution is not even throughout the study area, it is relatively higher in Basanti and Basanti I (35 p.c. each) and relatively lower in Hingalgaunj and Basanti II(15 p.c. each). In this context it is to be noted that this middle class group in Sunderbans area is in no way comparable to that in urban area , not even to middle class of rural areas of other parts of Bengal.

ANNEXURE-III

	Study Area									
Structure of Floors	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All				
Bed	13	16	18	13	16	15				
Table	4	5	4	4	5	4				
Chair	1	2	1	1	2	1				
Almery	3	2	1	3	2	2				
Aluminum cooking pots	30	18	20	30	18	23				
Aluminum plates	18	7	10	18	7	12				
Mobile phone	1	2	1	1	2	2				
Radio	1	2	1	1	2	1				
TV	0	1	0	0	1	1				
Clock	0	1	0	0	1	1				
Cycle	2	5	8	2	5	4				
Motor cycle	0	1	0	0	1	0				
Nirani	1	2	1	1	2	1				
Plough	0	0	1	0	0	0				
Power tiller	0	0	1	0	0	0				
Shallow tube well	0	1	0	0	1	0				
Marai machine	1	2	1	1	2	2				
Rice mill	0	1	0	0	1	0				
Spray machine	0	1	0	0	1	0				
Sewing machine	0	5	8	0	5	4				
Fishing gear	6	9	10	6	9	8				
Normal boat	0	1	0	0	1	1				
Pulling van	0	1	0	0	1	0				
Rickshaw/van	0	1	0	0	1	0				
Trees	16	8	9	16	8	11				
Ornaments	2	5	4	2	5	3				
Others	1	2	1	1	2	2				

 Table 3.1 : Percentage of Households Owning Different Types of Assets



	Study Area								
Source of Income	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Cereal crops	15	18	15	15	18	16			
Vegetables	29	20	29	29	20	25			
Fruits	4	4	4	4	4	4			
Other agricultural crops	5	5	5	5	5	5			
Agro labor	1	1	1	1	1	1			
Non agro labor	10	15	10	10	15	12			
Poultry/duck	2	2	2	2	2	2			
Livestock	1	1	1	1	1	1			
Fish culture	2	2	2	2	2	2			
Shrimp culture	10	12	10	10	12	11			
Crab fattening	1	1	1	1	1	1			
Tree nursery	0	0	0		0	0			
Fry nursery	2	2	2	2	2	2			
Share out	0	0	0	0	0	0			
Hari	0	0	0	0	0	0			
Fishing	3	3	3	3	3	3			
Crab collection	2	2	2	2	2	2			
Shrimp fry collection	0	0	0	0	0	0			
Honey from Sundarban	1	1	1	1	1	1			
Wood from Sundarban	1	1	1	1	1	1			
Goalpata	0	0	0	0	0	0			
Other Sundarban	2	2	2	2	2	2			
resources									
Rickshaw/van pulling	1	1	1	1	1	1			
Service	0	0	0	0	0	0			
Small business	2	2	2	2	2	2			
Business	2	2	2	2	2	2			
Remittance	0	0	0	0	0	0			
Others	4	3	4	4	3	4			

Table 3.2 : Percentage of Households Having Income from Different Sources



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Source of Income	Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
Cereal crops	14	15	12	14	15	14		
Vegetables	30	29	34	30	29	30		
Fruits	2	4	5	2	4	3		
Other agricultural crops	5	5	4	5	5	5		
Agro labor	2	1	2	2	1	2		
Non agro labor	10	10	9	10	10	10		
Poultry/duck	2	2	1	2	2	2		
Livestock	1	1	2	1	1	1		
Fish culture	3	2	1	3	2	2		
Shrimp culture	10	10	9	10	10	10		
Crab fattening	1	1	2	1	1	1		
Tree nursery	0	0	1	0	0	0		
Fry nursery	2	2	2	2	2	2		
Share out	0	0	1	0	0	0		
Hari	0	0	1	0	0	0		
Fishing	3	3	0	3	3	2		
Crab collection	2	2	2	2	2	2		
Shrimp fry collection	0	0	1	0	0	0		
Honey from Sundarban	1	1	0	1	1	1		
Wood from Sundarban	1	1	2	1	1	1		
Goalpata	0	0	0	0	0	0		
Other Sundarban								
resources	2	2	0	2	2	2		
Rickshaw/van pulling	1	1	2	1	1	1		
Service	0	0	1	0	0	0		
Small business	2	2	3	2	2	2		
Business	2	2	0	2	2	2		
Remittance	0	0	0	0	0	0		
Others	4	4	3	4	4	4		
Total	100	100	100	100	100	100		

 Table 3.3.b : Percentage of Income from Different Type of Income Sources





CHAPTER FOUR

Dependency on Sunderbans

Table 4.1.a : Livelihood Depends on Sur	derbon Assets
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	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All	
Average month	4	5	2	4	5	4	
depends on Sundarban in a year							
Average member to collect Sundarban's assets	2	3	2	2	3	2	
Average percentage of income come from Sundarban	28	25	30	28	25	27	

Dependency on Sunderbon:

Table 4.1.a : Livelihood Depends on Sunderbon Assets

	Study Area					
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Average month depends on Sundarban in a year	4	5	2	4	5	4
Average member to collect Sundarban's assets	2	3	2	2	3	2
Average percentage of income come from Sundarban	28	25	30	28	25	27

Economic dependence of these regions on Sanders can be established from various corners. Average number of months in a year for which people depends on Sanders has been estimated as 4(four) months. However this dependence is not unique across the regions. It is minimum in Patharpratima (2 months) and maximum in Hingalgaunj & Basanti II (5 months). Sanders provides honey, firewood, and many other minor forest produce, villagers collect these to supplement their family income. It is observed from the study that average number of collectors from a family varies between 2 (in Basanti, Hingalgaunj and Basanti I) to 3(Patharpratima and Basanti II). On an average 25-30 p.c. of family income has been observed to be originated from Sanders.

78 p.c. to 80 p.c. of respondent on enquiry recorded their support for restricting the entry in Sunderbans for protection and development of Sunderbans's bio-diversity. However in Hingalgaunj and Basanti relatively lesser percentage of households prefers to restrict the entry in Sunderbans (78p.c.) may be because of their greater dependence on Sunderbans for their livelihood, as matter of fact they depends normally 5 months in a year from Sunderbans. To ensure the reduction of dependence on Sunderbans the respondents revealed their preference for alternative income generating activities. As first choice they prefer to have jobs of **daily labour** (10 15 p.c. of household) **business** (13 -15 p.c. of household), **cultivation** (13 -14 p.c.) '*Jory hand-work'* (10 -14 p.c.) and **poultry farm** (5 p.c.).

Table 4.1.b : Percentage Distribution of Households by According to Support for Restricting Entrance in Sunderbon for
Protection and Development on Sunderbon's Biodiversity

	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All	
Yes	80	78	80	80	78	79	
No	20	22	20	20	22	21	
Total	100	100	100	100	100	100	

 Table 4.2.a: Percentage Distribution of Households by Type of First Choice of Alternative Job to Reduce Dependence on Sunderbon

	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All	
A DAILY LABOUR	13	14	10	13	14	13	
BUSINESS	13	14	15	13	14	14	
CATCHING FISH							
IN RIVER	8	7	8	8	7	8	
CUITIVATION	13	14	13	13	14	4	
PULLING RICKSHAW	3	4	3	3	4	4	
FISHARY	5	4	5	5	4	5	
HARD WORK	9	10	9	9	10	10	
LIVELSTOCK	1	1	1	1	1	1	
PERMANENT WORK	3	2	3	3	2	3	
PLANTATION	3	2	3	3	2	3	
POULTRY	5	4	5	5	4	5	
SMALL BISINESS	12	10	13	12	10	11	
WORK FOR JORI	10	14	10	10	14	12	
Total	100	100	100	100	100	100	

As second choice of alternative income generating activity they prefer to have **Business** (14p.c.) ,**poultry** (12p.c.), **Jori hand work** (10p.c.) and **fishery** (9p.c.). As third preferences they revealed their preferences on **Small business** (15 p.c.) **Jory works** (13p.c.), **Livestock** (13p.c.) **Fishery** (11p.c.)

 Table 4.2.b : Percentage Distribution of Households by Type of Second Choice of Alternative Job for Dependable

 Families on Sandersan

	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All	
A DAY LABOUR	8	8	10	8	8	8	
BUSINESS	16	12	15	16	12	14	
CATCHING FISH IN RIVER	8	8	8	8	8		
CUITIVATION	5	4	5	5	4	5	
PULLING RICKSHAW	5	4	5	5	4	5	
FISHARY	10	8	10	10	8	9	
HARD WORK	7	9	7	7	9	8	
LIVELSTOCK	6	6	6	6	6	6	
PERMANENT WORK	5	5	5	5	5	5	
PLANTATION	3	3	3	3	3	3	
POULTRY	10	15	10	10	15	12	
SMALL BISINESS	7	7	7	7	7		
WORK FOR JORI	10	11	8	10	11	10	
TOTAL	100	100	100	100	100	100	

	Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI	II All		
A DAY LABOUR	5	8	5	5	8	6		
BUSINESS	5	4	5	5	4	5		
CATCHING FISH IN RIVER	10	12	10	10	12	11		
CUITIVATION	7	5	7	7	5	6		
PULLING RICKSHAW	6	5	6	6	5	6		
FISHARY	5	2	5	5	2	4		
HARD WORK	3	1	3	3	1	2		
LIVESTOCK	10	15	15	10	15	13		
PERMANENT WORK	7	6	7	7	6	6		
PLANTATION	10	4	6	10	4	7		
POULTRY	8	5	8	8	5	7		
SMALL BISINESS	16	15	12	16	15	15		
WORK FOR JORI	8	18	11	8	18	13		
Total	100	100	100	100	100	100		

 Table 4.2.c : Percentage Distribution of Households by Type of Third Choice of Alternative Job for Dependable Families on Sunderbon





CHAPTER FIVE

Project related information
Cooking and Access to Electricity:

It is observed from the observed data that the bio-gas plant is not in use in either of the areas. Not only that the use of improved cooker is almost negligible in our study area, in fact it is totally absent in Hingalgaunj, Basanti I and Basanti II. In Patharpratima (1p.c.) and in Basanti (5p.c.) its presence just felt. Moreover use of electricity is almost negligible in our study area. Access to electricity is highest in Patharpratima, in fact, in this region only 9 p.c. of total household enjoy electrical access. This is 6 p.c. in Basanti and 2p.c. in Hingalgaunj and 1.5p.c. in Basanti II. Basanti is yet to get the access of electricity among our surveyed household. Use of electrical accessories is not discussed here because of scanty use of electricity.

Table 5.1 : Percentage Distribution of Households by Availability of Biogas Plant

Availability of Biogas Plant	Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
Yes	0	0	0	0	0	0		
No	100	100	100	100	100	100		
Total	100	100	100	100	100	100		

Table 5.2 : Percentage Distribution of Households According to Use of Improved Stove for Cooking

Use of Improved Stove	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Yes	5	0	1	0	0		
No	95	100	99	100	100		
Total	100	100	100	100	100		

 Table 5.3 : Percentage Distribution of Households According to Access to Electricity

A	Study Area							
Access to Electricity	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Yes	6	02	9	0	1.5			
No	94	98	91	100	98.5			
Total	100	100	100	100	100			

Trees:

In a rural society from the view point of economy as well as from ecology particularly in place like Sunderbans, tree plays a crucial role in the livelihood of its residents. Our survey reveals that 52 percent of the surveyed household has trees of Timber variety in their premises. 18 percent of such households have trees of fruit variety. But presence of Mangrove, ecologically most important in this delta region is relatively low. In fact on an average 10 percent of surveyed households have mangrove trees in their premises. Medicinal plant and Bamboo are very important from the view point of economy but they are observed to be less popular in our survey region. Table: 5.4 would give us a clearer picture. Average number of different types of trees per family is not very significant as is shown in Table: 5.4a. This may be because number of trees in the premise of those who are holding appears to be very small that caused average no of trees per family is closely approximately zero.



Project related information

	Study Area								
Type of Trees	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Timber	51	54	48	51	54	52			
Fruits	20	15	18	20	15	18			
Mangrove	9	11	10	9	11	10			
Bamboo	4	4	15	4	4	6			
Total	100	100	100	100	100	100			

Table 5.4: Percentage of Households Having Different Type of Trees

Table 5.4.a : Average Number of Different Type of Trees per Household

	Study Area								
Type of Trees	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Timber	0	0	1	0	0	0			
Fruits	2	2	2	2	2	2			
Mangrove	0	0	0	0	0	0			
Medicinal	0	0	0	0	0	0			
Bamboo	2	2	2	2	2	2			
Others	2	4	3	2	4	3			

Nursery:

It is observed from the survey that on an average 86 percent of households having Nursery and its distribution is almost even, in Basanti and Sandeskhali I 88 p.c. of households have Nursery while that in Hingalgaunj and Sandeskhali II is 84 percent. It is further observed that 55 percent of households have Timber plant, 22 percent has fruit plant and only 8 percent has mangrove plant in their nursery. Inter region variation may be observed table: 5.5a Table: 5.5b shows the average number of plants per household in different regions, this appears to be very insignificant.

Table 5.5.a : Percentage of Households Having Different Type of Plants

	Study Area								
Type of Trees	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Timber	51	57	58	51	57	55			
Fruits	20	25	25 22 20		25	22			
Mangrove	9	7	8	9	7	8			
Medicinal	8	7	6	8	7	7			
Bamboo	4	4	6	4	4	4			
Others	8	0	0	8	0	3			
Total	100	100	100	100	100	100			

Table 5.5.b : Average Number of Plants Per Household

	Study Area								
Type of Trees	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Timber	0	-	1	0	0	0			
Fruits	2	2	2	2	2	2			
Mangrove	0	-	0	0	0	0			
Medicinal	0	-	0	0	0	0			
Bamboo	2	1	2	2	1	2			
Others	2	2	2	2	2	2			

Crab Culture:

Sunderbans has a very conducive environment where crab culture can be highly productive. Popularity of crab culture among the surveyed household is well established, in fact on an average, 85 percent of surveyed households are started practicing crab culture. The popularity of this is relatively higher in Basanti and Sandeskhali

(90 p.c. each) and relatively lesser in Patharpratima (78 p.c.).However crab-culture has yet to be economically meaningful in their livelihood. As a matter of fact average production crab per household appears to be as low as 17 k.g. Possibly lack of a stable market hindered its economic valuation as reflected in Table: 5.6.b. Possibly entire crab collected by villagers are used in domestic consumption may be because of lack of sufficient marketing infrastructure.

Bee-Culture:

Practice of 'Bee-culture' has not been sufficiently popularized in these regions. In Patharpratima only 8p.c. of household are engaged in 'Bee-culture', in other regions this is still less popular. In Basanti and Sandeskhali I only 1p.c. of total household are engaged in this practice. This is revealed from Table: 5.7

	Study Area							
Bee Culture	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All		
Yes	1	4	8	1	4	4		
No	99	96	92	99	96	96		
Total	100	100	100	100	100	100		

Table 5.7 : Percentag	e Distribution	of Households	According to Bee	e Culture
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Saline Tolerant Crops and Vegetable Production:

The delta region is highly exposed to the soil salinity mainly due to frequent water surge from sea. Soil salinity is a perpetual problem in this area and is bigger constraint to agriculture. To combat this problem, saline tolerant cultivation needs to be spread and made popular. But unfortunately, the spread appears to be too insignificant. In Basanti & Sandeskhali I region only 24 p.c. of household cultivates saline tolerant crops and vegetable. In Hingalgaunj it further less, only 16 p.c during our survey, households were asked whether they are practicing saline tolerant crops and vegetables, it is observed from their reply that on an average 81 percent of them are yet to start practicing cultivation of saline tolerant crops and vegetables and only 19 percent appear with affirmative answers. Table: 5.8. Shows the inter-region variation in this. One of the possible reasons behind this may be due to the less dependency on agriculture which is once again may be explained by the size of land holding for the purpose of agriculture.

Table 5.8 : Percentage Distribution of Households According to Saline Tolerant Crops and Vegetables

		Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Yes	24	16	14	24	16	19			
No	76	84	86	76	84 8	81			
Total	100	100	100	100	100 1	00			

Saline Tolerant Fish Culture:

The water bodies of this delta region are also highly exposed to salinity due to the climatic condition that we have stated above, naturally practice of saline tolerant fish culture is as crucial as saline tolerant agriculture. Naturally we have also enquired households whether are started practicing this sort of fish culture. It has come out from their answer that nearly 86 percent of households have not yet started this short of practice. This ignorance is quite high in the areas like Hingalgaunj and Sandeskhali 1 (90 p.c. each). Further details in this aspect may be observed from Table 5.9

Table 5	.9 :	Percentage	Distribution	of Households	According to	Saline	Tolerance	Fish	Culture

		Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All			
Yes	15	10	20	15	10	14			
No	85	90	80	85	90	86			
Total	100	100	100	100	100	100			

Drip Irrigation:

Where irrigable water is limited, for less wasteful irrigation, drip irrigation needs to be made popular. Most unfortunate, in our surveyed area, the use of drip-irrigation is really very scanty, on an average only 6 percent of total household have revealed their affirmative answer. Inter-region variation is also remarkable. Practice of drip-irrigation is observed to be highest in Patharpratima (10 p.c. of household practices) and is lowest in Basanti & Sandeskhali I.

Use of Drip			Study	Area		
Irrigation System	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Yes	2	8	10	2	8	6
No	98	92	90	98	92	94
Total	100	100	100	100	100	100

Table 5.10 : Percentage Distribution of Households According to Use of Drip Irrigation System

Source of Drinking Water:

From the survey in our study area it is revealed that major source of drinking water is appeared as '**Tube well'** (60 p.c. in average), the second important source of drinking water is '**River-Water'**. Inter-regional differences are, however, exist significantly. In Basanti and Basanti I, 'Tube well' as a source of drinking is much more prominent (64%) than that in Patharpratima (55%) and Hingalgaunj (58%) & Basanti II(58%). 'Rain water' is also preserved for drinking purpose and on an average nearly 13% of households use 'Rain water' for drinking purpose.

Excessive use of tube well is still a common feature in this area. For the purpose of drinking water the use of tube well is still dominant, and it varies between 55-64p.c. Then comes River, 20-22p.c. of household fetches drinking water from 'river'. It is further observed that for a period of 3-4 months in a year they use 'rain water' for drinking purpose.

During our study by asking people about the purity of drinking water, we came to know that availability of safe drinking water is very limited in our study area. In fact, we found 12-18 p.c. of household receives safe drinking water. The availability of safe drinking water is abnormally low in Hingalgaunj & Basanti II (only 12 p.c. of household in each area).

We designed the survey in a manner such that we can understand people's perception in the matter related to the problem of limited availability of safe drinking water and accordingly questions were asked to find out the alternative supply sources they like to have. Largest section (64-70p.c. of households) prefers to have more tube well 10-24p.c. of household opined for 'preservation of rainwater'. 7-12p.c. of households indicated their preferences on supply of 'Tap water' arrangement. No one talked about digging new ponds or extension of canal.

TRAINING:

Several types of training programmes were organised for the improvement of economic, social and political life of the citizens of this delta region. We are interested to observe the responses of citizens to these training programmes and accordingly we enquired about this.

		Study Area														
Type of Training	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All										
Health	8	10	5	12	10	9										
Increase income	25	22	28	30	25	26										
Education	22 18		15	20	10	17										
Agriculture	45	50	52	38	55	48										
Human rights	0	0	0	0	0	0										
Others	0 0		0	0	0	0										
Total	100	100	100	100	100	100										

Table 5.10 : Percentage Distribution of Households According to Use of Drip Irrigation System

It is observed that different types of training programme have been conducted in our surveyed area mainly to for improvement in 'health', to impart knowledge for 'improved agricultural practice to enhance family income' and 'education'. However only 48p.c. of household received training related to agricultural improvement and only 17p.c. received training on 'education and9p.c. Undertook training on 'health'. A scrutiny of our result reveals that households are much interested in the training programmes that are expected to improve their economic life or standard of living more directly. On an average, 48 percent of total households have attended the training programme aiming to impart knowledge related to improved **agriculture**. 26 percent of total households have attended the training programme meant for **'increase in Income'**. Training on **'Education'** and **''Health'** has indirect impact on economic life, but the training programmes on them have received less attention from the households. As a matter of fact 17 percent of households received training on **'Education'** and 9 percent received training on **'Health'**.

ANNEXURE-V

			Study	Area		
Crab Culture	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Yes	90	84	78	90	84	85
No	10	16	22	10	16	15
Total	100	100	100	100	100	100

Table 5.6.a (4.6.1): Percentage of Households According to Crab Culture

 Table 5.6.b : Average Production of and average income from Crab Per Household

			Study	Area		
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
AverageProduction (in K.G)	20	15	15	20	15	17
Average Annual Income from Crab Fattening Per Household(In Rs/)	0	0	0	0	0	0

 Table 5.11 : Percentage Distribution of Households by Source of Drinking Water

	Study Area														
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All									
Pond	5	8	4	5	8	6									
Khal	0	0	0	0	0	0									
Tube well	64	58	55	64	58	60									
River	22	20	22	22	20	21									
Rain water	9 14		19	9	14	13									
Total	100	100	100	100	100	100									

 Table 5.11.a : Percentage Distribution of Households According to Availability of Safe Water

			Study	Area		
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Yes	17	12	18	17	12	15
No	83	88	82	83	88	85
Total	100	100	100	100	100	100

 Table 5.12 : Average Number of Month Use of Rain Water for Drinking

			Study	Area		
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All
Averagenumber of Month use of Rain water for drinking	3	4	3	3	4	3

 Table 5.13.a : Percentage Distribution of Households by Source of Drinking Water in the Village

		Study Area														
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	All										
Pond	4	8	8	4	8	6										
Khal	0	0	0	0	0	0										
Tube well	68	58	58	68	58	62										
River	22	20	24	22	20	22										
Rain water	6	14	10	6	14	10										
Total	100	100	100	100	100	100										

Project related information

Measures			Study A	rea		
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALII	SANDESHKHALI II	All
Need more Tubewell	64	70	78	64	70	69
Preservation of	24	20	10	24	20	20
Rain water						
To arrange Tap water	12	10	7	12	10	10
Digging of more Ponds	0	0	5	0	0	1
Extension of Canal	0		0		0	0
Total	100	100	100	100	100	100

 Table 5.13.b : Percentage of Household by Suggested Measures to Overcome Drinking Water Problems



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CHAPTER SIX

Impact of Climate Change and Disasters on household welfare The Sunderbans, covering about one million ha in the delta of the rivers Ganga, Brahmaputra and Meghna is shared between Bangladesh (~60 %) and India (~40 %), and is the world's largest coastal wetland. The area experiences a subtropical monsoon climate with an annual rainfall of 1,6001,800 mm and severe cyclonic storms. Enormous amounts of sediments carried by the rivers contribute to its expansion and dynamics. Salinity gradients change over a wide range of spatial and temporal scales. Large areas of the Sunderbans mangroves have been converted into paddy fields over the past two centuries, and more recently into shrimp farms. The Sunderbans has been extensively exploited for timber, fish, prawns and fodder. The regulation of river flows by a series of dams, barrages and embankments for diverting water upstream for various human needs and for flood control has caused large reduction in freshwater inflow and seriously affected the biodiversity because of an increase in salinity and changes in sedimentation. Sea surface temperature (SST) in the Sunderbans is increasing at the rate of 0.5OC per decade; globally, the rate is 0.060C per decade. Higher SST is leading to sea level rise and adverse impact on the fish stocks. Sea level is rising in this region at a rate higher than the global average. In the past 25 years, sea level has risen at a rate of 8 mm/year more than double the global average. This is leading to land loss as well as increasing soil salinity. The Indian part of Sunderbans has been losing land at 5.5 sq km/year over the past 10 years. The frequency of severe cyclone in the region has increased by 26 per cent over the past century. This chapter lists down the major natural and climate induced hazards with associated impacts on various dimensions of targeted households.

Impact on Household Welfare:

In the present study, we proposed to observe how the people of Sunderbans perceive the impact of climate change on their resources and livelihoods. Here Flood, river erosion, water logging, drought, cyclone, salinity, tidal surge, and increase in temperature, Heavy rainfall, erratic rainfall, hot wave and cold wave are considered as major sources of nature and climate induced hazards. We allowed respondents to reveal their observations in terms of degrees of influences of these factors on their welfare measured in terms of the factors that constitute the resources and livelihoods of the household such as 'Homestead lands &Houses' 'Trees' 'Livestock &Poultry' 'Agricultural land' 'Crops &vegetables' 'Shrimp farming' 'Fish culture' 'Crab culture' 'Spawn collection' ' Small business'' Service & Employment'.

As a whole irrespective of areas it is observed that 'flood', 'river erosion', 'salinity' and 'increase in temperature' are the main factor identified by the households. The impacts as perceived by household on different degrees-'severe' 'medium' and 'low' are observed. Percentage of households perceived by severe level of impact on **Homestead Land and Houses** by **River erosion** varies between 76.1 p.c. (Sandeskhali II) to 86.8 p.c. (in Patharpratima). Flood has been considered as second important factor; however, this varies widely between 44.8p.c. (sandeskhali1) to 85.8 (in Patharpratima). **Salinity** appeared as third important factor affecting **Homestead Land and Houses**. However there exist some degrees of differences in the ways it was perceived across the regions. Increase in Temperature also appeared as an important factor in this context. Further detail can be read from Table: 5.1.

Tree is an important component of household asset from the view point of both economy and ecology. Salinity appeared as most deterrent factor in this particular aspect; however, perception of people varies to some extent across the regions. In Sandeskhali I salinity affects least according to people's perspective. River erosion and flood appeared as first two important factors that hampered the household welfare through its adverse impact on Livestock & Poultry farming, at least as perceived by majority of household. However in Sandeskhali I, 44.8 percent of household's perceived increase in temperature as the most important factor that affects Livestock & Poultry

farming adversely. So far effect on **agricultural land** is concerned, flood and river erosion appeared as important factor almost uniformly across the regions. However in Sandeskhali I, in addition, **Water logging, Heavy Rainfall, Drought, increase in temperature and salinity** appeared as equally responsible factor behind the adverse impact on **agricultural land**. In case of severe impact on **Agricultural Land**, factors like **flood and river erosion** and heavy rainfall appeared as most responsible in almost all areas except in Basanti. Heavy rainfall and increase in temperature in addition to flood and river erosion appeared as prime factors that severely affecting vegetable and crop production in Sandeskhali1& Sandeskhali II. Shrimp farming as well as fish farming is not generally receiving any adverse effect from the factors identified by us except in Sandeskhali1, where increase in temperature and heavy rainfall has been observed to affect adversely the **shrimp farming and fish farming** Table:5.1 to Table:5.11 in annexure may throw more light in these aspects.





ANNEXURE-VI

 Table 6.1 : Percentage of Households Perceived by Level of Impacts on Homestead Land and Houses Due to Natural Disaster and Climate Change Events

Natural Disaster		BASANT	1	HING	GALGUN	IJ	PATH	PATHAR PRATIMA			SANDESHKHALI I			ESHKH	ALI II	All		
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low
Flood	72.7	9.6.	2.2	61.9	17.2	2.2	85.8	7.8	0.7	44.8	51.7	0	85.5	12.3	1.1			
River erosion	78.3	15.2	1.1	76.3	17.4	3.7	86.8	10.4	1.2	62.1	27.6	3.4	76.1	20.7	1.4			
Water logging	6.4	14.7	3.8	8.5	28.9	23.3	15.4	24.4	16.9	3.4	51.7	17.2	22.5	32.2	14.5			
Drought	2.3	5.3	3.0	5.9	13.0	19.3	8.0	4.0	9.0	13.8	20.7	3.4	14.1	17.4	12.3			
Cyclone	2.3	4.9	3.0	2.2	13.3	17.0	6.5	3.2	7.2	3.4	6.9	6.9	12.3	23.9	5.9			
Salinity	65.2	19.2	1.1	45.6	27.0	8.5	35.6	19.5	7.8	10.3	48.3	10.3	62.3	18.8	9.8			
Tidal surge	13.1	31.3	14.2	7.4	25.2	32.2	35.9	20.5	12.4	41.4	17.2	27.6	5.4	26.8	23.9			
Increase temperature	23.3	16.2	4.1	28.9	24.1	16.7	25.0	10.0	6.5	41.4	31.0	13.8	44.9	33.0	12.3			
Heavy rainfall	9.7	12.4	9.7	13.3	32.2	16.7	21.7	17.0	20.7	3.4	44.8	6.9	32.6	33.3	17.4			
Erratic rainfall	0.4	0.4	1.1	1.9	7.0	13.7	0.2	0.8	2.5	3.4	3.4	3.4	2.9	3.3	11.6			
Hot wave	0	0	0.4	0	1.5	13.3	1.2	1.0	0.7	0	0	3.4	0.7	1.4	4.3			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.2 : Percentage of Households Perceived by Level of Impacts on Trees Due to Natural Disaster and Climate

 Change Events

Natural Disaster		BASANT	П	HINGALGUNJ			PATHAR PRATIMA			SANDESHKHALI I			SAND	ESHKH	All			
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low
Flood	26.6	35.5	3.1	33.0	16.3	11.9	51.5	24.6	2.2	13.8	82.8	0	53.6	35.5	6.2			
River erosion	28.3	38.8	4.7	42.6	23.0	12.2	59.0	19.9	3.2	51.7	37.9	6.9	64.9	26.4	4.0			
Water logging	6.6	13.6	1.9	4.4	15.9	35.2	10.7	21.6	13.4	37.9	17.2	2.7	22.1	30.1	14.9			
Drought	4.3	4.7	14.1	1.1	24.1	26.3	11.2	10.4	10.9	3.4	79.3	10.3	22.5	40.2	16.7			
Cyclone	2.7	3.5	9.3	2.2	21.5	23.7	8.9	10.2	9.4	3.4	6.9	44.8	15.6	33.3	17.8			
Salinity	50.6	18.0	1.9	20.4	34.8	8.5	31.4	17.4	6.5	6.9	48.3	10.3	46.0	27.5	13.4			
Tidal surge	10.9	29.6	7.0	17.3	23.3	26.7	33.8	18.1	7.2	34.5	20.7	20.7	13.4	30.8	21.0			
Increase temperature	7.8	15.5	4.7	17.7	21.7	20.0	15.9	13.4	6.0	48.3	10.3	24.1	32.2	32.2	18.8			
Heavy rainfall	3.1	3.9	3.1	2.7	13.7	27.3	13.9	20.4	11.7	10.3	3.4	44.8	21.0	37.7	18.5			
Erratic rainfall	1.9	0.8	08	0.3	6.7	19.7	0.2	1.0	2.5	0	3.4	6.9	1.4	8.0	12.7			
Hot wave	0.4	0.4	0.4	1.0	2.7	17.7	0.7	1.7	1.0	0	0	0	1.1	4.0	9.4			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.3: Percentage of Households Perceived by Level of Impacts on Livestock and Poultry Due to Natural Disaster and Climate Change Events

Natural Disaster	BASANTI		П	HINGALGUNJ			PATH	PATHAR PRATIMA SA			SANDESHKHALI I			ESHKH	ALI II	All		
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low
Flood	37.9	20.1	3.8	36.7	28.0	3.3	44.2	25.5	5.7	6.9	72.4	17.2	33.0	41.3	10.1			
River erosion	42.2	23.2	3.4	41.3	20.0	14.0	49.6	27.4	4.0	44.8	27.6	20.7	31.9	37.0	16.3			
Water logging	3.4	6.5	8.4	9.0	16.3	25.0	6.2	17.9	15.7	6.9	44.8	20.7	10.1	19.9	23.6			
Drought	5.7	3.1	4.2	5.3	21.0	14.3	5.2	5.7	15.9	6.9	20.7	44.8	9.8	21.4	20.7			
Cyclone	5.3	1.1	2.3	2.3	17.7	16.7	2.8	4.7	14.2	6.9	44.8	3.4	2.9	20.7	18.8			
Salinity	22.0	17.4	14.8	16.3	26.3	13.7	9.7	27.5	9.7	3.4	48.3	6.9	15.9	25.0	17.4			
Tidal surge	8.0	12.2	13.7	6.7	19.7	18	22.2	18.0	10.7	3.4	37.9	34.5	4.3	15.6	17.4			
Increase temperature	16.8	9.9	1.9	22.0	20.0	21.0	18.0	9.8	6.5	41.4	24.1	13.8	15.6	33.7	17.0			
Heavy rainfall	4.9	3.8	8.4	5.3	12.0	28.7	8.0	18.5	8.0	3.4	48.3	13.8	20.3	23.2	15.2			
Erratic rainfall	1.5	1.9	0.8	1.0	7.7	24.7	0.2	1.3	2.3	6.9	0	0	3.3	6.9	6.9			
Hot wave	0	0	0.4	1.0	4.0	21.3	1.8	0.5	0.3	0	6.9	0	1.4	6.9	5.4			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Natural Disaster		BASANT	Ί	HINC	ALGUN	J	PATH	AR PRAT	IMA	SAND	ESHKHA	LII	SAND	ESHKH/	ALI II		All	
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low
Flood	12.0	6.8	0.4	44.3	8.7	1.7	48.4	4.2	0.3	79.3	3.4	3.4	56.9	16.3	4.3			
River erosion	14.0	6.4	2.0	47.0	6.7	3.3	50.6	6.4	0.3	58.6	27.6	0	54.7	17.8	4.3			
Water logging	1.6	4.8	0	9.7	13.3	15.7	15.1	8.0	3.7	44.8	10.3	10.3	29.0	13.8	9.1			
Drought	2.8	5.6	0.8	16.3	11.7	12.3	6.7	3.8	5.5	55.2	6.9	20.7	33.7	14.9	13.8			
Cyclone	0.9	0.9	0.9	7.7	14.2	17.7	6.2	5.6	5.3	3.4	41.4	3.4	20.8	16.7	14.6			
Salinity	1.7	3.0	3.4	8.8	21.5	13.5	16.3	13.5	4.9	37.9	10.3	6.9	12.4	14.5	12.4			
Tidal surge	6.4	4.7	2.6	17.3	20.4	14.2	27.7	8.8	2.7	44.8	17.2	17.2	20.7	20.7	15.2			
Increase temperature	0.9	2.1	0.9	18.1	22.3	10.8	13.8	8.3	1.8	37.9	17.2	17.2	22.1	15.9	15.2			
Heavy rainfall	0.9	3.0	1.7	5.4	15.8	20.4	12.3	12.0	7.4	41.4	6.9	10.3	15.2	11.7	17.2			
Erratic rainfall	0.4	0.4	0	0.4	9.2	11.2	0	1.5	1.5	0	0	0	2.1	2.8	2.8			
Hot wave	0	0	0	0.4	4.6	16.5	3.1	1.2	0.9	0	0	6.9	2.1	0	0.7			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.4 : Percentage of Households Perceived by Level of Impacts on Agricultural Land Due to Natural Disaster and Climate Change Events

 Table 6.5 : Percentage of Households Perceived by Level of Impacts on Crops and Vegetables Due to Natural Disaster and Climate Change Events

Natural Disaster		BASANT	1	HINC	GALGUN	J	PATH	AR PRAT	IMA	SAND	ESHKHA	LII	SAND	ESHKH/	ALI II		All	
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low
Flood	10.0	6.5	1.7	37.3	12.7	3.1	44.8	9.0	1.2	44.8	17.2	13.8	36.6	26.2	6.9			
River erosion	14.2	5.6	0.9	37.3	7.6	4.0	46.0	6.9	1.2	44.8	10.3	13.8	36.6	20.0	11.7			
Water logging	5.6	1.7	1.7	7.2	15.7	12.9	12.4	10.7	2.9	0	48.3	6.9	23.6	13.9	6.7			
Drought	9.3	2.9	0	7.5	14.9	11.6	8.1	6.9	4.5	34.5	10.3	10.3	24.0	16.8	14.4			
Cyclone	5.2	7.5	2.3	7.0	11.1	13.7	7.2	7.4	3.3	0	41.4	3.4	19.7	12.0	11.5			
Salinity	3.5	6.4	1.2	2.8	19.5	12.4	11.5	11.5	5.0	3.4	37.9	6.9	20.7	14.9	12.5			
Tidal surge	9.2	104	1.7	16.3	17.3	11.7	26.0	8.1	4.3	3.4	44.8	6.9	10.6	19.2	9.1			
Increase temperature	4.6	3.5	1.7	18.4	13.4	11.3	11.7	8.4	3.6	37.9	6.9	6.9	24.0	14.9	15.9			
Heavy rainfall	7.6	2.9	2.3	6.4	18.0	10.6	12.6	9.1	6.2	37.9	6.9	6.9	26.0	20.2	8.2			
Erratic rainfall	0.6	0	0	1.8	7.4	11.0	0.2	1.2	1.4	3.4	0	3.4	1.9	6.2	5.3			
Hot wave	0.6	0	0	2.2	5.8	14.1	0.5	0.2	1.2	3.4	0	3.4	1.4	1.4	1.9			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.6 : Percentage of Households Perceived by Level of Impacts on Shrimp Farming(Gher) Due to Natural Disaster and Climate Change Events

Natural Disaster		BASANT	1	HING	GALGUN	J	PATH/	AR PRAT	IMA	SAND	ESHKHA	LII	SAND	ESHKH/	ALI II		All	
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low
Flood	1.7	1.7	0.6	5.4	3.6	0.4	2.4	1.1	0	0	37.9	0	13.0	13.9	1.9			
River erosion	2.3	0.6	0	5.8.	0.7	1.1	2.1	1.1	0	37.9	0	0	9.6	17.8	5.3			
Water logging	0.6	0	0	2.2	1.8	1.4	0.2	0.6	0	0	37.9	0	4.3	6.2	4.3			
Drought	0.6	0	0	0.7	1.4	3.5	0.4	0.4	0.2	0	0	34.5	1.4	10.1	5.3			
Cyclone	0.6	0	0.6	0.4	1.8	1.4	0.2	0.6	0.4	0	0	37.9	2.4	2.9	4.8			
Salinity	0.6	0	0.6	0	1.0	1.0	0.4	0.6	0	3.4	0	34.5	1.9	7.7	8.7			
Tidal surge	0	0.6	0	4.4	2.0	2.4	0.8	0.8	0.8	3.4	3.4	0	0	5.3	4.8			
Increase temperature	1.2	0.6	0.6	5.4	2.7	1.0	1.2	0.2	0.2	37.9	0	0	5.3	10.1	4.8			
Heavy rainfall	0.6	0	0	1.4	2.4	1.1	1.0	0.4	0.6	0	37.9	0	2.4	10.6	7.2			
Erratic rainfall	0	0	0	0.7	0.3	2.4	0	0	0	0	0	0	1.0	1.4	1.9			
Hot wave	0	0	0	0.3	0.7	1.4	1.0	0	0	0	0	0	0	1.4	1.0			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.7: Percentage of Households Perceived by Level of Impacts on Fish Culture Due to Natural Disaster and Climate

 Change Events

Natural Disaster		BASANT	1	HINC	GALGUN	J	PATH	AR PRAT	IMA	SAND	ESHKHA	LII	SAND	ESHKH/	ALI II		All	
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severel	NediumL	.ow
Flood	7.4	4.6	0	20.7	6.1	0.3	29.5	7.2	0.2	41.4	10.3	6.9	50.5	8.7	2.4			
River erosion	9.7	2.9	0.6	21.0	4.7	0.3	34.7	4.5	0.2	37.9	10.3	10.3	47.6	10.1	3.8			
Water logging	0.6	1.7	0	2.7	4.7	4.3	2.6	6.6	5.1	41.4	3.4	0	16.3	15.9	3.4			
Drought	0.6	1.2	0	2.0	4.0	6.3	0.4	2.6	7.1	0	3.4	13.8	13.0	9.1	8.2			
Cyclone	0.6	1.2	0	1.3	4.7	7.3	0.2	2.1	8.3	3.4	3.4	31.0	12.5	9.6	11.5			
Salinity	0	0.6	0	2.7	5.0	5.7	1.5	5.5	7.1	3.4	41.4	0	11.5	2.9	9.6			
Tidal surge	2.3	1.7	1.1	1.3	2.7	7.3	20.1	7.1	0.9	41.4	0	3.4	3.8	7.7	10.1			
Increase temperature	5.2	1.2	0	6.0	4.7	4.3	13.0	2.1	1.5	37.9	6.4	3.4	26.4	8.7	8.2			
Heavy rainfall	2.9	2.9	0.6	3.0	6.7	3.7	7.5	10.0	6.0	0	37.9	0	21.2	8.7	7.2			
Erratic rainfall	0.6	0	0	0	1.0	4.7	0.2	0.9	0	0	3.4	3.4	0	2.9	1.9			
Hot wave	0	0	0	0	0.3	2.7	0	0	0.3	0	3.4	3.4	0.5	0.5	1.0			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.8 : Percentage of Households Perceived by Level of Impacts on Crab Culture Due to Natural Disaster and Climate Change Events

Natural Disaster		BASANT	1	HINC	GALGUN	J	PATH/		IMA	SAND	ESHKHA		SAND	ESHKH/			All	
	Severe	Medium	Low	Severel	MediumL	.ow												
Flood	0.7	0.7	0	0.4	0	0	0.9	0	0	0	0	0	1.7	0	3.3			
River erosion	0.7	1.5	0	0.8	0	0	0	0.3	0	0	0	0	1.7	3.3	0			
Water logging	0	0.7	0	0.4	0	0	0.3	0.3	0.3	0	0	0	0	0	1.7			
Drought	0	0	0	0	0	0	0	0.3	0.6	0	0	0	0	0	0			
Cyclone	0	0	0	0	0	0	0	0.3	0.6	0	0	0	0	0	0			
Salinity	0.7	0.7	0	0	0	0	0	0.9	0	0	0	0	0	0	1.7			
Tidal surge	0	0	0	6.7	2.9	0	0.3	0.9	0	0	0	0	0	0.8	2.5			
Increase temperature	0.7	1.5	0	6.3	3.4	0	0.3	0.3	0	0	0	0	0.8	1.7	1.7			
Heavy rainfall	0.7	0	0	0.4	0.4	0	0	0.3	0.6	0	0	0	0.8	0	2.5			
Erratic rainfall	0.7	0	0	0.4	0.4	1.3	0	0	0	0	0	0	0	0.8	0			
Hot wave	0	0	0	0.9	0	1.3	0	0	0	0	0	0	0	0	0			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.9: Percentage of Households Perceived by Level of Impacts on Spawn Collection Due to Natural Disaster and

 Climate Change Events

Natural Disaster		RASANT	1	HINC			РАТНИ		ΙМΔ	SAND	ЕЗНКНА		SAND	ESHKH	AT T 11		Δ11	
	Severe	Medium	Low	Severel	/lediumL	.ow												
Flood	21.0	20.3	2.1	13.2	4.4	4.0	2.8	0	0.3	0	0	0	25.0	10.0	0.8			
River erosion	37.5	11.1	1.4	11.9	4.8	2.6	2.2	0.9	0	0	0	0	24.2	8.3	3.3			
Water logging	0	1.4	0.7	2.2	4.4	1.8	0	0.6	0	0	0	0	11.7	7.5	8.3			
Drought	0.7	0	0.7	2.2	2.2	4.4	0	0.3	0.3	0	0	0	0.8	5.8	11.7			
Cyclone	0.7	0.7	0.7	0.4	1.8	3.1	0	0.3	0.3	0	0	0	3.3	4.4	16.7			
Salinity	19.5	18.9	0.7	6.6	4.4	1.8	0.6	0.6	0	0	0	0	10.8	10.0	5.8			
Tidal surge	4.2	2.8	0.7	0	0	1.4	1.6	0	0.3	0	0	0	0	5.0	13.3			
Increase temperature	16.8	11.9	4.2	2.3	5.9	1.4	0	0.9	0	0	0	0	10.8	4.2	10.8			
Heavy rainfall	5.7	8.9	2.5	1.8	2.7	2.3	0.6	0.6	0.6	0	0	0	7.5	11.7	5.8			
Erratic rainfall	0.6	0	1.3	0	0	0.4	0	0.3	0	0	0	0	2.1	1.4	7.1			
Hot wave	0	0	1.3	0	0	1.2	0	0.9	0	0	0	0	0.7	1.4	6.9			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

Natural Disaster		BASANT	1	HING	GALGUN	J	PATH/	AR PRAT	IMA	SAND	ESHKHA	uı	SAND	ESHKH/			All	
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severel	MediumL	.ow
Flood	0	1.3	0	0.4	0	0.4	1.9	0.9	0.3	0	0	0	1.4	2.1	2.1			
River erosion	1.3	0.7	0	0.4	0.4	0.4	1.9	0.6	0	0	0	0	3.4	2.1	0			
Water logging	0	0	0	0	0	0	0	0	0.3	0	0	0	0	1.4	1.4			
Drought	0	0	0	0	0	0.4	0	0.3	0	0	0	0	0.7	0	0			
Cyclone	0	0	0	0	0	0.4	0.3	0	0.6	0	0	0	0	1.4	0.7			
Salinity	0	1.4	0	0	0.4	0.4	1.3	0.6	0	0	0	0	0	4.1	1.4			
Tidal surge	0	0	0	5.4	1.7	1.2	0.9	0	0.3	0	0	0	0	0	0			
Increase temperature	0.7	1.4	0	5.0	2.1	1.2	0	0	0.3	0	0	0	0	1.4	1.4			
Heavy rainfall	0.7	0	0	0	0	0.4	0	0.6	1.3	0	0	0	0.7	1.4	2.1			
Erratic rainfall	0	0	0	0	0.4	1.2	0	0	0.3	0	0	0	0	0	1.4			
Hot wave	0	0	0	0	0.4	0.8	0	0	0	0	0	0	0	0	1.2			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

 Table 6.10 : Percentage of Households Perceived by Level of Impacts on Small Business Due to Natural Disaster and Climate Change Events

 Table 6.11 : Percentage of Households Perceived by Level of Impacts on Service/Employment Due to Natural Disaster and Climate Change Events

Natural Disaster	В	ASANTI		HIN	GALGUN	IJ	PATH	AR PRAT	IMA	SAND	ESHKHA	LII	SAND	ESHKH	ALI II		All	
	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	Medium	Low	Severe	MediumL	.ow
Flood	0.7	0	0	3.3	1.2	0.4	0	0	0	0	3.4	0	0	0.5	0			
River erosion	0.7	0	0	0	0	0	0	0	0	0	3.4	0	0	0.5	0			
Water logging	0	0	0	1.7	0.4	0	0	0	0	0	0	3.4	0	0	0.5			
Drought	0	0	0	0	0.4	0.8	0	0	0	0	0	0	0	0	0			
Cyclone	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0			
Salinity	0.7	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0			
Tidal surge	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0			
Increase temperature	0.8	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0			
Heavy rainfall	0	0.8	0	0	0	0	0	0	0	3.4	0	0	0.8	0	0			
Erratic rainfall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Hot wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Cold wave	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			





CHAPTER SEVEN

Impact of climate change and disasters on household's Food Security, Health, Education, Safe Drinking Water and Sanitation facilities In this section we like to observe impact of climatic change and natural disaster on household's **food security**, **health**, **education**, **safe drinking water and sanitation** facilities as perceived by household themselves. These aspects in their turn are constituents of human development index (HDI), thus from this analysis we can get some idea about how the HDI of the households would be affected and we can also understand the major factors that are affecting the HDI as a consequence of climatic change and disaster.

As perceived by households, in all five regions flood and increase in temperature can be observed to be most important factor that affects food security most severely. In fact 81.1 p.c. household in Basanti II, 8..8p.c. in Patharpratima, 74.8 p.c. of house hold in Basanti, 72.4 p.c. in Basanti I and 63.8 p.c. house hold in Hingalgaunj perceived severe level of impact of flood on food security in their livelihood. Increased temperature has identified as another major factor as perceived by household in threatening the food security severely. In fact Patharpratima 78.5 p.c. of household, in Basanti 75.3 p.c., in Basanti II 71.0 p.c. and in Hingalgaunj 68.3 p.c. of household perceived this factor that has severe impact on their food security. In addition, heavy rainfall in Basanti I (48.3 p.c. of household perceived it) and sometimes erratic rainfall in Basanti II (44.6 p.c. of household perceived) also appeared as important factor that have threatened the food security most severely.

Flood and increase in temperature appeared as most dominant factor as perceived by household that revealed severe impact on **health** in all five regions. As a matter of fact 46.5 p.c. of respondent in Basanti, 44.2 p.c. in Hingalgaunj 45.9 p.c. in Patharpratima, 37.9 p.c. in Basanti I & 44.6 p.c. in Basanti II perceived flood as a crucial deterring factor on health. Another important factor that affects their health severely is erratic rainfall. In fact 43.0 p.c. of respondent in Basanti, 41.6 in Hingalgaunj, 44.4 in Patharpratima, 48.3p.c. in Basanti I and 44.2 p.c. in Basanti II have perceived this as factor affecting health severely.

So far, **education** is concerned, according to people's perception, except in Basanti, **flood** was considered to be most important factor. However **heavy rainfall** and **increase in temperature** also emerged as factors affecting health in Basanti I.

Drinking water as perceived by households was severely affected by **flood** and **increase in temperature** in all five regions. In addition, in Basanti I **cyclone** was recorded as factors that are severely affecting drinking water. In Basanti II **heavy rainfall** and **erratic rainfall** emerged as factors affecting **drinking water** severely.

Partial responses have been recorded by households in case of sanitation and increase in temperature & flood appeared as factors contributing to it. For further detail please refer to Annexure-VII Table: 7.1 to Table: 7.5 and for a visual impression Chart7: 1 to Chart7: 5 may be considered.



Impact of climate change and disasters on household's Food Security, Health, Education, Safe Drinking Water and Sanitation facilities

ANNEXURE-VII





Chart: 7.2: Percentage of Households Perceived by Level of Impacts on Food Security Due to Natural Disaster and Climate Change Events (Hingalgaunj



Impact of climate change and disasters on household's Food Security, Health, Education, Safe Drinking Water and Sanitation facilities

Chart: 7.3: Percentage of Households Perceived by Level of Impacts on Food Security Due to Natural Disaster and Climate Change Events (Patharpratima)



Chart: 7. 4 Percentage of Households Perceived by Level of Impacts on Food Security Due to Natural Disaster and Climate Change Events (Sandeskhali II)



Chart: 7. 5 Percentage of Households Perceived by Level of Impacts on Food Security Due to Natural Disaster and Climate Change Events(Sandeskhali II)



 Table: 7.1: Percentage of Households Perceived by Level of Impacts on Food Security Due to Natural Disaster and Climate Change Events

Natural Disaster	В	ASANT	1	HINC	ALGU	NJ	PATHA	R PRAT	IMA	SAND	ESHKH	ALI I	SANDE	SHKH	ALI II
	severe	medium	low	severe	medium	low									
Flood	74.8	17.9	1.8	63.7	1.8	8.6	80.8	13.2	1.0	72.4	13.8	6.9	81.5	14.1	0.7
River erosion	16.3	15.2	4.5	16.5	28.7	21.5	24.5	16.9	14.5	31.0	44.8	3.4	29.0	30.8	11.2
Water logging	26.0	21.6	8.2	15.8	36.6	15.8	14.2	15.5	12.5	34.5	20.7	13.8	22.5	29.7	10.1
Drought	16.0	32.7	14.5	7.3	26.4	31.7	39.7	21.5	13.0	31.0	37.9	10.3	13.8	19.9	23.9
Cyclone	9.8	7.2	3.4	8.9	16.8	29.7	17.5	4.7	5.7	27.6	24.1	0	18.1	33.0	15.2
Salinity	9.1	14.8	10.6	8.6	26.1	27.4	15.7	16.9	15.0	6.9	37.9	6.9	12.3	24.3	22.5
Tidal surge	4.2	9.1	4.9	5.3	15.2	26.1	14.4	11.4	14.9	3.4	44.8	3.4	13.8	25.7	9.8
Increase temperature	75.3	15.6	2.2	68.3	27.1	1.3	78.5	12.4	0.5	58.6	24.1	13.8	71.0	19.9	3.6
Heavy rainfall	11.3	18.0	12.8	8.3	17.5	25.7	18.9	16.5	13.0	48.3	0	3.4	20.7	22.5	15.2
Erratic rainfall	16.6	15.5	4.9	18.2	20.1	14.2	19.4	5.3	4.8	37.9	17.2	3.4	44.6	21.4	15.6
Hot wave	0.8	0.4	0.0	0.7	5.3	24.1	0.5	1.3	1.7	3.4	17.2	24.1	5.1	12.3	10.5
Cold wave	3.0	0.4	1.1	0.0	4.0	13.5	0.2	0.7	0.7	3.4	3.4	20.7	1.1	1.8	9.8
Others	0.4	0	0	0.7	0.7	5.9	0.5	0.3	0	0	0	17.2	0.7	0	1.4

 Table:7.2: Percentage of Households Perceived by Level of Impacts on Health Due to Natural Disaster and Climate Change Events

Natural Disaster	В	ASANTI		HINC	ALGU	NJ	PATH/		TIMA	SAND	ESHKH/	ALI I	SAND	SHKH	ALI II
	severe	medium	low	severe	medium	low	severe	medium	low	severe	medium	low	severe	medium	low
Flood	46.5	27.9	5.6	44.2	38.6	11.9	45.9	36.2	11.9	37.9	41.4	3.4	44.6	44.6	5.8
River erosion	4.9	5.7	4.9	7.3	23.4	15.5	21.2	19.0	15.9	6.9	37.9	37.9	14.9	43.5	14.5
Water logging	17.7	16.5	6.0	8.3	28.1	30.7	8.7	16.5	12.4	3.4	48.3	3.4	4.7	26.1	23.6
Drought	14.6	16.5	4.5	5.3	21.8	27.1	24.0	25.5	17.0	37.9	24.1	17.2	5.1	31.9	29.0
Cyclone	8.8	9.8	0.8	4.0	10.6	19.5	10.2	10.2	4.8	27.6	17.2	3.4	6.9	21.4	18.5
Salinity	7.2	3.8	8.7	5.0	24.1	15.5	13.4	12.9	10.9	6.9	34.5	6.9	9.4	19.6	21.4
Tidal surge	11.7	17.8	9.8	12.5	17.8	24.1	11.9	18.2	11.4	17.2	27.6	10.3	18.1	29.7	15.2
Increase temperature	43.0	23.3	3.3	41.6	26.7	9.2	44.4	32.2	9.8	48.3	24.1	10.3	44.2	36.2	8.3
Heavy rainfall	19.2	12.5	3.3	4.6	14.9	16.2	10.7	15.9	15.4	17.2	34.5	6.9	10.1	26.4	18.1
Erratic rainfall	11.8	12.9	0.0	1.3	22.9	12.1	7.5	12.0	5.3	10.3	27.6	10.3	24.3	28.6	20.8
Hot wave	1.6	0.0	0.4	0.0	4.4	15.2	0	0.5	3.8	0	37.9	13.8	1.2	19.6	11.8
Cold wave	8.0	1.2	0.8	1.0	6.4	24.2	0	0.8	1.8	0	13.8	6.9	0.8	4.3	6.3
Others	0.0	0.0	0.0	0.0	2.4	3.4	0.3	0.5	0.3	0	3.4	6.9	0.4	2.7	0

 Table:7.3: Percentage of Households Perceived by Level of Impacts on Education Due to Natural Disaster and Climate Change Events

	-						DATIL								
Natural Disaster	В	ASANT		HINC	SALGU	NJ	PATHA	AR PRAI	IMA	SAND	SHKH/		SAND	SHKH	
	severe	medium	low	severe	medium	low	severe	medium	low	severe	medium	low	severe	medium	low
Flood	8.7	23.6	17.3	32.0	24.2	17.2	31.6	33.6	13.6	44.8	17.2	27.6	37.3	32.5	18.8
River erosion	0.4	1.2	4.4	3.4	8.4	17.5	17.2	15.5	15.3	3.4	44.8	31.0	6.3	13.7	23.5
Water logging	7.1	5.2	16.7	7.5	25.3	17.8	7.6	10.8	13.6	41.4	13.8	6.9	7.9	14.4	18.1
Drought	1.6	2.8	12.7	1.0	5.2	11.5	12.7	13.4	12.9	3.4	31.0	34.5	0.9	5.1	14.4
Cyclone	0.4	0.8	8.0	0.3	8.7	13.3	5.5	7.9	5.5	0	34.5	13.8	8.4	12.6	20.5
Salinity	0.0	1.6	8.4	1.7	11.9	9.8	7.1	11.3	9.4	27.6	20.7	3.4	9.8	22.3	17.2
Tidal surge	10.0	2.8	6.4	6.6	13.6	20.3	5.8	12.2	12.8	27.6	10.3	17.2	15.8	23.7	12.1
Increase temperature	10.5	24.6	9.8	23.4	21.7	20.3	26.1	17.0	15.0	48.3	10.3	20.7	36.7	24.2	15.8
Heavy rainfall	2.0	5.2	10.0	1.7	11.5	19.2	7.6	11.8	12.1	44.8	0	3.4	9.8	12.6	14.0
Erratic rainfall	2.4	4.8	10.0	2.1	10.8	13.6	4.9	14.4	3.8	37.9	6.9	10.3	29.8	13.0	17.7
Hot wave	0.0	0.0	0.8	0.0	9.1	14.3	0.2	1.6	2.0	17.2	10.3	17.2	4.2	4.2	12.1
Cold wave	2.0	1.2	0.0	1.0	14.7	11.2	0.4	0.5	1.3	0	3.4	20.7	0.9	1.4	1.4
Others	0.0	0.4	0.4	0.0	2.1	3.1	0.4	0	0.2	0	0	17.2	0.8	2.1	1.3

 Table:7.4: Percentage of Households Perceived by Level of Impacts on Safe Drinking Water Due to Natural Disaster and Climate Change Events

Natural Disaster	В	ASANT		HINC	ALGU	NJ	PATH		ΓΙΜΑ	SAND	ESHKH/		SAND	SHKH	ALI II
	severe	medium	low												
Flood	46.7	33.1	8.9	69.9	23.8	1.0	66.7	20.8	2.7	69.0	24.1	3.4	77.1	16.5	3.4
River erosion	10.4	11.2	16.3	21.3	29.4	8.7	19.5	15.7	10.6	10.3	65.5	10.3	27.5	30.1	15.7
Water logging	8.7	20.1	4.3	10.1	27.6	24.8	7.3	17.9	11.5	13.8	44.8	6.9	13.1	15.7	14.0
Drought	17.6	34.9	5.1	13.3	28.3	15.0	37.3	17.7	11.8	48.3	31.0	6.9	14.8	27.1	14.8
Cyclone	8.3	10.7	1.0	9.1	20.6	17.8	6.5	9.9	4.1	48.3	0	3.4	15.7	17.8	19.1
Salinity	4.4	2.0	9.6	12.6	18.9	21.7	9.6	11.6	7.7	27.6	24.1	3.4	12.7	6.9	19.1
Tidal surge	7.9	2.4	3.2	6.6	27.6	14.3	6.4	13.9	6.9	6.9	41.4	3.4	12.6	16.7	18.9
Increase temperature	50.8	26.9	4.2	60.1	27.5	5.2	55.2	24.8	4.9	55.2	24.1	13.8	56.8	26.1	6.3
Heavy rainfall	11.4	16.3	1.9	6.9	21.3	17.2	13.3	17.8	11.6	41.4	6.9	3.4	13.5	21.2	13.1
Erratic rainfall	11.6	14.6	0.7	17.9	14.1	14.8	10.3	12.4	4.3	44.8	10.3	3.4	32.4	16.7	12.2
Hot wave	0.4	1.1	0.0	0.3	9.3	8.9	0.4	1.3	1.9	6.9	6.9	31.0	2.7	5.0	6.3
Cold wave	3.8	0.8	0.0	1.7	5.5	20.6	0	0.6	0.9	0	3.4	3.4	0.9	2.3	5.9
Others	0.0	0.4	0.0	0.0	2.7	2.4	0.4	0.6	0	0	0	0	2.3	0.9	0.9

 Table:7.5: Percentage of Households Perceived by Level of Impacts on Sanitation Due to Natural Disaster and Climate Change Events

Natural Disaster	В	ASANT	l	HINC	GALGU	NJ	PATHA		IMA	SAND	ESHKHA	ALI I	SANDE	ESHKH.	ALI II
	severe	medium	low	severe	medium	low									
Flood	17.5	33.8	25.6	26.1	4.7	41.4	6.9	0	59.5	18.9	2.7				
River erosion	1.5	2.7	1.9	8.9	13.7	14.4	0.8	7.1	9.8	3.4	17.2	24.1	7.2	12.2	13.5
Water logging	16.6	11.7	9.4	9.3	22.7	18.6	0.6	9.6	11.8	48.3	0	0	15.3	11.3	16.7
Drought	2.6	6.4	16.9	1.4	10.7	89	3.8	5.5	11.3	10.3	31.0	3.4	5.4	4.5	12.2
Cyclone	7.1	4.1	8.3	7.9	14.8	10.0	1.5	4.1	3.4	17.2	31.0	0	8.6	13.5	20.7
Salinity	1.1	0.4	7.6	3.8	10.0	14.8	0.6	4.7	5.1	6.9	10.3	3.4	8.1	15.3	11.3
Tidal surge	1.9	0.8	0.4	2.4	10.3	9.6	0.4	4.9	3.6	6.9	10.3	17.2	5.4	6.3	7.2
Increase temperature	53.3	17.5	10.2	52.6	16.5	13.4	25.9	19.0	4.9	37.9	6.9	0	4.5	22.5	5.9
Heavy rainfall	21.6	11.2	12.6	8.2	11.3	14.4	9.0	13.2	11.0	41.4	3.4	3.4	13.1	15.8	6.3
Erratic rainfall	10.2	15.4	2.3	19.9	11.7	11.3	7.2	4.8	3.7	37.9	6.9	0	19.8	16.2	10.8
Hot wave	0.0	0.0	0.0	0.3	4.9	10.4	0.3	0.5	1.4	3.4	10.3	3.4	1.4	1.4	9.0
Cold wave	0.0	0.9	0.9	0.3	5.2	9.4	0	0	0.3	0	3.4	0	0.9	1.9	0.5
Others	0.0	0.0	0.5	0.3	2.1	3.8	0	0	0	3.4	0	0	1.4	0	0



CHAPTER EIGHT

Perception on Climate Change

This section captures the perception on climate change of the targeted households.

8.1 Understanding about Weather and Climate Change:

	Study Area									
Realization	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II					
Heavy storm/cyclone /rainfall	6.3	27.3	13.9	16.5	15.6					
Increase river water	18.0	26.7	31.8	25.4	26.3					
Increase temperature	12.3	12.7	11.0	15.3	17.8					
Heavy rainfall	9.3	12.4	10.7	14.1	12.2					
Very hot	9.9	7.5	5.6	4.5	7.5					
Season change	9.8	0.5	10.0	6.5	8.3					
Erratic rainfall	14.7	17.4	16.3	16.4	17.4					
Others										

Table 8.1: Percentage of Respondents by Their Perceived Under Study of Weather and Climate

The respondents were asked about their understanding on weather and climate change and the most significant responses are listed in **Table 16**. Please refer to **Table 8.1** for more detail.

Villagers see definite changes in terms of **sea level rise**. **They** have seen sufficient increase in the level of water during high tide (*Bhara Kotal*). **Increased temperature** for a reasonably longer period has been observed by the community belonging to this delta region. Community also talked about settlement of the local habitat and river siltation as major causes for flooding of rivers. Intrusion of saline water into the agricultural land results in loss of yields and greater risk to the farmers. Permanent intrusion causes loss of agricultural land and making people migrate (environmental refugees). Change in monsoon pattern causes severe stress on agriculture which is fully dependent on weather. Increase in span of summer increases insect attack on crops. The delayed winter hampers the cultivation of "Ravi Crop" (winter crops). The intrusion of saline water causes severe stress on availability of drinking water, increasing humidity leads to incremental phenomenon of vector borne diseases. People's perception regarding this climatic change has been observed by this study. The subsequent sections will describe the recorded perception in a nut-shell.

8.2 Perception of Climate Chang taking place in the respective areas:

Table8.2: Perception of Respondents Regarding Climate Change

	% of Households								
Measures	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALII	SANDESHKHALI II	ALL			
Yes	80.8	76.9	88.5	100	90.9				
No	17.7	23.1	11.4	0	8.3				
Total	100.0	100.0	100.0	100.0	100.0	100.0			

Roughly 77 percent to 100 percent of total households claimed to have a clear perception about change in climate. Interestingly where the change is more prominent people's affirmative perception is more vibrant. In Sandeskhali I(100p.c.) and in Sandeskhali II(91p.c.) expressed that they have a clear perception on this change.





8.3 Perception of Future Tendency of Hazards

Realisation of respondents regarding the conduciveness of the environment of cyclone centre for women members of the family is more or less negative. In Sandeskhali I, 100 p.c. of the respondent opined that the environment of cyclone centre is not at all conducive for women members of the family. In other areas too, more than two-third of respondents consider the centres to be not conducive for women members. Further detail can be observed from table: 8.3 above. Area wise response is depicted in Chart: 8.3 given below.

 Table 8.3: Realisations of Respondents regarding the conduciveness of the environment of cyclone centers for women member of the family(% of Household)

	Study Area								
Response	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II				
Yes	35.6	30.7	27.1	0	22.5				
No	64.4	69.3	72.9	100	77.5				
Total	100.0	100.0	100.0	100.0	100.0				

Chart: 8.3 Realizations of Respondents regarding the conduciveness of the environment of cyclone centers for women member of the family



In this study we propose to record the respondents' perception about the future trend of events like **flood**, **drought**, **tidal surge**, **cyclone**, **rise in sea level and tornado**, **salinity**, **water logging**, **water pollution** etc. Accordingly we asked the respondents whether the incidence will increase, reduce or remain same or whether they do not know anything about the future trend. As per our records it is revealed that irrespective of areas, following respondents'

perception we can say that in future **flood** will be intensified. Percentage of respondents recorded their inability to express their perception regarding future trend of **flood** is substantially high in Hingalgaunj and Sandeskhali I. Chart: 8.4.1 to Chart: 8.4.5 gives us clear idea about future trend of **flood** in all five regions.

Perception of respondents about future trend of **drought and its severity** is not unique across the regions. While in Patharpratima more than 91p.c. of respondents feel that future Trend of **Drought and its Severity** will be intensified while in Sandeskhali I roughly 37.9 p.c. feels that there will be no change in drought and its severity, and 37.9 p.c. of the respondents recorded their inability to express. However in Basanti, Hingalgaunj, and Sandeskhali II more than 50p.c. of respondents that the future trend of **drought and its severity** would intensify in future.



Chart 8.5.1 Perception about Future Trend of Drought and its Severity

Regarding future trend of tidal surge, majority recorded their apprehension about its intensification; almost half of the respondents in Sandeskhali I (44.8p.c.) failed to predict the future trend of tidal surge. Regarding the future trend of cyclone more or less majority of the respondents anticipates intensification of it, however, a substantial section in Patharpratima, Sandeskhali I and Sandeskhali II cannot say anything. Except in Sandeskhali I, majority of respondents in other four regions clearly revealed their apprehension regarding the intensification of future trend of tidal surge. In Sandeskhali I, 44.8 p.c. of respondents do not know anything about the future trend of tidal surge. With respect to future trend of cyclone majority of respondents in all five regions anticipates intensification. Irrespective of regions, majority of respondents fail to ascertain their prediction about Tornado. Only in Sandeskhali I, nearly 51 percent of respondents apprehend intensification in the rise in sea level. In other four regions majority of respondents 'Do not know' about the future trend of rise in sea level. Regarding salinity of soil except in Sandeskhali II & Patharpratima majority of respondents have clear verdict on increase in salinity, in Sandeskhali II & Patharpratima majority expressed their inability to predict. Regarding water logging majority has no idea about it in neither of the regions. Future trend of water pollution will be intensified as per the perception of majority irrespective of area. Perception about future trend of erratic rainfall is not clear in all the regions. Except Basanti, majority don't know about its trend. Only in Basanti 45.9 p.c. predicted an intensification of erratic rainfall. For future trend of earthquake, hot wave and cold wave majority recorded their inability in all five regions. For further details one may consult Annexure VIII, table: 8.4.1 to table: 8.4.13 and Chart: 8.4.1 to Chart: 8.5.13

8.5.

Global warming, riding on spiraling emissions, is bringing about irreversible changes in the climate and environmental systems around the globe. For citizens of the world, especially for the poor and impoverished who depend on natural resources for their lives and livelihoods, mere survival for the now means negotiating through substantial additional burdens and challenges. In other words, they must now adapt to more hostile environments for their sustenance.

The global discourse on climate change does not seem too concerned about this challenge of adaptation for survival in the poorer parts of the world. In fact, the debate has chosen to focus only on disaster risk reduction. In some platforms for instance (as in the work of the International Commission on Climate Change and Development), only flooding events are prominently discussed. It is critically important that long-term adaptation processes are kept in

consideration when planning for short-term disaster management, as the success in the latter will largely be determined by how the former is handled.

The Sunderbans, a coastal, underdeveloped area, is one of the most visible victims of the ravages of climate change in India. Fragility of the ecosystem coupled with underdevelopment has made this region particularly vulnerable. With rising sea levels, coastal areas face the threat of more severe and frequent floods, erratic rainfall and cyclones. The Inter-governmental Panel on Climate Change or IPCC in 2007 has already warned that low-lying areas of the world would bear the maximum brunt of climate risks because of sea level rise and salt-water intrusion into underground aquifers. Salt water intrusion into the ground and groundwater makes agriculture difficult and contaminates sources of drinking water, something that has started affecting Sunderbans.

The vulnerability of the people living in this delta region spread across India and Bangladesh has steadily increased as these climatic changes in the natural atmosphere have not proved to be favourable for agriculture, fishing and other natural resource-based livelihood practices. When the capability of resident populations to cope with changing ecosystems is retarded, its vulnerability increases.

Current and Future Coping Strategies:

A change in climate in future requires a strategic change in coping pattern as well as in life style to adjust them in the wake of a climatic change. In this context we are anxiously waiting for the response of households in the process and speed of adaptation in the modified techniques of production and life style. Accordingly, we asked the households in our surveyed regions about several strategies they are following currently and for comparison the future strategies they like to avail for maintaining of the existing standard of living.

The targeted households were asked about their current and future coping strategies for some given problems and the responses of households are recorded and given as follows:

Safe Water (Current Strategies):

 Table 8.5.1: Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Safe Water

	Study Area									
Present Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II					
Fetch water from other's pond/ tube well near or far	82.4	97.0	88.3	89.7	89.9					
Use little water for drink/use than need	38.0	29.4	32.3	24.1	16.7					
Collect rain water and then use in dry season	3.6	20.8	21.4	41.4	13.4					
Use purchasing water from bazaar	0	7.3	7.0	0	2.9					
Use river/khal water	0.4	3.6	2.6	3.4	2.2					
Others	0	0	0	0	0					

It is observed from the survey that current need of safe water is generally (82.45% in Basanti to 97.05% in Hingalgaunj) met by fetching water from others pond/tube well. Lack of own resource for drinking water they are compelled to curtail their minimum need by (38.0% in Basanti to 16.7% in Sandeskhali II). The scarcity of drinking water is so acute that they are even forced purchase drinking water from market. However, in Basanti and Sandeskhali I instance of purchase of water from the market has not been recorded. Use of stored rain water in dry season is also very common a strategy that has been practiced currently. This practice is quite prominent in Sandeskhali I (41.4%), Patharpratima (21.4%) and in Hingalgaunj (20.8%). Chart: 7.6.1a gives a clear visualization of these findings.





Safe Water (future Strategies):

 Table 8.5.1a: Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on

 Safe Water

	% of Households									
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II					
Collect rain water and preserve in base of house	48.9	60.0	65.3	51.7	72.8					
Re-excavate community base pond for preserve rain water through PSF	38.0	48.2	55.1	58.6	31.9					
Supply water easily with community base tube well	37.8	68.9	57.1	27.6	29.3					
Others	1.4	0	0	0	0					

For mitigating the present crisis of drinking water, respondents prefer to use mainly three future strategies namely more emphasis on the preservation of rain water, Re-excavation of community pond, and increase in number of community tube well. However they like put greater emphasis on collection of rain water particularly in Basanti, Patharpratima and Sandeskhali II. Hingalgaunj while places much emphasis on community tube well Sandeskhali I prefers community pond for enhanced supply of water in future. Chart: 7.6.1b given below may be consulted for further scrutiny.





Agriculture (current Strategy):

The present strategies to save agricultural output (crops) after obtaining signal of climatic whims (mainly from cyclonic and tidal surge), households used to collect semi ripe crops from field to minimize the loss. Some of them have also started cultivating saline tolerant crop in lieu of traditional crop. Crop cultivation with mulching system is also getting popular, although very slowly. Use of water from canal (khal) for the purpose of irrigation is also used for avoiding salinity; the scope of this is very limited. Table 8.5.2 and Chart: 8.6.2a given below, gives a detail description of current strategies the farmers used apply currently to cope with the climatic change in the field of agriculture.

Table 8.5.2.a: Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Agriculture

	% of Households							
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Collect semi ripe crops when get early warning of cyclone/tidal surge	14.8	60.4	46.3	69.0	73.6			
Cultivate saline tolerant crops in lieu of local crops	18.5	53.2	39.6	24.1	23.9			
Keep land in fallow for lack of water	6.9	35.0	24.3	31.0	26.4			
Cultivate crops with mulching system	7.2	23.1	13.5	0	0.5			
Irrigate cultivate land with khal water to reduce land	0.4	3.9	12.9	0	6.3			
Others	0	0	0	0	0			

46.3% in Patharpratima and 73.6% in Sandeskhali II prefers to collect their semi matured crop from the field untimely after receiving signal of cyclonic and tidal surge. In Hingalgaunj and Patharpratima second popular strategy is adoption of saline tolerant crops. This appears to be surprising, that inspite of being very prone to cyclone and tidal surge they failed to popularize the cultivation of saline tolerant crops at least to the desired level.





Agriculture (Future Strategy):

Regarding future strategy majority of our surveyed households prefer to shift to saline tolerant crop cultivation instead of early harvesting. According to their second choice they revealed their preferences on use of water from canal after re-excavation of canal for cultivation in dry season. Use of sufficient organic fertilizer is also stressed by them. Table 7.5.2b and Chart 7.5.2b may be consulted for further scrutiny.

	holds				
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Cultivate saline tolerant crops	23.3	67.7	60.2	69.0	56.3
Cultivate with improve irrigation system	7.1	31.6	44.1	20.7	30.7
Use mulching system	15.7	42.8	23.2	0	3.4
Use sufficient organic fertilizer	14.8	30.3	32.5	20.7	14.1
Reserve safe water with re-excavate khal to use in dry season for crop production	4.7	33.8	56.2	51.7	39.5
Others	0	0	0	0	0

 Table 8.5.2.b: Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Agriculture

Chart: 8.6.2b Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Agriculture



Fisheries (current Strategy)

To combat the impact of change in climate in the field of fisheries currently surveyed households rely mainly on untimely catching of fish, in addition, except in Basanti, they have started the saline tolerant fish culture in place of traditional species. The incidence of untimely sale of fish is also appeared to be rampant in all regions except in Basanti. Table:8.5.3.a and Chart:8.5.3 may be consulted for further detail.

 Table 8.5.3:a
 Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Fisheries

	% of Households							
Present Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Untimely commercial Catching of fish when get early warning of cyclone/tidal surge	19.3	49.5	53.4	72.4	67.8			
Culture saline tolerant fish in lieu of local species	13.9	46.2	30.6	34.5	26.6			
Sale fish for lack of water	2.8	43.6	39.1	48.3	29.9			
Supply water in gher with irrigation	0	5.6	10.9	0	1.7			
Others	3.2	0	0.2	0	0			





Fisheries (Future Strategy):

For future strategy in case of pisciculture, in all four regions (except in Basanti) surveyed households like to put emphasis on the culture of saline tolerant fish as well as on culture of fish in fresh water in re-excavated canal. While culture of saline tolerant fish receives relatively more importance in Hingalgaunj and Patharpratima, culture of fish in fresh water in re-excavated canal receives relatively more importance in Sandeskhali I and Sandeskhali II. Table: 8.6.3b and Chart: 8.6.3.b may help us for further investigation.

 Table 8.5.3a: Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Fisheries

			0/ . C .		
			% of Households		
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Culture saline tolerant fish	19.7	61.6	63.0	58.6	41.2
Culture fish with irrigate water in gher	7.5	24.6	28.9	13.8	17.5
Culture fish with reserve safe water to re-excavate khal	6.1	55.4	53.7	65.5	55.8
Others	3.5	0	0.5	0	0

Chart: 8.6.3b Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Fisheries



Livestock (current Strategy):

The present strategies in respect to livestock population in the wake of calamity are very simple, either they keep them in relatively safer place or they go for distress selling.

Table 8.5.4a:	Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact
	on Livestock

	% of Households							
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Keep livestock in safe place when get early warning cyclone/tidal surge	46.0	64.4	75.8	58.6	68.4			
Sale livestock in low price	30.5	50.5	52.8	75.9	64.2			
Give algae of gher as livestock food in lack of green grass	13.6	13.9	19.0	3.4	10.7			
Others	0.8	0	0.2	0	0.4			

Chart: 8.6.4a Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Livestock



Livestock (future Strategy):

For future strategies surveyed households prefer to have better (in terms of reliability and timeliness) information delivery system so that they can keep their livestock in safer place in right time. They also like to get facility of centre for livestock-shelter. Table:8.5.4a and Chart: 8.6.4.b may throw some more light in this aspect.

 Table 8.5.4b:
 Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Livestock

	% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Delivery reliable news about weather in right time	36.6	54.0	54.9	69.0	61.4		
Manage place in shelter center for keep livestock	43.7	48.7	63.3	41.4	50.2		
Discover saline tolerant green grass for supply to community	19.6	41.7	46.3	10.3	14.9		
Others	3.9	0	0.5	0	0.4		





Houses (Current Strategy):

Present strategies adopted to protect houses from the climatic changes are mainly use of pillars in Basanti, Hingalgaunj, Patharpratima and Sandeskhali II, in Sandeskhali I Plantation of trees observed to be the prime strategy. This also very popular in Sandeskhali II, Hingalgaunj and Patharpratima. Taking shelter in Cyclone centre is also received some attention. Following table and Chart would give us a more accurate evidence of this.

 Table 8.5.5:
 Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Houses

	% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Use pillar for protection of house before disaster	84.5	82.1	76.4	24.1	61.3		
Plant trees around houses to reduce impact of storm	25.8	55.3	49.2	72.4	61.3		
Take shelter in shelter center when get early warning of cyclone/tidal surge	20.6	33.1	42.5	6.9	30.4		
Take initiative for safe water and sanitation facilities	36.6	36.1	28.7	24.1	27.9		
Others	0	0	0.2	0	0		

Chart: 8.6.5a Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Houses



Houses (future Strategy):

As future strategy the observed households like to have more cyclone centres along with cyclone and tidal surge resistant houses. In addition they like to put emphasis on plantation more trees around the houses. They also prefer to take initiative for drinking water and sanitation facilities. Following Table and Chart may be consulted for greater understanding.

 Table 8.5.5a:
 Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Houses

	% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Make cyclone/tidal surge protection of house	56.3	72.2	53.5	48.3	65.9		
Plant trees around house	35.7	43.4	535	37.9	36.6		
Increase number of cyclone center and facilities	35.5	42.1	56.7	10.3	25.0		
Take initiative for drinking water and sanitation facilities	45.4	63.6	38.5	41.4	35.5		
Others	0	0	0	0	0		

Chart: 8.6.5b Percentage Distribution of Households by future Strategies to Cope/Adapt to Climate Change Impact on Houses



Livelihood (current Strategies):

It is observed from the survey that in five regions the present strategy to cope with the adverse effect of climate change is movement to other place in search of job. In Hingalgaunj it is observed that sale of household asset is also very common. Selling of labour in advance or borrowings from friends, relatives or from NGOs is also practiced to maintain the livelihood.

 Table 8.5.6:
 Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Livelihood

	% of Households									
Present Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II					
Move another place for job	76.1	83.9	78.9	79.3	79.7					
Sale advance labour	28.6	14.6	15.2	34.5	13.0					
Take loan from mohajan	8.4	18.2	15.2	0	4.6					
Take loan from relatives/friends	26.1	32.5	28.2	6.9	30.4					
Take loan from NGO/bank	7.3	24.3	38.1	17.2	8.0					
Take little food	23.7	17.1	6.0	6.9	21.6					
Sale household assets	3.4	72.5	13.3	0	0.9					
Others	0.4	0	0	0	0					

Chart: 8.6.6a Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Livelihood



Livelihood (future Strategies):

Future strategy to maintain livelihood, it is observed that the households prefers to have more vibrant Government and Non-Government financial assistance with procedural flexibility in the loan delivery system in addition to the provision of alternative job opportunity. The following Table and Chart will help us to understand this more clearly.

 Table 8.5.6a:
 Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Livelihood

	% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Manage alternative job	58.3	77.5	82.2	20.7	56.9		
Govt and non govt. supply food and financial support	45.7	52.9	40.7	86.2	50.2		
Manage loan from NGO/bank in easy condition	22.1	43.9	48.7	13.8	34.4		
Others	0	0	0.3	0	0		





Shrimp culture/Gher (current strategies):

On receipt of warning and/ or signals for cyclone and / tidal surge, villagers in our surveyed regions used to follow currently the untimely catching and selling of Shrimp even at an abnormally low price to avoid absolute loss. Culture of saline tolerant fish is also receiving attention particularly in Hingalgaunj, Sandeskhali I, and Sandeskhali II. However in Basanti it is yet to receive any significant attention. Use of net around the '*Gheri'* is practiced to protect 'shrimps' from flashing out during heavy rain and water logging.

 Table 8.5.7: Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Shrimp culture/gher

	% of Households						
Present Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Catch shrimp for sale in low price not due time when get early warning of cyclone / tidal surge	6.7	39.3	29.9	62.1	59.2		
Culture saline tolerant fish in lieu of local species	1.7	32.2	17.6	31.0	33.8		
Use net around gher	0.8	15.0	14.5	17.2	10.2		
Supply water in gher with irrigation	0.5	4.5	4.0	0	1.9		
Others	0	0	0.2	0	0		

Chart: 8.6.7a Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Shrimp culture/gher



Shrimp culture/Gher (future strategies)

Table 8.5.7a:
 Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Shrimp culture/gher

	% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Manage saline tolerant fish fry	9.9	43.1	36.9	41.4	37.6		
Culture fish with reserving fresh water re-excavate khal/nala	5.6	38.2	31.9	65.5	68.8		
Others	0	0.7	1.0	0	0		

Except in Basanti, in future, it is observed from the investigation that more emphasis will be given to the practice of saline tolerant fish fry. In Sandeskhali I and Sandeskhali II, fishermen likes place greatest emphasis on culture of fish in fresh water kept in re-excavated canal. Basanti being less susceptible to the impact of climatic change induced calamities appears to be less sensitive in the interrogation

Chart: 8.6.7b Percentage Distribution of Households by future Strategies to Cope/Adapt to Climate Change Impact on Shrimp culture/gherSanitation (current Strategy)

Table 8.5.8: /	Percentage Distribution	of Households by Present	t Strategies to (Cope/Adapt to	Climate	Change I	Impact
C	on Sanitation						

		% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Initiative as per need for protection of sanitation facilities	79.3	78.3	69.1	37.9	60.4			
Use neighbor's latrine	28.6	40.1	14.8	17.2	26.1			
Others	0	0	0	0	0			

Chart: 8.6.8 a Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Sanitation



Sanitation (future Strategy)

 Table 8.5.8a:
 Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Sanitation

		% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Build strong sanitary latrine in high place	70.9	83.5	61.0	48.3	69.4			
Manage govt./non govt. community base sanitary latrine	45.5	56.9	57.6	37.9	35.8			
Others	0	1.0	0	0	0			

During cyclone and heavy rain the sanitation of the villagers almost jeopardizes. Currently they some how manages the problem even by using the latrine of neighbours. But they do not like to this stop gap arrangement, they prefers the building of strong latrine in relatively high place. In this connection they prefer to the intervention of Government or agencies like NGOs.





Health (current strategy)

Table 8.5.9:
 Percentage Distribution of Households by Present Strategies to Cope/Adapt to Climate Change Impact on Health

		% of Households						
Present Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Take village doctor advice/go to pharmacy for advice	85.0	87.3	86.9	86.2	82.1			
Send emergency patient in hospital	27.2	59.2	57.8	37.9	46.3			
Others	0.4	0	0	0	0			





Health hazards particularly incidence of enteric diseases appears at a very high degree during cyclone, flood and tidal surge. To fight against these the villagers currently used to take advice and medicine directly from pharmacies/medicine shops without consulting doctors, in case emergencies they rushes to hospitals and nourishing homes. In future they likes to have change in this, they likes to have improved treatment at village level hospitals. They prefer the initiative of Panchayat. They also expressed that the Government/NGOs should supply medicine at free of cost from these hospitals.

Health (future strategy)

 Table 8.5.9a: Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Health

	% of Households						
Future Strategies	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II		
Provide good treatment in village level	64.8	70.4	60.5	58.6	69.4		
Build hospital in Panchayat level	41.8	53.2	56.8	41.4	38.8		
Govt./non govt. supply medicine in hospital at free of cost	35.9	64.4	75.1	55.2	48.5		
Others	0	0	0	0	0		

Chart: 8.6.9 b Percentage Distribution of Households by Future Strategies to Cope/Adapt to Climate Change Impact on Health



Table 8.6 Availability of post calamity assistance:

It is observed from the survey that nearly half of the household did not receive any post calamity assistance. It is further observed that maximum assistance was available in Hingalgaunj and Sandeskhali I.

	% of Households				
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Yes	47.6	67.0	56.4	69.0	56.7
No	46.6	31.8	43.6	31.0	43.3
Total	100.0	100.0	100.0	100.0	100.0




It is visibly clear from the following Table and Chart that the main sources of post calamity temporary shelter were relatives and neighbours in Basanti, Hingalgaunj and Basanti II (however very meager in numbers), Government Institution in Patharpratima and NGO in Sandeskhali I. In fact according to 72.7% of households in Sandeskhali I replied that they have taken temporary shelter in NGO buildings.

		% of Households							
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II				
Relative/neighbor	15.5	11.0	22.8	4.5	2.6				
Friends	4.3	0.6	10.3	0	1.3				
Money lender	1.1	0	0.6	0	0				
NGO	7.2	0	8.6	72.7	0				
Government institution	5.2	0	30.0	0	2.6				

 Table 8.6.1
 Source of post calamity temporary shelter

Chart: 8.8 Source of post calamity temporary shelter



In none of the areas much post calamity assistance was received for repairing and building of houses, except in Patharpratima where maximum assistance in this head was availed from Governmental sources (51%) and NGOs (22.4%). Following Table and may be used for a more comprehensive understanding.

Table 8.6.2 Sources of post calamity assistance for house building/repair

	% of Households						
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL	
Relative/neighbor	2.1	3.8	0.6	18.2	6.6		
Friends	0	0.6	0	13.6	2.6		
Money lender	1.0	0	0	0	0		
NGO	0	1.1	22.4	4.5	1.3		
Government							
institution	3.1	2.8	51.4	0	19.7		
Total							





 Table 8.6.3
 Source of post calamity financial assistance

	% of Households						
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL	
Relative/neighbour	5.2	8.8	9.0	13.6	7.9		
Friends	21.6	2.8	12.1	18.2	13.2		
Money lender	7.3	2.2	4.6	4.5	1.3		
NGO	0	0.6	3.4	9.1	3.9		
Government institution	32.4	41.4	54.4	13.6	38.2		
Total							

Chart: 8.10 Source of post calamity financial assistance



For production of food substantial post calamity assistance was availed in four regions except Basanti. In most of the regions Governmental agencies appeared as primary source of such assistance, 73.7% in Sandeshkhali II,50% in Patharpratima and 42% in Hingalgaunj. In Sandeskhali I NGOs appeared as primary source(77.3%). For further information following Table and Chart may be consulted.

	% of Households							
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Relative/neighbor	0	9.9	0	9.1	7.9			
Friends	2.2	0.6	0.6	4.5	10.5			
Money lender	2.0	0	0.6	0	0			
NGO	13.5	20.4	36.8	77.3	13.2			
Government institution	5.2	42.0	50.0	4.5	73.7			

 Table 8.6.4
 Source of post calamity assistance for food production

Chart: 8.11 Source of post calamity assistance for food production



In case of post calamity assistance for clothing too Government Institutions have been observed to be the major most source(except in Basanti where NGOs appeared as the primary source for the purpose). NGOs appear as second important source. The only exception is Sandeskhali I where some assistance available from Relatives and Neighbours, assistance from other sources was virtually absent in this region

Table 8.6.5	Source of	post calamit	y assistance	for clothing
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	% of Households							
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II			
Relative/neighbor	1.1	2.2	2.9	13.6	9.2			
Friends	2.1	0	0.6	0	3.9			
Money lender	0	0	1.7	0	0			
NGO	23.8	22.1	38.6	0	17.1			
Government institution	2.8	32.0	40.5	0	44.7			



Chart: 8.12 Source of post calamity assistance for clothing

So far post calamity assistance for capital assets is concerned, as expected, no sources are important except the Government Institution, that too in Basanti and Hingalgaunj, in other areas their presence is not felt at all. In Patharpratima only 6% of respondents availed post calamity assistance in this head from Government Institutions.

		% of Households							
Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II				
Relative/neighbor	1.0	0	0.3	0	0				
Friends	1.1	0	0.2	0	0				
Money lender	0	0	0.5	0	0				
NGO	1	1.0	1.0	0	0				
Government institution	22.4	12.9	5.8	0	0				

 Table 8.6.6
 Source of post calamity assistance for capital assets

Chart: 8.13 Source of post calamity assistance for capital assets



ANNEXURE-VIII

	Study Area							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
Reduce	10.8	0.3	0	0	1.1			
No change	9.0	4.0	2.0	24.1	11.6			
Intensify	74.6	77.9	94.8	62.1	79.0			
Don't know	4.9	16.8	3.2	13.8	7.6			
Total	100.0	100.0	100.0	100.0	100.0	100.0		

Table 8.4.1: Perception about Future Trend of Flood

Chart: 8.4.1: Perception about Future Trend of Flood in Basanti



Chart: 8.4.2: Perception about Future Trend of Flood in Hingalgaunj







Chart: 8.4.4 Perception about Future Trend of Flood in Sandeskhali I



Chart: 8.4.5 Perception about Future Trend of Flood in Sandeskhali II



N4	% of Households							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
reduce	2.2	1.3	0.2	3.4	6.9			
No change	29.1	9.6	1.0	37.9	24.3			
intensify	52.7	69.6	91.3	20.7	48.6			
Don't know	14.5	17.5	7.0	37.9	19.6			
Total	100.0	100.0	100.0	100.0	100.0	0 100.0		

Table 8.4.2: Perception about Future Trend of Drought and its Severity

Chart 8.5.2 Perception about Future Trend of Tidal Surge



Chart 8.5.3 Perception about Future Trend of Tidal Surge



Table8.4.3: Perception about Future Trend of Tidal Surge

Measures	% of Households							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
reduce	6.1	1.3	0.7	6.9	4.7			
No change	19.4	14.9	2.0	20.7	22.5			
intensify	57.2	62.7	63.2	27.6	52.9			
Don't know	16.5	19.8	33.4	44.8	18.8			
Total	100.0	100.0	100.0	100.0	100.0	100.0		





Table 8.4.4: Perception about Future Trend of Cyclone

		% of Households						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
reduce	3.6	5.3	0.8	0	5.8			
No change	11.9	21.5	3.8	6.9	21.7			
intensify	65.1	49.2	51.2	58.6	44.6			
Don't know	18.7	22.4	43.5	34.5	26.8			
Total	100.0	100.0	100.0	100.0	100.0	100.0		

Chart 8.5.5 Perception about Future Trend of Cyclone



 Table 8.4.5: Perception about Future Trend of Tornado

		% of Households							
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL			
reduce	1.4	7.6	0.5	0	5.4				
No change	6.1	13.2	1.8	3.4	5.1				
intensify	18.6	7.3	16.1	24.1	7.2				
Don't know	72.0	66.7	77.9	72.4	80.8				
Total	100.0	100.0	100.0	100.0	100.0	100.0			

Chart 8.5.6 Perception about Future Trend of Tornado



Table 8.4.6: Perception about Future Trend of Sea Level Rise

		% of Households						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
reduce	18	7.9	3.7	0	4.0			
No change	5.7	14.2	6.9	10.3	7.2			
intensify	20.4	8.3	34.6	51.7	20.3			
Don't know	70.3	65.3	53.8	37.9	67.4			
Total	100.0	100.0	100.0	100.0	100.0	100.0		

Chart 8.5.7 Perception about Future Trend of Sea Level Rise



 Table 8.4.7: Perception about Future Trend of Salinity

		% of Households						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
reduce	1.1	4.6	0.2	3.4	11.6			
No change	38.7	16.5	13.0	17.2	24.6			
intensify	46.2	44.2	40.8	48.3	22.5			
Don't know	12.2	32.0	45.0	31.0	40.6			
Total	100.0	100.0	100.0	100.0	100.0	100.0		





Table 8.4.8: Perception about Future Trend of Water Logging

		% of Households						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
reduce	13.3	6.9	2.7	6.9	12.7			
No change	34.1	17.8	6.5	13.8	25.4			
intensify	25.1	24.1	25.3	27.6	18.8			
Don't know	24.7	76.2	63.9	51.7	42.4			
Total	100.0	100.0	100.0	100.0	100.0	100.0		

Chart 8.5.9 Perception about Future Trend of Water Logging



Table 8.4.9: Perception about Future Trend of Water Pollution

	% of Households						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL	
reduce	9.0	2.3	0.3	6.9	6.9		
No change	34.4	20.5	4.8	6.9	23.6		
intensify	35.1	49.8	72.7	55.2	44.6		
Don't know	20.4	22.8	20.7	31.0	23.9		
Total	100.0	100.0	100.0	100.0	100.0	100.0	



Chart 8.5.10 Perception about Future Trend of Water Pollution

 Table 8.4.10:
 Perception about Future Trend of Erratic Rainfall

	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL	
reduce	4.3	11.2	2.2	3.4	9.1		
No change	16.8	22.4	6.9	3.4	19.2		
intensify	45.9	23.1	32.9	13.8	32.6		
Don't know	31.5	38.9	55.5	79.3	38.4		
Total	100.0	100.0	100.0	100.0	100.0	100.0	

Chart 8.5.11 Perception about Future Trend of Erratic Rainfall



Table 8.4.11: Perception about Future Trend of Earth Quake

	Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL	
reduce	1.4	5.3	0.7	3.4	5.4		
No change	11.5	16.5	4.8	3.4	15.6		
intensify	45.9	36.0	28.8	17.2	36.6		
Don't know	40.9	40.9	63.9	75.9	41.3		
Total	100.0	100.0	100.0	100.0	100.0	100.0	

Chart 8.5.12 Perception about Future Trend of Earth Quake



 Table 8.4.12:
 Perception about Future Trend of Cold Wave

		Study Area						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL		
reduce	2.9	7.6	20.6	0	13.4			
No change	12.2	7.3	3.3	3.4	17.4			
intensify	22.2	11.6	4.8	20.7	11.2			
Don't know	59.9	65.0	68.1	72.4	55.8			
Total	100.0	100.0	100.0	100.0	100.0	100.0		

Chart 8.5.13 Perception about Future Trend of Cold Wave



 Table 8.4.13:
 Perception about Future Trend of Hot Wave

	% of Households						
	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II	ALL	
reduce	9.0	2.3	0.3	6.9	6.9		
No change	34.4	20.5	4.8	6.9	23.6		
intensify	35.1	49.8	72.7	55.2	44.6		
Don't know	20.4	22.8	20.7	31.0	23.9		
Total	100.0	100.0	100.0	100.0	100.0	100.0	

Chart 8.5.14 Perception about Future Trend of Hot Wave







CHAPTER NINE

Gender and Climate Change

Women in the Sunderbans commonly experience many **disadvantages** with climate change. They have to work **harder** for a livelihood but have less control over income and productive resources. Being poorly represented in policy and decision making, their opportunities for human development are also gradually whittled away. Women also suffer when men migrate, left to run the households with meager resources. At least 50 per cent of the women here are anemic due to pregnancy, lactation and inequitable food distribution within families. As per national statistics about 58 per cent girl children are underweight and 18 per cent malnourished. There has been a sharp rise in the number of women marginal labourers, from 6-10 per cent, between 1991 and 2001.As competition for resources get tougher, it becomes more difficult for women to access them. For example, fry (prawn seedlings) collection, an economic activity that supplements household income, faces **declining prices**, increasing restrictions from the forest department, dwindling stock of fries, limited access to support services, resource opportunities and social exclusion. Women **who are engaged** in fry collection usually do so because of no other viable alternative. These women are considered to have low social status and are often excluded from village functions.

9.1 Collection and Usage of Fuel Wood:

Fire wood plays a crucial role in a subsistence rural economy particularly in absence of other alternative fuel sources. From our surveyed study we found that use of fire wood for the purpose of mainly cooking is very popular in all five selected regions of Sunderbans. Sometimes these fire woods are collected from own premises, but that is far less than their requirement and naturally they need to collect it from outside, sometimes they even go to Sunderbans for the collection of these fire wood. Collection of fire wood from Sunderbans is extremely hazardous and full of uncertainty and risk. It is observed that in Sandeskhali I, surveyed households are mainly dependent on the purchase of fire wood from market. In the subsequent sub section we shall be examining how this time absorbing less productive job load is distributed among the different members of the family.

9.1.1: Collection of fire wood from own premises:

The table below gives an idea that this job is mainly done by the wives of the families. In Hingalgaunj, Patharprtima and in Sandeskhali II more than 60 p.c. of households respond that this job is done by the wives. In Basanti nearly 35p.c. of households respond that the wives used to perform this job. Table 9.1.1 & Chart 9.1.1 exhibits this.

% of Hh					
Collector	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Husband	2.6	6.6	3.0	0	14.2
Wife	34.6	61.7	67.6	0	61.8
Son	0.4	4.0	0	0	0
Daughter	0.9	0	1	0	0

Chart: 9.1.1 collection of fire wood from own premises

Chart: 9.1.1 collection of fire wood from own premises



9.1.2: Collection of fire wood from outside:

The job distribution among family members in case of Collection of fire woods from outside also follows the same pattern except for Sandeskhali I where collection of fire woods is totally unfound. In all four other regions wives are dominant agent in this job, however, the involvement of wives are relatively more in Basanti & Hingalgaunj. The following Table and Chart will depict this more clearly.

% of Hh					
Collector	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Husband	0.4	5.0	2.0	0	3.3
Wife	58.5	55.4	27.7	0	34.8
Son	1.3	3.6	0.3	0	0.7
Daughter	0.8	3.3	1.5	0	0

Table 9.1.2 collection of fire wood from outside

Chart: 9.1.2 collection of fire wood from outside



9.1.3: Collection of fire wood from Sunderbans:

Helplessness and vulnerability of women of Sunderbans can easily be observed from the findings of this section. The involvement of risk and hazard in collection of fire wood from Sunderbans is a well known fact and its need no elaboration. In all five regions the main collector of fire woods from Sunderbans is wife. In Basanti and Patharpratima its incidence is as high 36.4% and 47.1% respectively. This is revealed from Table and Chart furnished below.

Table 9.1.3 C	Collection of fire	wood from	Sunderbon
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% of Hh					
Collector	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Husband	3.0	0.3	8.3	3.4	1.4
Wife	36.4	7.3	47.1	6.9	23.2
Son	1.7	0	0.3	0	0.4
Daughter	3.0	0	0.8	0	0.7

Chart: 9.1.3 collection of fire wood from Sunderbon



9.1.4: Collection of fire wood by purchase:

In case of market purchase of fire wood the job distribution underwent a drastic change, in all five regions the share of collection by husbands increased suddenly, in Basanti, Hingalgaunj and Patharpratima the relative shares of husbands surpassed that of wives. This once again re establishes the patriarchies that are prevailing even in these subsistence societies. Women are relatively more exposed to non-market activities. However in Sandeskhali I and Sandeskhali II the relative supremacy of wives in share persists. This is quite explicit from the following Table and Chart.

% of Hh					
Collector	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Husband	32.6	41.9	20.5	24.1	29.3
Wife	17.9	38.0	18.4	65.5	33.7
Son	0.4	2.0	1.7	0	0.7
Daughter	0.4	0	0	0	0

Chart: 9.1.4 collection of fire wood by purchase



9.2 Collection and Usage of Water:

Like fire wood, water is another important component of human life. Sunderbans, in spite of being a river based land space it suffers from acute crisis of sweet water for drinking and other purposes mainly because of its proximity to Bay of Bengal. Collection of water involves lot of time, labour and sometimes hazards also. Sources water are ponds (both own pond and others' ponds) tube wells (both own and others'), and Rivers/ Canals flowing nearby.

So far collection of drinking water from own pond is concerned women under takes the main responsibility of collection of drinking water. In Patharpratima, nearly 73p.c. of households respond that wives used to collect drinking water from own ponds. Collection of water from others' pond is more relevant in Basanti, Sandeskhali I and in Hingalgaunj. Women remains the major collector of water in all five regions.

Availability of own tube well is very rare across the households in our survey region, normally they collects water from others' tube wells. But the collectors remain unchanged. The distribution of collectors revealed by the tables and charts is highly skewed and the almost entire job is shouldered by the women folks. This is also true for all other sources of water used for the purpose of drinking. Table: 9.3.1 to Table 9.3.6 and **Chart: 9.3.1 to Chart 9.3.6** may also be considered for further probing.

Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Husband	2.1	1.7	4.7	0	9.8
Wife	21.5	55.1	73.1	20.7	46.7
Son	0.4	1.0	0	0	2.2
Daughter	0.9	0	2.7	0	0.4

Table 9.3.1: collection of drinking water from	Own pond	(% of Hh)
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Chart: 9.3.1 collection of drinking water from Own pond (% of Hh	1)
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 Table 9.3.2
 collection of drinking water from Own tube well (% of Hh)

Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Husband	0	0.3	0.3	0	1.1
Wife	2.1	1.7	6.4	0	4.7
Son	0.4	0	0	0	0
Daughter	0.4	0	0.2	0	0

Chart: 9.3.2 collection of drinking water from Own tube well (% of Hh)



 Table 9.3.3: collection of drinking water from Others' pond (% of Hh)

Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALII	SANDESHKHALI II
Husband	2.2	3.3	0.8	0	1.1
Wife	44.2	59.7	25.7	72.4	22.1
Son	0.9	1.0	0.5	0	0
Daughter	0.4	1.0	0.5	0	3.3

Chart: 9.3.3: collection of drinking water from Others' pond (% of Hh)



Table 9.3.4 collection of drinking water from Others' tube well (% of Hh)

Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Husband	1.3	5.0	2.0	0	4.2
Wife	88.9	90.4	63.8	86.2	65.3
Son	0.9	0.3	1.2	0	0.4
Daughter	3.4	1.7	3.6	0	3.4

Chart: 9.3.4: collection of drinking water from Others' tube well (% of Hh)



 Table 9.3.5
 collection of drinking water from River/canal(% of Hh)

Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALII	SANDESHKHALI II
Husband	0	0	0.7	0	0
Wife	8.9	1.7	4.1	0	0.4
Son	0	0	0.5	0	0
Daughter	0	0	0.3	0	0

Chart:9.3.5 collection of drinking water from River/canal(% of Hh)



 Table 9.3.6
 collection of drinking water from Other Sources(% of Hh)

Source	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALII	SANDESHKHALI II
Husband	0	0	0.4	0	0
Wife	0.4	0.3	21.5	3.4	24.4
Son	0	0	0	0	0
Daughter	0	0	0.4	0	0

Chart: 9.3.6 collection of drinking water from Other Sources(% of Hh)



9.4 Disaster Management Center (DRR Related Institute) and Female Members

Disaster Risk Reducing institutes are involved in the reduction of the impact of disaster by protecting River Embankments, Mangrove Plantation & Preservation. Early Evacuation also reduces the Risk. Rescue and Shifting of Women, Child & the Aged to a safer place like School Buildings or High Areas is one of them. Also arrange Portable Water, Dry Foods, ORS Packets and Medicines as per availability. We have enquired about the membership of it particularly among the women .The respondents were asked whether the female members of the households were involved in any institutions related to DRR and it was found that in Sandeskhali I none of the female respondents have any membership with the DRCSC. Women membership is highest in Sandeskhali II where it is only around 6 p.c. Thus our survey reveals that the DRCSCs are yet to attract the women member.

	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Yes	4.5	0.7	4.3	0	6.2
No	94.5	99.3	95.7	100	93.8

9.4 Membership of Disaster Management Center of Female Members (% of Hh)

Chart: 9.4 Membership of Disaster Management Center of Female Men	nbers (% of Hh	Hh)
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9.5: Shelter Usage Practice of Women

We have enquired whether women members of the families are taking shelter in disaster-shelter centre or not. In this case we received mixed reaction in different region. In Basanti 58 p.c. of women recorded that they had taken shelter in these disaster relief centre. But in other four regions majority did not receive the service of these shelter-centres. In Sandeskhali I only 17.2 p.c. of women said that they have taken shelter in these centres. As a whole we can say that the efficacy of these centres did not match the aspiration of the local people and more or less failed to attract the majority of women victim of calamity.

9.5.1 Refuge in Disaster Relief Shelter by female members (% of Hh)

	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Yes	58.0	34.0	37.5	17.2	34.4
No	41.6	66.0	61.7	82.8	65.6

Chart: 9.5.1 Refuge in Disaster Relief Shelter by female members (% of Hh)



9.5.2: Causes of Not Going to Shelter Centre

We enquired why these centres failed to attract women member of the society. Accordingly we framed the questions so that we can investigate the underlying causes behind this unattractiveness of these centres. 'Over congestions', 'lack of separate arrangement for women' 'inadequate sanitation' & 'lack of space for domestic animals' appears as important reasons behind not going to cyclone shelter. 'Fear of Outrage of Dignity' may also be considered as a factor behind this. Table and Chart 8.5.2 would help us further in understanding the reasons.

Causes	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
1. Over congestion	31.7	77.1	45.6	62.5	60.1
2. inadequate sanitation	23.8	82.2	44.2	45.8	48.5
3. no separate arrangement for women	30.5	88.0	64.3	37.5	56.3
4. no space of domestic animals	4.9	74.3	21.6	41.7	37.0
5. inadequate communication	14.6	45.8	18.9	70.8	56.2
6. fear of outrage of dignity	10.7	47.9	18.6	54.2	21.4
7. hooligans	11.7	20.0	4.6	12.5	6
8 others					

Table: 9.5.2: Causes of Not Going to Shelter Centre

Chart: 9.5.2:	Causes	of Not	Going to	Shelter	Centre
•	00000				



9.6: Mitigation of the Problems in Shelter Center:

We have also made an enquiry how the problem of shelter center can be mitigated. What additional arrangement be made so that these centers become acceptable to villagers particularly to the women members. Keeping this problem in our mind we made an enquiry and improvement sought by the interviewees are recorded and furnished in the following Table: 8.6.1. It is observed that in all regions the main improvements that they desired are 'Separate Arrangement for Women', 'Better Security Arrangement', 'and Adequate Sanitation Facility' along with increased number of centers. The following table and chart may be considered for relative priority shown in different regions.

Table: 9.6.1 Mitigation	of the	Problems	in Shelter	· Centre
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	Causes	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
1.	Separate arrangement for women	40.4	90.8	67.0	50.0	51.1
2.	space of domestic animals	6.9	77.7	36.1	41.7	35.7
3	adequate sanitation	23.3	75.0	48.2	25.0	33.0
4.	better security	40.5	71.4	40.4	66.4	37.4
5.	increased number of centers	36.3	67.6	32.0	62.5	40.1
6.	improvement of communication	35.0	42.3	25.0	62.5	36.3
7.	food supply during cyclone	35.0	44.5	23.6	33.3	29.7

Chart: 9.5.4: Mitigation of the Problems in Shelter Centre



9.6: Women's Contribution in Household Income:

Women's contribution in family income varies widely across the regions. It is highest in Patharpratima (Rs. 7759 per year) and lowest in Sandeskhali I (Rs.1603 per annum). Women's annual income closely varies between Basanti (Rs.3397/-) and Sandeskhali II (Rs.4287/-). The sources income of women appears to very inelastic. In Basanti the Major sources of women's income are selling fry(39%) and others(30%), in Hingalgaunj the major sources are income as daily wage labour (29%) and Selling of fry (24%). In Patharpratima Poultry (23%), daily wage labours (22%) and Selling Vegetables (16%) are the main sources of income of women. In Sandeskhali I selling of cattle(47%) and selling of milk(32%) may be considered as prime source of women's income. The main sources of income of women in Sandeskhali II are Income from Daily Wage Labour (42.6%) and selling of Fry (25.5%). From the above findings we can infer that income generated by women is not only meager but also not uniform across the regions. In addition these incomes are not primary but may be considered as supplementary source of income which appears to be inelastic.

	BASANTI	HINGALGUNJ	PATHAR PRATIMA	SANDESHKHALI I	SANDESHKHALI II
Growing vegetables	45	309	1231	0	95
Poultry	183	714	1768	286	224
Daily wage labour	193	1203	1728	52	1827
Selling fish	106	292	487	0	206
Selling fry	1337	999	914	0	1095
Selling cattle	475	13	596	748	177
Selling milk	50	72	293	517	10
Grocery	0	7	64	0	42
others	1008	503	678	0	611
Total	3397	4112	7759	1603	4287

Table 9.6 Income of Female Members by various sources

Chart: 9.6 Income of Female Members from various sources



9.7 Gender Division of Labor: Disaster Perspective:

Women bear almost all responsibility for meeting basic needs of the family, yet are systematically denied the resources, information and freedom of action they need to fulfill this responsibility. The vast majority of the world's poor are women. Two-thirds of the world's illiterates are female. Of the millions of school age children not in school, the majority are girls. The current world food price crisis is having a severe impact on women. Around the world, millions of people eat two or three times a day, but a significant percentage of women eat only once. And, now, many women are denying themselves even that one meal to ensure that their children are fed. These women are already suffering the effects of even more severe malnutrition, which inevitably will be their children's fate as well. The impact of this crisis will be with us for many years. Studies show that when women are supported and empowered, all of society benefits. Their families are healthier, more children go to school, agricultural productivity improves and incomes increase. In short, communities become more resilient.

Given this back drop, we like to examine the role of women and degree of women empowerment particularly in the issues related to the distribution of work as well as in the decision making power. We like to enquire further that whether there exists any difference in the pattern of their distribution and in the pattern of decision making power of the women as well as of the men.

We have taken twenty four activities which include **major decision** like 'addressing of food crises', sale of food, seed, trees, land, houses and sale of ornaments; loans from different sources, of migration, and **minor issues** like involving in gardening, poultry/duck rearing and shrimp/crab culture. It is observed from the survey that in **all major cases**, males are dominant in decision making particularly in **'Normal'** period in almost all regions, and the role of **joint decision** making increases substantially during the period of **'Disaster**' and more interestingly the relative male dominance increases once again in the '**Post Disaster'** period. In minor issues like 'Homestead Gardening' 'Poultry/Duck rearing' etc, Women enjoy relatively greater power in decision making. Another interesting aspect that has come out of our survey is so far loans from NGOs/CBOs are concerned women are left with more decision making power may be because NGOs are more flexible towards women folk. This appears to be strategic delegation of power to women to ensure availability of loans from NGOs. Table: 9.9.1 to Table: 9.9.5 and Chart 9.9.1a to Chart 9.9.5c in **Annexure-IX** may be consulted for further clarification.

ANNEXURE-IX

 Table: 9.9.1: Gender Role in Different Type of Works during Normal/Disaster/Post Disaster Periods (Basanti)

								(Perce	entage)
Type of Works		Normal		Duri	ng disas	ter	After disaster		
	male	female	jointly	male	female	jointly	male	female	jointly
Addressing food crisis	39.9	6.2	38.3	15.2	4.3	78.5	22.7	15.5	59.3
Sale of livestock	20.7	7.3	23.3	24.8	12.4	53.1	28.1	14.9	37.7
Sale of food	9.3	9.8	9.3	13.1	8.2	63.9	28.3	5.0	38.3
Sale of seed	1.6	0	0.5	14.3	0	14.3	14.3	0	14.3
Sale ornaments	2.8	0	1.1	27.8	5.6	16.7	35.0	5.0	20.0
Sale trees	5.4	1.1	4.3	39.3	7.1	32.1	24.1	17.2	31.0
Sale land	2.2	0	0	41.7	0	0	30.8	0	0
Mortgaging land	0.5	1.1	0	18.2	9.1	0	10.0	10.0	0
Sale house	0	0.5	0	0	12.5	0	11.1	0	0
Loan from relatives	12.4	1.2	15.9	40.0	3.5	47.1	40.9	7.5	39.8
Loan from mohajan	5.4	3.3	6.5	26.1	6.5	50.0	27.9	13.6	36.4
Loan from bank	7.0	1.6	1.6	31.0	13.8	34.5	46.7	10.0	26.7
Loan from NGO/CBO	5.0	8.9	7.8	1.8	20.0	67.3	12.5	30.4	44.
Arrange alternative job	0.5	0	1.1	6.7	0	46.7	13.3	0	40.0
To use deposit/saving	1.7	0.6	4.0	8.3	5.6	63.9	8.3	5.6	58.3
VGD/VGF	24.0	21.1	16.0	40.7	10.7	46.0	49.0	12.3	34.8
Permanent migration	3.2	2.1	3.7	31.0	13.8	34.5	57.1	5.7	20.0
Temporary migration	3.4	2.9	19.2	25.7	5.7	62.9	25.4	7.5	49.3
Cultivation of disaster tolerant crops	2.2	0	7.5	11.1	7.4	63.0	20.0	0	52.0
Poultry/duck rearing	1.6	18.8	2.2	4.0	66.0	18.0	0	62.0	24.0
Homestead vegetables gardening	6.4	1.6	1.1	50.0	3.6	21.4	46.4	10.7	21.4
Shrimp culture	0	0	0	0	0	14.3	0	0	14.3
Crab culture	0	0	0	0	0	28.6	0	14.3	0
Others	0.5	0.5	0.5	18.2	0	18.2	9.1	9.1	27.3

Chart: 9.9.1. a : Gender Role in Different Type of Works during Normal period in Basanti



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Chart: 9.9.1.b: Gender Role in Different Type of Works during Disaster period in Basanti

Chart: 9.9.1.c: Gender Role in Different Type of Works during Post Disaster period in Basanti



(Percentage)

Type of Works		Normal		Dur	ing disas	ster	Af	After disaster		
	male	female	jointly	male	female	jointly	male	female	jointly	
Addressing food crisis	35.4	11.7	51.4	19.7	13.8	66.5	28.7	16.1	53.1	
Sale of livestock	16.3	14.4	28.3	32.8	14.2	41.5	15.8	25.7	45.4	
Sale of food	7.4	4.3	21.8	14.0	6.6	52.1	9.1	9.1	53.7	
Sale of seed	7.8	0.8	4.7	24.2	2.1	12.6	21.1	3.2	13.7	
Sale ornaments	4.7	1.9	17.5	13.3	9.7	39.8	12.4	8.8	42.5	
Sale trees	10.9	3.9	24.5	26.4	9.5	39.9	28.9	7.4	39.6	
Sale land	5.4	0.4	13.6	13.9	1.0	35.6	20.8	2.0	30.7	
Mortgaging land	12.5	0.8	12.5	31.6	1.7	27.4	30.8	1.7	29.1	
Sale house	1.6	0.8	10.9	7.0	2.3	32.6	4.7	2.3	15.1	
Loan from relatives	15.2	3.5	22.6	21.5	9.2	57.7	23.1	9.2	53.1	
Loan from mohajan	4.3	1.2	6.6	10.3	5.1	28.2	15.0	3.8	26.2	
Loan from bank	11.7	0.4	9.7	28.0	5.0	27.0	32.7	3.0	23.8	
Loan from NGO/CBO	2.3	0.8	3.9	12.5	6.2	32.8	12.1	4.5	31.8	
Arrange alternative job	11.7	0.4	14.4	18.4	5.8	49.5	25.0	4.8	47.1	
To use deposit/saving	6.6	2.3	25.3	7.6	5.3	61.8	12.9	6.8	47.0	
VGD/VGF	38.9	14.8	36.2	43.8	13.3	41.2	32.4	14.9	44.8	
Permanent migration	2.3	1.2	17.9	8.7	6.7	44.2	8.7	3.8	43.3	
Temporary migration	5.4	1.9	24.1	8.6	7.8	60.2	10.9	6.2	49.2	
Cultivation of disaster tolerant crops	10.9	4.3	12.1	20.0	6.4	33.6	23.6	13.6	29.1	
Poultry/duck rearing	5.8	53.1	14.4	5.0	58.4	28.7	3.5	72.1	16.9	
Homestead vegetables gardening	7.4	13.2	19.1	11.8	25.2	35.4	13.4	26.0	42.5	
Shrimp culture	3.9	1.2	2.3	8.2	8.2	8.2	18.0	11.5	8.2	
Crab culture	0	0.4	0	0	6.0	0	2.0	6.0	0	
Others	0	0	0	0	0	0	0	4.0	0	

Table: 9.9.2: Gender Role in Different Type of Works during Normal/Disaster/Post Disaster Periods (Hingalgaunj)

Chart: 9.9.2. a: Gender Role in Different Type of Works during Normal period in Hingalgaunj





Chart: 9.9.2. b: Gender Role in Different Type of Works during Disaster period in Hingalgaunj

Chart: 9.9.2. c: Gender Role in Different Type of Works during PostDisaster period in Hingalgaunj



(Percentage)

Table: 9.9.3: Gender Role in Different Type of Works during Normal/Disaster/Post Disaster Periods (PatharPratima)

Type of Works		Normal		Duri	ng disast	er	After disaster		
	male	female	jointly	male	female	jointly	male	female	jointly
Addressing food crisis	35.2	6.3	53.8	28.8	6.9	59.4	36.8	6.6	51.8
Sale of livestock	13.7	7.7	17.7	17.4	4.8	33.2	21.7	9.6	23.9
Sale of food	8.7	2.2	9.7	23.1	1.2	15.3	16.3	3.9	25.3
Sale of seed	4.0	1.1	0.2	7.6	1.8	1.8	11.9	3.2	2.2
Sale ornaments	2.3	2.3	2.3	2.6	1.5	3.6	2.9	6.3	3.4
Sale trees	18.2	2.1	2.3	28.3	2.1	3.0	33.6	4.0	2.4
Sale land	13.8	0.3	2.9	29.9	1.1	3.7	30.7	0.5	6.2
Mortgaging land	7.6	0.3	0.3	12.7	0.5	2.1	19.2	0.5	1.5
Sale house	5.4	0	0.3	10.2	0	1.1	12.8	0	1.1
Loan from relatives	12.8	1.4	17.9	16.0	1.8	28.8	25.6	1.3	26.1
Loan from mohajan	5.2	0.5	6.6	10.2	0	16.5	16.0	1.1	14.4
Loan from bank	10.0	5.1	7.3	17.3	6.4	15.8	22.0	11.9	14.8
Loan from NGO/CBO	4.3	5.4	13.7	7.8	6.7	28.0	11.5	13.4	23.5
Arrange alternative job	15.5	1.4	19.6	15.37	0.9	41.3	33.6	3.5	28.9
To use deposit/saving	14.5	2.5	13.1	29.6	3.1	24.0	29.2	6.1	26.4
VGD/VGF	19.6	14.6	50.3	29.4	7.5	54.2	22.3	15.5	52.8
Permanent migration	10.9	1.4	5.7	21.3	11.5	56.3	22.8	1.0	11.9
Temporary migration	10.6	1.6	11.2	17.9	3.3	25.0	24.8	2.6	18.
Cultivation of disaster tolerant crops	6.8	1.4	8.5	9.6	2.0	10.1	13.0	4.2	18.6
Poultry/duck rearing	2.4	28.1	10.2	4.8	35.2	18.8	2.6	42.0	20.4
Homestead vegetables gardening	2.2	13.0	17.1	10.7	11.2	15.2	4.6	23.1	28.2
Shrimp culture	1.6	4.1	3.0	5.5	2.5	10.4	1.8	7.8	10.8
Crab culture	0.3	0.8	1.9	3.3	2.0	3.3	1.9	1.9	6.5
Others	0.3	0.3	0.5	0	0	3.6	1.2	1.2	3.5

Chart: 9.9.3. a: Gender Role in Different Type of Works during Normal period in Patharpratima





Chart: 9.9.3. b: Gender Role in Different Type of Works during Disaster period in Patharpratima

Chart: 9.9.3. c: Gender Role in Different Type of Works during Post Disaster period in Patharpratima



 Table: 9.9.4: Gender Role in Different Type of Works during Normal/Disaster/Post Disaster Periods (Sandeskhali I)

 (Percentage)

Type of Works		Normal		Duri	ng disast	ter	Aft	After disaster		
	male	female	jointly	male	female	jointly	male	female	jointly	
Addressing food crisis	10.3	10.3	10.3	10.3	10.3	13.8	6.9	10.3	6.9	
Sale of livestock	3.4	0	0	3.4	6.9	3.4	3.4	6.9	0	
Sale of food	3.4	17.2	0	0	6.9	3.4	0	6.9	13.8	
Sale of seed	0	0	0	0	0	0	0	0	0	
Sale ornaments	3.4	0	0	0	0	0	0	0	0	
Sale trees	3.4	3.4	0	3.4	0	0	0	0	3.4	
Sale land	3.4	3.4	0	0	0	0	0	0	6.9	
Mortgaging land	3.4	0	10.3	3.4	3.4	0	3.4	3.4	10.3	
Sale house	0	0	6.9	0	0	0	0	0	6.9	
Loan from relatives	0	0	0	0	0	0	3.4	0	0	
Loan from mohajan	6.9	0	0	3.4	0	0	3.4	0	3.4	
Loan from bank	0	0	0	0	0	0	0	0	0	
Loan from NGO/CBO	0	0	0	0	0	0	0	0	6.9	
Arrange alternative job	0.	6.9	0	0	10.3	0	0	10.3	0	
To use deposit/saving	3.4	3.4	0	0	3.4	0	0	3.4	6.9	
VGD/VGF	0	0	0	0	0	0	3.4	0	0	
Permanent migration	0	0	0	0	0	0	0	0	0	
Temporary migration	0	0	0	0	0	0	0	0	0	
Cultivation of disaster tolerant crops	0	0	0	0	0	0	0	0	0	
Poultry/duck rearing	0	0	0	0	0	0	0	0	0	
Homestead vegetables gardening	0	0	0	0	0	0	0	0	0	
Shrimp culture	0	0	0	0	0	0	0	0	0	
Crab culture	0	0	0	0	0	0	0	0	0	
Others	0	0	0	0	0	0	0	0	0	

Chart: 9.9.4. a : Gender Role in Different Type of Works during Normal period in Sandeskhali I





Chart: 9.9.4. b: Gender Role in Different Type of Works during Disaster period inSandeskhali I

Chart: 9.9.4. c : Gender Role in Different Type of Works during Post Disaster period inSandeskhali I



Type of Works		Normal		Duri	ng disast	er	Aft	After disaster		
	male	female	jointly	male	female	jointly	male	female	jointly	
Addressing food crisis	31.2	10.3	27.7	22.9	11.7	34.6	20.0	11.9	33.1	
Sale of livestock	13.4	4.2	3.4	4.7	4.2	9.9	6.1	5.2	7.5	
Sale of food	5.8	4.9	61.6	3.7	4.6	4.1	3.2	4.1	2.3	
Sale of seed	3.1	1.3	0	1.4	1.8	1.4	1.1	0.9	1.4	
Sale ornaments	3.1	1.3	0.4	1.8	1.4	0.9	1.8	1.8	0.5	
Sale trees	8.0	2.7	1.3	4.6	2.3	3.7	2.3	3.2	5.5	
Sale land	3.1	1.8	0.9	2.3	1.8	1.4	2.3	1.8	1.4	
Mortgaging land	4.0	1.3	0.9	2.8	1.4	3.3	1.9	2.3	2.3	
Sale house	2.2	0.9	0	1.9	0.9	0	1.9	0.9	0	
Loan from relatives	14.7	4.9	4.9	6.0	5.5	12.6	9.3	3.7	11.6	
Loan from mohajan	6.7	2.2	1.3	5.5	2.8	3.2	7.4	2.8	1.4	
Loan from bank	4.0	1.3	0.9	3.7	0.9	1.4	2.8	0.9	1.4	
Loan from NGO/CBO	1.8	2.2	1.8	0.5	1.9	4.2	1.9	1.4	4.2	
Arrange alternative job	6.7	3.6	1.8	5.6	4.7	3.7	5.4	3.1	4.5	
To use deposit/saving	6.5	5.1	3.3	7.0	4.2	5.1	21.0	21.0	10.3	
VGD/VGF	21.0	16.1	14.7	17.4	19.6	13.4	2.2	2.2	0.4	
Permanent migration	1.4	2.8	1.4	1.9	2.3	1.4	10.3	1.8	3.1	
Temporary migration	2.8	8.3	4.1	3.7	3.7	5.1	1.3	1.8	1.8	
Cultivation of disaster tolerant crops	0.9	1.9	2.8	1.9	3.2	3.7	0.9	8.9	2.2	
Poultry/duck rearing	0	8.8	5.1	0.5	10.6	3.2	2.7	2.7	6.7	
Homestead vegetables gardening	1.4	2.8	6.0	0.5	5.6	7.9	1.3	1.8	0	
Shrimp culture	1.4	1.9	0	1.9	2.3	0	0	1.3	0	
Crab culture	0	1.4	0	0	1.4	0	0	0.9	0.4	
Others	0	1.2	0.6	0	1.2	1.2	0	0	0	

Table: 9.9.5: Gender Role in Different Type of Works during Normal/Disaster/Post Disaster Periods (Sandeskhali II)

Chart: 9.9.5. a: Gender Role in Different Type of Works during Normal period inSandeskhali II



⁽Percentage)



Chart: 9.9.5. b: Gender Role in Different Type of Works during Disaster period inSandeskhali II

Chart: 9.9.5. c: Gender Role in Different Type of Works during PostDisaster period inSandeskhali II





Conclusion

Conclusion

It has the largest mangrove diversity in the world including several threatened floral and faunal species. The core area (Sunderbans National Park) has been designated as World Heritage Site. Approximately 4 million people live in Sunderbans. The community is, to some extent dependent on the forest resources. Agriculture is not properly developed due to many reasons. Sunderbans is under severe stress and the community is quite vulnerable. The Sunderbans consists of 102 islands, among them 48 are inhabited. The population of the region is mainly migrant settlers from different parts of Bangladesh and southern West Bengal for last 60 - 120 years. At present four major types of livelihood activities are practiced:

- Agriculture
- Fishery
- Wood Collection
- Honey Collection
- Rampant Migration in search of livelihood security

Approximately 65% of the total population is dependent on agriculture based economy. Generally, there is a single crop economy, in some places double crop are in practice with rain water harvesting. Paddy, different vegetables, Green Chili, Pumpkins etc. are the major crops .The yield is medium and farmers are in some cases successful in diversifying into various cash crops. However in post *aila* phase there observed a fall in the yield rates to great extent. Lack of proper market linkages acts as a barrier for their economic realization - which in turn leads to poverty. Fishing activities are prevalent at various scales in the Sunderbans catering to livelihoods amongst 15% of the population. Small scale fishing activity in the delta region .Micro scale fishing activity in the shallow river bed - mainly to collect the baby prawns / shrimps - high short term income - risk factor high in terms of biodiversity presence e.g. Crocodiles, Snakes and out flashing due to cyclone and tidal surge, and loss arising due to increase in salinity of water bodies because of the vulnerability caused by frequent tidal surge. This also leads to rapid siltation in river bed.

Summarized local community perception about changing climate:

Villagers see definite changes in terms of sea level rise. They have seen sufficient increase in the level of water during high tide (*Bhara Kotal*). Community also expressed their observation in increase in temperature as well as prolonged heavy rainfall. Community also talked about settlement of the local habitat and river siltation as major causes for flooding of rivers.

Adverse effects of climate change as perceived by the community

Intrusion of saline water into the agricultural land-results in loss of yields and greater risk to the farmer. Permanent intrusion causes loss of agricultural land and making people migrate (environmental refugees). Change in monsoon pattern causes severe stress on agriculture which is fully dependent on weather. Increase in span of summer increases insect attack on crops. The delayed winter hampers the cultivation of "Ravi Crop" (winter crops). The intrusion of saline water causes severe stress on availability of drinking water. Increasing humidity leads to incremental phenomenon of vector borne diseases.

Responses of the community

In adapting to the situation, the community is shifting gradually to farming of saline tolerant variety of crop in anticipation of increase in salinity of soil caused by cyclone and tidal surge. Diversification into different weather resistant crops - *not a secure mechanism since realization of money against the crops due lack of market linkages still needs to be addressed.* Construction and renovation of ponds and canals for rain water harvesting and use in winter cultivation.

Searching for alternative livelihood options for proper substitution of certain livelihood activities like baby prawn/ catching shrimps, timber smuggling etc. Looking for effective capacity building activity through scientific and organizational intervention in support of their indigenous adaptation efforts. *The three things they need the most:* Alternative Livelihoods Option & Proper Market Linkages, Education, Primary Health Services. Various initiatives at different stakeholder' levels already in operation. But they prefer to have further intervention by Government agencies as well as by NGOs for its extension and upgradation to the desired extent.
List of households under baseline survey

意

District (Baseline)	Block	GP	Village names	Number of HHs
South 24 Parganas	Patharpratima (600 HHs)	Ramganga	Indraprastha	24
			Dakshin Shibpur	29
			Sagarmadhabpur	26
			Dakshin Gayadham	47
			Ramganga	74
		Brajaballavpur	Brajaballavpur	51
			Gobindapurabad	85
			Kshetromohanpur	64
		G-Plot	Krishnadaspur	33
			Sitarampur	50
			Gobardhanpur	20
			Indrapur	57
			Buraburirtat	30
			Daspur	10
	Basanti (300 HHs)	Basanti	Sajinatala	20
		Uttar Mokamberia	Bablapara	24
			Charanekhali	25
			Harbhangi	45
		Bharatgarh	Mahespur I	15
			Anandabad 5	30
			Anandabad 4	25
			Garanbose I	25
		Masjidbati	Gadkhali	35
		Jyotishpur	Harekrishnapur fisherypara	30
			Purba Hatkhola	26
North 24 Parganas	Sandeshkhali I (38 HHs)	Hatgachi	Simulati	38
	Sandeshkhali II (268 HHs)	Bermajur I	Halderpara	05
			Aitpara	33
			Polpara	62
			Daroankhali	16
			Bermajur natunpara	45
			Dambalpara	29
		Bermajur II	Purba Jhupkhali	30
			Paschim Jhupkhali	15
			Ajgara	33
	Hingalganj (303 HHs)	Hingalganj	Kulermath	20
			Mamudpur	20
		Sandelerbill	Sandelerbill 11	25
			Sandelerbill 14	30
			Kanchanpur	25
			Kanaknagar	25
			Dalalabad (Bankra)	35
		Dulduli	Nebukhali	30
			Ketarchalk	26
			Swarupkathi	27
			Kothabari	40

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About the Organisation

Bangladesh Centre for Advanced Studies (BCAS) is a leading research and policy institute in the non-government sector of Bangladesh, established in 1986. It is independent, non-profit and specializes in policy analysis, action research and project implementation for sustainable development at local, national, regional and global levels. BCAS addresses sustainable development through the following interdisciplinary themes. They are:

- Environment and climate change
- Good governance through people's participation
- Poverty alleviation and sustainable livelihoods
- Economic growth
- Public-private partnership
- Sustainable markets

The overall aim of BCAS is to provide guidance and practical solutions to promote sustainable development, eradicate poverty, improve access of the poor to resources and ensure social justice.

BCAS tests dynamic ideas, develops models and gives practical solutions to problems in all areas that fall under the broad themes. These ideas have been replicated by NGOs, government departments, private sectors and UN agencies.

Development Research Communication and Services Centre (DRCSC), nongovernment development organization was formed in 1982 as a resource centre for collection, collation and dissemination of information on various socio-economic issues and to highlight the struggles of various NGOs, CBOs and individuals to ensure social justice; especially for informal sector workers, indigenous communities and small & marginal farmers/landless labourers as well as self employed artisans. Along with that, since 1992, the centre focused on Sustainable Agriculture & Natural Resource Management for improving food & livelihood security of the rural poor through sustainable management of natural resources on the basis of principles and actions, that are environment friendly, economically appropriate, socially just and developed by mutual cooperation. The resource centre started to expand its services through a Network of local NGOs and Development Cooperation Groups.

