CHAPTER 6 MODEL PROJECTS

6.0 Model Projects and their Present Situation

Two Model Projects – one for each of the Char and Haor areas - are to be implemented prior to realization of phased out program of the Master Plan. The Model Projects have the objective to demonstrate effectiveness of the proposed developments in the Master Plan and to verify the planned results.

In order to achieve this target, two villages – one from the Char area and the other from Haor area – have been selected to study the feasibility of implementation of the development works.

Based on the accepted criteria, Algar char Gram under Erendabari Union in Upazila Fulchari of Gaibandha district and Gurai Gram under Gurai union in Upazila Nikli of Kishoreganj district have been selected for the Model Projects. Algar char Gram is an attached char of the Jamuna river in the Char area, while Gurai Gram is situated in a shallow haor in the Haor area.

While investigating the 'present situation' in relation to the floods and their consequences e.g. extent of inundation, damages, sheltering, evacuation etc, the floods of 1988, 1998 and 1999 in the Model Project areas have been considered for the questionnaire survey. These three years have been selected as the floods of 1988 and 1998 are historical events that occurred rather recently while the third year (1999) presents a normal flood situation that has a return probability every year.

6.1 Algar char Gram

The village Algar char is situated in the active floodplain on left bank of the Brahmaputra-Jamuna river. Long before, the Erendabari union was situated near the right bank of the river but due to morphological changes the entire of the Union has shifted eastward. Thus in course of time the village Algar char become an Attached Char with the left bank. The village stretches about 2.00 km on north-south and 2.50 km on east west direction. Due to its location in char areas of the Brahmaputra-Jamuna river, the village of Algar char is essentially flood-prone and experiences flood of some magnitude every year.

6.1.1 Present Situation

Algar char Gram has seven settlement areas known as 'paras'; they are named after influential persons of the locality. Names of the 'paras' are:

1. Jalal sarkar/ Hossain member para
2. Mokbul bepari para
3. Razzak chairman para
4. Aklas member/ Samad fokir para

5. Joynal member/ Hasan khalifa para

6. Zolil dewani para

7. Mehar Munsi Para

6.1.2

(1) Development works of CARE in Algar char Gram

CARE (Bangladesh) has worked in 2001 for some development in three "paras" of Algar char, namely: Jalal sarkar/Hossain member para, Razzak chairman para and Aklas member/Samad Fokir para. In the first two 'paras' CARE raised homesteads while in the third 'para' they raised the ground level of a madrassa and constructed its tin-roofed building. CARE has also worked on raising the main road running through the village - starting from the Jalal sarkar/Hossain member para and ending on to Joynal member/Hasan khalifa para and also did plantation on its sides.

(2) Erosion-prone paras of Algar char on Jamuna channel bank

Jalil dewani para and Maher munsi para are situated in the western side of the village. They are detached from the rest of the village by wide farmlands. These two paras are very close to the eroding channel bank of the Brahmaputra-Jamuna river and are more flood-prone than the remaining paras.

6.1.3 General information on Algar char Gram

The following **Table 6.1** shows the general statistics of the seven paras of Algar char Gram as in 2002.

Table 6.1: General statistics of the 'paras' in Algar char Gram

Sl. No.	Name of para	Total Popula -tion	No. of houses	Total area (ha)					No.of Cattle
				Farm-land	Home-steads	Pond	River	Total	
1	Jalal sarker/Hossain member para	740	235	137.0	14.9	1.2	0.0	153.1	950
2	Mokbul bepari para	262	59	109.0	3.0	0.4	0.0	112.4	200
3	Razzak chairman para	650	130	28.0	6.6	0.8	0.0	35.4	210
4	Aklas member/ Samad Fokir para	579	238	81.0	11.1	0.5	0.0	92.6	180
5	Joynal member/Hassan khalifa para	563	225	143.0	9.5	0.7	0.0	153.2	620
6	Zolil dewani para	158	52	34.0	4.1	0.0	55.0	93.1	600
7	Maher munshi para	187	36	30.0	2.9	0.0	40.0	72.9	98
	TOTAL	**3139**	**975**	**562.0**	**52.1**	**3.6**	**95.0**	**712.7**	**2858**

The villagers of Algar char Gram - being economically insolvent - are beset with manifold problems at the advent of flood season. On one hand, they are to survive in the face of inundation of homesteads, on the other hand, to stay alive, food is be procured within their meagre resources in a scarce situation. Damage to their household properties, particularly the livestock and homesteads, is a regular feature in every flood.

People of Algarchar have to take preparation to meet the annual flood by procuring 'chira' 'muri' 'gur' and other rural food items with the scanty means they have. They seem to be destined to live on flood prone and eroding chars without a flood warning system in place. They are to depend on natural symptoms to understand about an approaching flood and look for a shelter when their houses are inundated or eroded. There are not enough rooms in the three schools cum shelters of the village during a flood season. Many evacuee families pass days and nights in open-air refuge places or on the unsubmerged roads. Even if a family gets space in a shelter there are many other problems they have to overcome. Inadequate food, problems of sanitation, scarcity of drinking water and medicine, lack of safety and security are some of the distressing points the villagers confront in shelters/refuge places.

Some paras of the village are situated on the erosion prone Jamuna channel banks. In case of immediate vulnerability of the homesteads due to the approaching erosion, villagers are to shift their houses to a safe distance.

Villagers of Algar char Gram have a continuous struggle for a survival throughout the monsoon. This dominates most of their activities and drains their resources leaving little scope for any productive works during the period. The flood related problems together with their economic insolvency make life of the people of Algar char absolutely miserable. Obviously, they do not have the resources to cope with the problems.

6.1.3.1 Vulnerability of Algar char Gram to inundation

Vulnerability of Algar char Gram to inundation has been obtained by questionnaire surveys and is summarized in **Table 6.2**. The Table shows the percent area of the village/paras including the farmland and the homestead areas that suffered inundation during 1988, 1998 and 1999.

Table 6.2: Inundation of 'paras' (homestead+farmland) in Algar char Gram in 1988, 1998 and 1999

Sl No.	Village/ 'paras'	Total Area of farmland and homestead (ha)	Inundation88			Inundation 98			Inundation 99		
			Area (ha)	% inun-dated	Av. Dura-tion (week)	Area (ha)	% inun-dated	Av. Dura-tion (week)	Area (ha)	% inun-dated	Av. Dura-tion (week)
1	Jalal sarker/Hossain member para	151.9	151.9	100%	2-3	117.0	77%	8-12	59.2	39%	2
2	Mokbul bepari para	112	112	100%	2-4	112.0	100%	3-12	53.8	48%	3
3	Razzak chairman para	34.6	34.6	100%	1-2	34.6	100%	0-12	29.1	84%	2
4	Aklas member/ Samad Fokir para	92.1	92.1	100%	3-8	81.0	88%	5-15	35.0	38%	4

5	Joynal member/Hassan khalifa para	152.5	152.5	100%	1-3	152.0	100%	12	47.3	31%	1-2
6	Zolil dewani para	38.1	38.1	100%	4-12	38.1	100%	7-13	32.8	86%	2-3
7	Maher munshi para	32.9	32.9	100%	4-12	32.9	100%	3-12	16.8	51%	2-3
	Total	**614.1**	**614.1**	**100%**		**567.6**	**92%**		239.5	**39%**	

It shows that 100% village area as a whole was inundated in 1988 (severe flood) for periods ranging 1 to 6 weeks, 92 % was inundated for 1 to 8 weeks in 1998 (severe flood), while 39% of the farmland with homestead areas were inundated in 1999 (normal flood). Farmland accounts for about 70% of the total village area and even in a normal flood about 60% of the farmland area goes under floodwaters. This is why 39% of the areas of farmland plus homestead combined were inundated in the normal flood of 1999.

Table 6.3 presented below shows the percent of 'homestead areas only' that suffered inundation during the years 1988, 1998 and 1999.

Table 6.3: Inundation of 'paras' in Algar char Gram (homestead only) in 1988, 1998 and 1999

Sl No.	Village/ 'paras'	Total Homestead Area (ha)	Inundation88			Inundation 98			Inundation 99		
			Area (ha)	% inun-dated	Av. Duration Week	Area (ha)	% inun-dated	Av. Duration Week	Area (ha)	% inun-dated	Av. Duration Week
1	Jalal sarker/Hossain member para	14.9	14.9	100%	3	7.3	49%	5	1.5	10%	2
2	Mokbul bepari para	3.0	3.0	100%	3	3.0	100%	3	0.6	19%	2
3	Razzak chairman para	6.6	6.6	100%	3	6.6	100%	3	0.5	8%	1
4	Aklas member/ Samad Fokir para	11.1	11.1	100%	3	6.5	59%	5	1.0	9%	1
5	Joynal member/Hassan khalifa para	9.5	9.5	100%	3	9.5	100%	3	1.1	12%	1
6	Zolil dewani para	4.1	4.1	100%	5	4.1	100%	7	1.0	25%	2
7	Maher munshi para	2.9	2.9	100%	4	2.9	100%	3	1.7	57%	2
	Total	**52.1**	**52.1**	100%		**40.0**	77%		**7.4**	**14%**	

From Table 6.3 it is seen that 100% of the homesteads were submerged in 1988, while 77% of them went under water in 1998, while some 14% were inundated in the normal flood year of 1999. It can be observed that the last two paras (Zolil dewani para and Mehar munshi para) are situated in low-lying areas which are most flood-prone.

The following **Table 6.4** shows the varying depths of inundation on the house courtyards in Algar char Gram.

Table 6.4: Number of houses in 'paras' of Algar char Gram with depth and duration of flooding

Sl. no.	Name of para	Year	Total no. of houses in the para	No. of houses with maximum range of depth of flooding						No. of houses with duration of flooding (weeks)				
				Max Depth range >	0	0-50	50-100	100-150	>150	Duration >	<2	2-3	4-5	>5
1	Jalal sarkar / Hossain member para	1988	235		0	40	118	77	0		181	54	0	0
		1998			120	27	78	10	0		0	27	88	0
		1999			212	23	0	0	0		23	0	0	0
2	Mokbul bepari para	1988	59		0	15	30	15	0		22	37	0	0
		1998			22	22	15	0	0		0	22	15	0
		1999			48	9	1	0	0			10	1	0
3	Razzak chairman para	1988	130		0	16	57	57	0		43	87	0	0
		1998			12	116	3	0	0		0	116	3	0
		1999			120	10	0	0	0		10	0	0	0
4	Aklas member/ Samad fokir para	1988	238		0	60	67	52	60		60	119	60	0
		1998			98	19	62	60	0		19	79	40	0
		1999			217	12	10	0	0		0	0	0	0
5	Joynal member/ Hassan khalifa para	1988	225		0	0	0	56	169		1	81	0	0
		1998			0	101	113	11	0		0	113	11	0
		1999			198	14	14	0	0		14	14	0	0
6	Zolil dewani para	1988	52		0	0	0	39	13		0	42	10	0
		1998			0	20	33	0	0		0	39	13	0
		1999			39	10	3	0	0		10	3	0	0
7	Maher munshi para	1988	36		0	0	5	31	0		5	31	0	0
		1998			0	12	4	21	0		15	21	0	0
		1999			15	14	7	0	0		14	7	0	0
	TOTAL:	**1988**	**975**		**0**	**130**	**276**	**328**	**241**	**No. of houses**	**311**	**451**	**70**	**0**
		1998			**251**	**316**	**306**	**101**	**0**		**35**	**415**	**170**	**0**
		1999			**848**	**93**	**34**	**0**	**0**		**81**	**24**	**0**	**0**

The Table 6.4 indicates that while more no. of houses were inundated under higher depths in 1988, the overall duration of submergence was less than that of 1998.

CARE implemented 57 homestead raising works in paras under sl. 1 and 3 (Jalal sarker/Hossain member para and Razzak chairman para) under its Flood Proofing Project in 2001. Also they raised the Algar char market and the 3 schools with the compounds to make them act as flood shelters and refuge places in time of floods that will call for such action.

6.1.3.2 Flood damages in Algar char

The **Table 6.5** shows the flood damages in Algar char during the same 1988, and 1998 and 1999.

Table 6.5: Damages in the 'paras' of Algar char Gram in 1988, 1998, 1999 floods

Sl. No.	Algar char Gram/ 'paras'	Total Area (ha)	Farm -land area (ha)	Crop damage							Damaged Cattle			Damaged House			Human life lost		
				Crops	1988		1998		1999		1988	1998	1999	1988	1998	1999	1988	1998	1999
					Damaged area (ha)	Damaged crop production (ton)	Damaged area (ha)	Damaged crop production (ton)	Damaged area (ha)	Damaged crop production (ton)	No.	No.	No.	No.	No.	No.	No.	No.	No.
1	Jalal sarker/Hossain member para	153.1	137	Paddy aman	75	146.3	35	68.3			90	35	0	300	100	0	3	0	0
				Jute	21	37.8	10	18.0											
2	Mokbul bepari para	112.4	109	Paddy aman	109	212.6	109	212.6			13	0	0	50	19	2	0	0	0
3	Razzak chairman para	35.4	28	Paddy aman	13	25.4	13	25.4			17	0	0	175	150	0	0	0	0
				Jute	4	7.2	4	7.2											
4	Aklas member/ Samad Fokir para	92.6	81	Paddy aman	43	83.9	40	78.0			18	9	0	150	0	0	0	0	0
				Jute	15	27	10	18.0											
5	Joynal member/Hassan khalifa para	153.2	143	Paddy aman	80	156	20	39.0			240	0	0	30	7	3	4	0	0
				Jute	1	1.8	1	0.9											
6	Zolil dewani para	93.1	34	Paddy aman			15	29.3			0	0	0	100	50	10	0	0	0
				Jute			20	36.0											
7	Maher munshi para	72..9	30	Paddy aman	13	25.4	13	25.4			55	35	0	50	40	15	10	4	0
				Jute															
	Total	**712.7**	**562**	**Paddy aman**	**333**	**649.6**	**245**	**478**			**433**	**79**	**0**	**855**	**366**	**30**	**17**	**4**	**0**
				Jute	**41**	**73.8**	**45**	**80.1**											

The Table 6.5 indicates that the crop damages are due to the floods of 1988 and 1998, and that there was no damage in the normal flood year of 1999.The farmers generally do not grow crops in the low lying areas of the chars which are most likely to be inundated in monsoon by normal yearly floods.

Damage of cattle, as is observed from the Table, only occurs during the severe floods. During the severe floods of 1988 and 1998 cattle were lost to the tune of 855 and 366 respectively, while in 1999 normal flood there was no damage.

Loss of human life in the village Algar char occurred mostly in 1988 with 17 deaths and also some in 1998 with 4 deaths. However, in the normal flood year of 1999 there was no death.

6.1.3.3 Existing Flood Shelters and Sheltering facilities

The **Table 6.6** shows the present situation of shelters and sheltering facilities.

Table 6.6:Present situation of existing flood shelters

Para No.	Name of the Shelter	Name of the 'para' where the shelter is situated	In normal time it is used as	Type of the building	Floor area	Accommodation capacity of the building	Area of open space M^2	Capacity of open space	Elevation of the Shelter
1	Paschim Algar char Pry School cum Flood Shelter	Jalal sarker/Hossain member para	Primary school	Tin walled and roofed	139 sqm.	120 people	1035 sqm	500 people may take shelter in open space	Above 1988 flood level
1	Road from Erendabari to Care Bridge	Jalal sarker/Hossain member para	Road	Open air			4m wide and 500m long = 2000 sqm	1000 people may take shelter in open space.	Above normal flood level
3	Road from Jigabari to Razzak chaiman para	Razzak chairman para	Road	Open air			4m wide and 200m long = 800 sqm	400 people may take shelter in open space.	Above normal flood level
3	Algar char Girls High School Cum Flood Shelter	Razzak chairman para	Girls' High School	Tin walled and roofed	160 sqm	130 people	2800 sqm	1400 people may take shelter in open space.	Above 1988 flood level
4	Algar char Madrassa cum flood shelter	Aklas member/ Samad Fokir para	Madrassa	Tin walled and roofed	100 sqm	90 people	35m wide and 60 m long =2100 sqm	1000 people may take shelter in open space	Above 1988 flood level

Although there is no proper flood shelter with all the possible facilities in the village, nevertheless 3 existing schools/madrassa are so remodelled by raising their level of elevation that those can be used as flood shelters in time of need. Besides, two rural roads are generally used by the flood affected people as refuge place for themselves and their cattle. As they come generally late to take shelter probably due to delayed decision, the flood affected people of the last two paras, namely Zolil dewani para and Maher munshi para, get shelter on the open air refuge place in front of the school-cum-shelter compounds and also on the roads by erecting improvised huts for themselves.

6.1.3.4 Flood warning and dissemination, Evacuation and Sheltering

As revealed from the questionnaire survey and from the discussions with the villagers there is no systematic flood warning system at work in any of the 7 paras of Algar char as can be observed from the **Table 6.7**. People decide to evacuate by observation of rise of water level and other natural symptoms when the flood is already in their doorsteps. Not that all members of the family evacuate to a safer place, rather in most cases some may decide to stay on at their premises to look after the belongings by surviving on raised platforms (macha).

Table 6.7: Evacuation and Sheltering in paras of Algar char

Sl. No.	Name of Para	Name of the nearest flood shelter	Distance of the nearest flood shelter	How villagers go there in flood	Is there any flood warning dissemination system	How villagers decide to evacuate
1	Jalal sarker/Hossain member para	Algar char Girls' School cum flood Shelter	1.25 km	On foot and wading	No	Observing rise in water level and other natural symptom
2	Mokbul bepari para	Algar char N G Primary School cum flood shelter	1.5 km	On foot, banana boat	No	Do
3	Razzak chairman para	Algar char Girls' School cum flood Shelter	0.20 km	On foot	No	Do
4	Aklas member/ Samad Fokir para	Do	0.20 km	Banana boat, on foot	No	Do
5	Joynal member/Hassan khalifa para	Do	0.50 km	On foot	No	Do
6	Zolil dewani para	Algar char Girls' School cum flood Shelter	1.5 km	Engine boat & banana boat	No	Do
7	Maher munshi para	Do	1.25 km	On foot and banana boat	No	Do

From the government or NGO side, advance evacuation of the flood affected people is not done; more exactly the marooned people are rescued to safety by the government and non-government agencies under extreme circumstances. As collected during reconnaissance, the people of Zolil dewani para and Mehar munshi para were rescued by government effort as they had been marooned in their raised platforms (machas) during the floods of 1988 and 1998.

Present situation in the in the flood warning dissemination in Bangladesh is stated in section 2.10 under Chapter 2 of the Master Plan part. Algar char is one of the several thousands villages in the country where flood warnings do not reach in time. The whether forecast that is transmitted through the radio and other media are not very much intelligible to the villagers as the broadcasted rise/fall of the water levels are not area-specific.

The FFWC is now implementing a Pilot project for assessing a feasible and effective dissemination procedures. In 2001, three UZs (Lohajang, Shudarganj and Chauhali) have been selected as pilot centres for dissemination of flood warnings through the UZ Disaster Management Committees(UZDMC). The committees interprets the rise/fall in terms of area inundation in the Union level and disseminate to the concerned unions-level Disaster Management Committee.. The Union Level Disaster Management Committee, informs the villagers using the UP Members/ Imams / Schools Teachers and other members of the Committee and arranges to announce by drum

beating in the local markets. By the year 2004, all flood prone areas are expected to be included under FFWC's flood forecasting and warning as well the dissemination system in the model of the 3 present pilot UZs.

6.1.3.5 Overall constraints in Algar char

From the Table 6.8 presented below it appears that main issue in Algar char is inundation of homesteads and lack of adequate number of shelter.

Table 6.8: Algar char constraints - priority of mitigation as considered by villagers

		Degree of priority (%) suggested for mitigation by people of para						
		Jalal sarker/Hossain member para	Mokbul bepari para	Razzak chairman para	Aklas member/ Samad Fokir para	Joynal member/ Hassan khalifa para	Zolil dewani para	Maher munshi para
Constraints	**Suggested measures**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
a. Homestead inundation	Raising homesteads by earthworks	40	63	16	62	70	12	0
b. Erosion of the Char land	Provide protection char against erosion of char	5	0	0	0	0	2	0
c. Erosion of the homestead area by current	Provide protection char against erosion of homesteads	0	0	0	0	0	2	0
d. Lack of flood shelters for people and cattle	Construction of shelters for people and livestock	10	22	0	22	4	0	40
e. Lack of flood warning and flood preparedness	Installation of workable flood warning and dissemination system	0	0	0	0	0	0	0
f. Others (lack of roads etc)	Construction of roads and embankment	45	15	84	16	26	84	60

As it can be observed from the Table 8, villagers of Algar char (4 paras out of 7) think inundation of households is the most troublesome problem. However, reason for low percent of opinion (16%) in favour of inundation of households by Razzak chairman para is probably due to the raising of homesteads by CARE in 2001. The other two paras who do not think homestead inundation is their most staggering problem although most of their houses have the maximum inundation every year are Zolil dewani para (12%) and Mehar munshi para (0%). These two paras are most vulnerable to erosion as well as inundation as the areas are low-lying. Apprehending the homestead raising there is unfeasible, the villagers might have opined for some other items.

6.2 Gurai Gram

Gurai is the other village where Model Project will be implemented to demonstrate effectiveness of the planned developments. Situated in the Gurai Union of Nikli UZ under Kishoreganj district, the village is located in a shallow haor area near the course of Ghorauttar river which carries flow from Surma-Baulai, Mogra, Dhanu and Kangsha rivers to the south through Bhairab Bazar. Farmland of the village is not under protection of any submersible flood embankment to save boro crop from early flood. The village mound - which is erosion prone due to monsoon waves - accommodates the settlements stretching about 1.2 km on north-south and 0.9 km on east-west direction. The mound is partly protected from wave erosion by brick walls on the eastern side for separated lengths of 190m and 20 m. Elsewhere on eastern, northern, north-eastern and southern sides there are protection works by indigenous method i.e. earthfilled gunny bags, vegetative cover, bamboo fencing etc.

6.2.1 Present Situation

There are 17 ‘paras’ in Gurai Gram mound as listed below:

1. Chila para
2. Bania para
3. Atka para
4. Uttar para
5. Fakir para
6. Jal para
7. Kuna para
8. Masjid para
9. Namashud para
10. Dakhin para
11. Purba para
12. Ghosh para
13. Paschim para
14. Shibir para
15. Pal para
16. Naogaon para
17. Moddon para

6.2.2 General information on Gurai Gram

The following **Table 6.9** presents the pertinent statistics of the village.

Table 6.9: General statistics of the 'paras' in Gurai Gram

Sl.No.	Name of para	Total Population	No. of houses	Area (ha)					No.of Cattle
				Home-steads	Farm-land	Pond	River	Total	
1	Chila para	148	21	0.50	8.1	0.0	0.0	8.60	19
2	Bania para	415	39	0.80	10.1	0.2	0.0	11.10	18
3	Atka para	755	92	1.80	24.3	0.3	0.0	26.40	60
4	Uttar para	438	81	1.70	136.9	0.2	0.0	138.80	270
5	Fakir para	103	28	1.20	4.5	0.3	0.0	6.00	22
6	Jal para	597	136	3.80	23.1	1.2	0.0	28.00	50
7	Kuna para	272	73	1.40	15.0	0.8	0.0	17.20	55
8	Masjid para	1837	199	7.80	67.0	1.5	0.0	76.30	165
9	Namashud para	156	24	0.60	3.0	0.4	0.0	4.00	21
10	Dakhin para	643	56	1.20	16.2	1.2	0.0	18.60	45
11	Purba para	1833	133	3.60	89.1	2.5	0.0	95.00	135
12	Ghosh para	555	67	3.00	16.6	0.6	0.0	20.20	60
13	Pashchim para	815	69	1.50	37.3	2.0	0.0	40.80	41
14	Shibir para	749	92	3.00	32.4	1.8	0.0	37.20	35
15	Pal para	841	87	3.80	6.5	1.5	0.0	11.80	37
16	Naogaon para	1346	230	4.80	13.0	1.6	0.0	19.40	75
17	Moddon para	629	129	2.70	4.5	0.0	0.0	7.20	125
	Gurai Bazar			1.50		0.9		2.40	
	TOTAL	**12132**	**1556**	**44.70**	**507.6**	**17.0**	**0.0**	**569.00**	**1233**

Inhabitants of Gurai Gram, which is village mound in the haor area, start taking preparation in advance to meet the annual floods by collecting bamboo stakes, empty sacks and other native materials for protection against the wave erosion. Paddy is boiled and Chira, Muri, Gur and other rural foods are stocked. Cattle and poultry in the homesteads, culture fishery in the ponds are taken care of; valuable articles are shifted to secured place. In pre-flood days they get busy in preparation for the ensuing event. This they have to do because they know soon they will be in a flood environment without proper warning and evacuation system in place. They have to take their own decision for evacuation by observing the natural symptoms like a cloudy sky, continuous south-eastern winds, flying of grasshoppers and/or the rising of water level. They know their village mound will be having the onslaught of waves in the coming days and will yield land with homesteads to the wave erosion.

The wave erosion which is most staggering problem facing the Gurai Gram population, is a regular phenomenon in each monsoon. Villagers have to fight a constant battle throughout the monsoon to save their homesteads from this kind of erosion. The task of protecting their mound is however difficult as they do not have enough resources to do it securely. The indigenous protection of the village mound, which they practice throughout their lives, dominates all their activities in monsoon

and drains most of their resources leaving very little for any productive works during the period, 4 to 6 months in year. Due to this, the people of Gurai Gram are becoming increasingly insolvent every year. The flood related problems together with their economic insolvency make life of the people of Gurai Gram more and more miserable. Clearly, they do not have the resources to cope with the problems.

6.2.2.1 Vulnerability of Gurai Gram to inundation

Vulnerability to floods are assessed from the inundations caused by floods of three sample years namely 1988, 1998 and 1999.

The Table 6.10 presented below shows the % areas of the village/paras that were inundated during the floods of the sample years. The inundated area includes homesteads in the village mound as well as the farmland in the haor areas within the village.

Table 6.10: Inundation of 'paras'in Gurai Gram (homestead+farmland) in 1988, 1998 and 1999

Sl No.	Village/ 'paras'	Total Area (ha)	Inundation88			Inundation 98			Inundation 99		
			Area (ha)	% inunda -ted	Av. Durati -on (week)	Area (ha)	% inundat -ed	Av. Durati -on (week)	Area (ha)	% inundat ed	Av. Dura- tion (week)
1	Chila para	8.6	8.6	100%	6	8.6	100%	8	8.3	96%	6
2	Bania para	11.1	10.9	98%	7	10.9	98%	7	10.4	94%	5
3	Atka para	26.4	26.1	99%	7	26.1	99%	7	24.6	93%	5
4	Uttar para	138.8	122.1	88%	7	122.1	88%	7	122.1	88%	5
5	Fakir para	6.0	6.0	100%	6	4.0	66%	8	4.0	66%	5
6	Jal para	28.0	27.7	99%	6	26.6	95%	7	26.0	93%	5
7	Kuna para	17.2	16.5	96%	6	16.5	96%	8	5.7	33%	5
8	Masjid para	76.3	75.5	99%	6	72.5	95%	8	72.5	95%	5
9	Namashud para	4.0	3.6	90%	7	2.1	53%	8	2.1	53%	5
10	Dakhin para	18.6	17.3	93%	6	17.3	93%	8	17.3	93%	5
11	Purba para	95.0	90.3	95%	6	90.3	95%	8	39.9	42%	5
12	Ghosh para	20.2	19.6	97%	7	15.8	78%	8	15.8	78%	5
13	Pashchim para	40.8	36.7	90%	7	35.5	87%	7	35.5	87%	5
14	Shibir para	37.2	35.0	94%	7	33.9	91%	7	33.1	89%	5
15	Pal para	11.8	10.0	85%	7	7.2	61%	8	7.2	61%	5
16	Naogaon para	19.4	17.8	92%	6	12.2	63%	8	12.2	63%	5
17	Moddon para	7.2	7.2	100%	7	3.7	51%	8	1.7	24%	5
	Gurai Bazar	**2.4**									
	Total	**569.00**	**531.04**	**93%**		**505.18**	**89%**		**438.37**	**77%**	

As the farmland constitutes nearly 90% of the village area and every year overwhelmingly large proportion of the same gets inundated in monsoon, the overall inundation in 1988 was 93%, in 1998 was 89% and even in lean year of 1999 it was 77%.

Table 6.11 shows the percent of homestead areas only in the village mound that accounted for

inundation during the same sample flood years 1988, 1998 and 1999.

Table 6.11: Inundation of 'paras' in Gurai Gram (homestead only) in 1988, 1998 and 1999

Sl No.	Village/ 'paras'	Homestead Area (ha)	Inundation88			Inundation 98			Inundation 99		
			Area (ha)	% inundate-d	Av. Durati-on (week)	Area (ha)	% inundat-ed	Av. Duration (week)	Area (ha)	% inunda-ted	Av. Duration (week)
1	Chila para	0.50	0.50	100%	3	0.20	40%	4	0.04	7%	1
2	Bania para	0.80	0.80	100%	3	0.26	32%	4	0.00	0%	0
3	Atka para	1.80	1.80	100%	3	0.88	49%	4	0.11	6%	1
4	Uttar para	1.70	0.27	16%	1	0.00	0%	0	0.00	0%	0
5	Fakir para	1.20	1.20	100%	3	0.00	0%	0	0.00	0%	0
6	Jal para	3.80	3.80	100%	3	1.41	37%	4	0.72	19%	1
7	Kuna para	1.40	1.40	100%	3	0.57	41%	4	0.00	0%	0
8	Masjid para	7.80	4.99	64%	2	0.00	0%	0	0.00	0%	0
9	Namashud para	0.60	0.60	100%	3	0.00	0%	0	0.00	0%	0
10	Dakhin para	1.20	1.20	100%	3	0.44	37%	4	0.00	0%	0
11	Purba para	3.60	3.60	100%	2	1.76	49%	4	0.00	0%	0
12	Ghosh para	3.00	3.00	100%	3	1.41	47%	4	0.18	6%	1
13	Pashchim para	1.50	0.74	49%	3	0.00	0%	0	0.00	0%	0
14	Shibir para	3.00	3.00	100%	3	0.75	25%	3	0.00	0%	0
15	Pal para	3.80	3.80	100%	3	0.91	24%	3	0.19	5%	1
16	Naogaon para	4.80	4.13	86%	4	0.00	0%	0	0.00	0%	0
17	Moddon para	2.70	2.70	100%	3	0.51	19%	2	0.00	0%	0
	Gurai bazar	1.50									
	Total	**44.70**	**37.53**	84%		**9.11**	20%		**1.24**	3%	

In the haor areas, villages are generally situated on the raised mounds. Problem of inundation of the homesteads is not acute like that prevails in the char areas. However, in the severe floods of 1988 and 1988, the submergence of homesteads was 84% and 20% respectively. In the lean year of 1999 the inundation of homesteads was almost nil - only 3%.

The **Table 6.12** presents the varying depths of inundation on the courtyard of houses during the same sample flood years 1988, 1998 and 1999.

Table 6.12: No. of houses in 'paras' of Gurai Gram with depth & duration of flooding in 1988, 1998, 1999 floods

Sl no.	Name of para	Year	Total no. of houses	No. of houses with maximum range of depth of flooding						No. of houses with duration of flooding (weeks)				
				Depth range >	<0	0-50	50-100	100-150	>150	Duration >	<2	2-3	4-5	>5
1	Chila para	1988	21					21				21		
		1998			3	10	8				10	8		
		1999			19	2					2			
2	Bania para	1988	39				39					39		
		1998			27	1	11				1	12		
		1999			39									
3	Atka para	1988	92				92					92		
		1998			46	6	40				6	40		
		1999			86	6					6			
4	Uttar para	1988	81		68	13					13			
		1998			81									
		1999			81									
5	Fakir para	1988	28				28					28		
		1998			28									
		1999			28									
6	Jal para	1988	136				34	102				102	34	
		1998			86	30	20					30	20	
		1999			110	26					26			
7	Kuna para	1988	73			49	24					73		
		1998			43	20	10					20	10	
		1999			73									
8	Masjid para	1988	199		5	75	119					75	119	
		1998			71	84	44					84	44	
		1999			199									
9	Namashud para	1988	24				24					24		
		1998			24									
		1999			24									
10	Dakhin para	1988	56			34	22				34	22		
		1998			35	17	3					17	3	
		1999			56									
11	Purba para	1988	133			98	35				98	35		
		1998			68	49	16					49	16	
		1999			133									
12	Ghosh para	1988	67			45	22				45	22		
		1998			36	22	9					22	9	
		1999			63	4					4			
13	Pashchim para	1988	69		35	21	12				21	12		
		1998			69									
		1999			69									
14	Shibir para	1988	92			45	47				45	47		
		1998			69	23						23		
		1999			92									
15	Palpara	1988	87			36	51					87		
		1998			66	15	6					15	6	
		1999			87									
16	Naogaon para	1988	230		32	115	58	25			115	58	25	
		1998			230									
		1999			230									
17	Moddon para	1988	129			35	94					129		
		1998			66	59	4					59	4	
		1999			129									
TOTAL:		1988	1556		140	566	701	148	0		372	866	178	0
		1998			104	337	172	0	0		17	381	113	0
		1999			151	37	0	0	0		37	0	0	0

The Table 6.12 indicates that while the percent of homesteads inundation is more in 1988 (91%) than in 1998 (33%), percent of the homesteads having 4-5 weeks duration of inundation is more in

1998 (22%) than in 1988 (13%).

6.2.2.2 Flood damages in Gurai

The **Table 6.13** shows the flood damages in Gurai Gram during the floods in the years 1988, 1998, and 1999.

Table 6.13 :Damages in the 'paras' of Gurai Gram in 1988, 1998 and 1999

Sl No.	Village/ 'paras'	Total Area (ha)	Farml and area (ha)	Inundation of farmland						Damaged Cattle			Damaged House			Human life lost		
				1988		1998		1999		88	98	99	88	98	99	88	98	99
				area (ha)	% area damag -ed	area (ha)	% area damag -ed	area (ha)	% area damag -ed	No.	No.	No.	No.	No.	No.	No.	No.	No.
1	Chila para	8.6	8.1	8.1	100%	8.1	100%	8.1	100%	7	4	0	0	0	0	0	0	0
2	Bania para	11.1	10.1	10.1	100%	10.1	100%	10.1	100%	0	0	0	0	0	0	0	0	0
3	Atka para	26.4	24.3	24.3	100%	24.3	100%	24.3	100%	16	10	0	0	0	0	0	0	0
4	Uttar para	138.8	136.9	124.6	91%	124.6	91%	124.6	91%									
5	Fakir para	6.0	4.5	4.5	100%	4.5	100%	4.5	100%	8	0	0	25	0	0	0	0	0
6	Jal para	28.0	23.1	23.1	100%	23.1	100%	22.6	98%	0	0	0	0	0	0	0	0	0
7	Kuna para	17.2	15.0	15.0	100%	15.0	100%	14.3	95%	0	0	0	0	0	0	0	0	0
8	Masjid para	76.3	67.0	67.0	100%	67.0	100%	61.0	91%									
9	Namashud para	4.0	3.0	3.0	100%	3.0	100%	2.8	93%	0	0	0	0	0	0	0	0	0
10	Dakhin para	18.6	16.2	16.2	100%	16.2	100%	16.2	100%	25	18	`0	0	0	0	0	0	0
11	Purba para	95.0	89.1	87.3	98%	87.3	98%	40.1	45%	18	14	0	0	0	0	0	0	0
12	Ghosh para	20.2	16.6	16.6	100%	16.6	100%	16.3	98%	0	0	0	0	0	0	0	0	0
13	Pashchim para	40.8	37.3	36.6	98%	36.6	98%	30.2	81%									
14	Shibir para	37.2	32.4	32.4	100%	32.4	100%	0.0	0%	10	3	0	0	0	0	0	0	0
15	Pal para	11.8	6.5	6.5	100%	6.5	100%	6.1	94%									
16	Naogaon para	19.4	13.0	13.0	100%	13.0	100%	12.2	94%	0	0	0	0	0	0	0	0	0
17	Moddon para	7.2	4.5	4.5	100%	4.5	100%	4.0	91%	2	0	0	0	0	0	5	2	0
	Gurai Bazar	2.4																
	Total	**569.0**	**507.6**	**492.6**	97%	**492.6**	97%	**397.4**	78%	**86**	**49**	**0**	**25**	**0**	**0**	**5**	**2**	**0**

Crops are not grown in the haor areas during monsoon flood. In some years, early floods damage the boro crops. Severe floods of sample years (1988 and 1998) occurred between June to September when there was no crops in the field. In the lean year of 1999, there was no early flood that caused damage to boro crop before harvesting.

Loss of cattle and human life occurred in 1988 and 1998, but damage to houses occurred only in 1988.

6.2.2.3 Existing Floods and Sheltering facilities

It can be seen from Table **6.14** that there is a tin roofed Flood Shelter in Gurai Gram having a floor area of 2032 sqm in 4 sheds. The present condition is quite dilapidated and can hardly accommodate 240 people. Many of the displaced people of the eastern side of the village mound - having lost their homesteads to the wave erosion - found abode in the Flood Shelter since long. It is reported that the Shelter was built by an NGO (MES) in 1974 and was never given maintenance thereafter.

Table 6.14: Existing Flood Shelters in Gurai Gram

Para No.	Name of the Shelter	Name of the 'para' where the shelter is situated	In normal time it is used as	Type of the building	Floor area	Accommodation capacity of the building	Area of open space	Capacity of open space	Elevation of the Shelter
14	Shibir Flood Shelter	Shibir para	Occupied by villagers who are displaced from their homes due to wave erosion of the mound.	Tin roofed and brick walled	2032 sqm	240 people	1035 sqm	X	Above normal flood level

6.2.2.4 Flood warning, Evacuation and Sheltering

As per questionnaire survey result, there is no systematic flood warning system at work in any of the paras of the village. When situation arises, people decide to evacuate by themselves observing the rise in water level and other natural indications eg. cloudy weather, rainfall. As is the case of other village mounds in the haor areas, they are not inundated under high depth of water every year. Only a very small part of the settlement areas may be inundated under the normal floods.

Table **6.15** shows the situation of 'Flood warning, Evacuation and Sheltering' of Gurai Gram – para wise.

Table 6.15: Evacuation and Sheltering in paras of Gurai

Sl. No.	Name of Para	Name of nearest flood shelter	Distance of the nearest flood shelter	How villagers go there in flood	Is there any flood warning dissemination system at work	% people evacuated to flood shelter/ refuge places in 1988/1998/1999	How villagers decide to evacuate
1	Chila para	Shibir para flood shelter	1.25 km	On foot	No	80% in 1988 50% in 1998 00% in 1999	Observing rise in water level and other natural symptom
2	Bania para	Shibir para flood shelter	1.0 km	On foot, banana boat	No	26% in 1988 14% in 1998 00% in 1999	Do
3	Atka para	Shibir para flood shelter	0.50 km	On foot	No	25% in 1988 15% in 1998 00% in 1999	Do
4	Uttar para	Shibir para flood shelter	0.30 km	On foot	No	10% in 1988 0% in 1998 0% in 1999	Do
5	Fakir para	Shibir para flood shelter	0.50 km	On foot	No	25% in 1988 0% in 1998 0% in 1999	Do
6	Jal para	Shibir para flood shelter	0.30 km	On foot	No	4% in 1988 3% in 1998 0% in 1999	Do
7	Kuna para	Shibir para flood shelter	0.50 km	On foot	No	75% in 1988 60% in 1998 00% in 1999	Do
8	Masjid para	Shibir para flood shelter	0.50 km	On foot	No	55% in 1988 0% in 1998 0% in 1999	Do
9	Namashud para	Shibir para flood shelter	0.50 km	On foot	No	40% in 1988 0% in 1998 0% in 1999	Do
10	Dakhin para	Shibir para flood shelter	1.0 km	On foot	No	30% in 1988 20% in 1998 0% in 1999	Do
11	Purba para	Shibir para flood shelter	0.75 km	On foot	No	50% in 1988 20% in 1998 0% in 1999	Do
12	Ghosh para	Shibir para flood shelter	0.05 km	On foot	No	7% in 1988 0% in 1998 0% in 1999	Do
13	Pashchim para	Shibir para flood shelter	0.20 km	On foot	No	10% in 1988 0% in 1998 0% in 1999	Do
14	Shibir para	Shibir para flood shelter	0.20 km	On foot	No	4% in 1988 3% in 1998 0% in 1999	Do
15	Pal para	Shibir para flood shelter	0.10 km	On foot	No	5% in 1988 0% in 1998 0% in 1999	Do
16	Naogaon para	Shibir para flood shelter	0.50 km	On foot	No	10% in 1988 0% in 1998 0% in 1999	Do
17	Moddon para	Shibir para flood shelter	0.30 km	On foot	No	5% in 1988 0% in 1998 0% in 1999	Do

The lone flood shelter being within the village mound and is within distance of 0.10 to 1.00 km from the paras, the affected people can reach the shelter on foot or by boat should they decide to

move.

6.2.2.5 Vulnerability of Gurai mound against wave erosion

Gurai Gram mound is situated in a shallow haor area. The village mound has been subjected to wave erosion in monsoon from east, north and south sides while there is little or no threat from the west. The eastern periphery - having a vast open fetch length of about 10 km in front - is the worst affected side while the north and south sides have a lesser rate of erosion. The southern side is vulnerable on its eastern end while its western end seems to have attained some stability with the indigenous mode of protection by sandfilled gunny bags etc. The wave generating wind blows mostly from the eastern and the north-eastern direction, while lesser degree of wind blows from the south-eastern direction also. Generally, monthly maximum winds peed in monsoon varies between 10 to 20 knots. On all the sides that are exposed to wave action, erosion has intruded about 30m into the village mound, against the indigenous protection works, during the last 30 years. The northern side of the mound faces somewhat less assault of waves and is mostly covered by earth filled gunny bags and other local means.

The average rate of mound erosion in the eastern side is about 1m per year. Erosion could be more without the indigenous protection. Owners of many of the wiped out houses have migrated to the western and central parts of the mound on other people's land. Some of them left the village forever to take refuge in slums of the cities like Chittagong and Dhaka.

Table 6.16 presents para-wise vulnerability – immediate and potential – against wave erosion in the Gurai Gram.

Table 6.16: Vulnerability of village mounds against wave erosion in Gurai

Para no.	Name of para	Total		Vulnerable to erosion at present		Potentially vulnerable for near future	
		Houses (no.)	Households (no.)	Houses (no.)	Households (no.)	Houses (no.)	Households (no.)
1	Chila para	21	10	9	5	11	6
2	Bania para	39	18	11	5	20	10
4	Uttar para	81	41	6	3	32	15
5	Fakir para	28	13	8	4	11	5
6	Jal para	136	65	15	8	34	16
7	Kuna para	73	35	15	7	32	15
10	Dakhin para	56	27	10	5	25	12
11	Purba para	133	64	16	7	30	16
	TOTAL:	**567**	**273**	**90**	**44**	**195**	**95**

6.2.2.6 Overall constraints in Gurai

From the **Table 6.17** presented here it can be seen that the main problem in Gurai is the wave erosion. As has been expressed in the beginning, the average rate of erosion of the mound due to

monsoon waves is 1 m/year even with effort of the villagers to resist erosion by their indigenous means. This made many people loose their homes and hearth becoming destitute and migrating to city slums and elsewhere.

Table 6.17:Gurai Constraints: Priority of mitigation as considered by villagers

Sl No.	Constrains >	a. Homestead inundation	b. Erosion of the Village mound by wave action	c. Erosion of the homestead area by current	d. Lack of flood shelters for people cattle	e. Lack of flood warning and flood preparedness	f. Others (lack of roads etc.)
	Suggested measures >	a. Raising by homesteads earthworks	b. Provide protection against erosion of waves	c. Provide protection against erosion of homesteads	d. Construction of flood shelters for people livestock	e. Installation of workable flood and warning dissemination system	f. Construction of roads and embankment
	Name of para	Degree of priority in % suggested for mitigation by people					
1	Chila para	20	65	5	5	5	0
2	Bania para	20	65	5	5	5	0
3	Atka para	30	50	10	5	5	0
4	Uttar para	10	65	5	10	10	0
5	Fakir para	10	70	5	10	5	0
6	Jal para	15	65	5	5	10	0
7	Kuna para	10	75	5	5	5	0
8	Masjid para	5	70	5	5	5	0
9	Namashud para	15	70	0	10	5	0
10	Dakhin para	15	55	5	10	10	5
11	Purba para	10	70	10	5	5	0
12	Ghosh para	15	50	5	10	20	0
13	Pashchim para	20	50	5	10	10	5
14	Shibir para	36	34	0	5	15	10
15	Pal para	18	65	0	7	10	0
16	Naogaon para	20	55	5	15	5	0
17	Moddon para	18	61	5	7	8	1