“Collective Action to Reduce Climate Disaster Risks and Enhancing Resilience of the Vulnerable Coastal Communities around the Sundarbans in Bangladesh and India”

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Participatory Vulnerability Assessment (PVA) Report

Report Prepared by :
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Preface

This report will help to understand the climate change impacts, associated risks & vulnerability of the coastal communities of five blocks of Sunderbans delta region. These participatory vulnerability assessment reports categorize adaptation needs and prioritize the climatic threat on local vulnerable community viewpoint. It will help to assess present and future climate change impacts in the local contexts starting with flood, breaching of river embankment, cyclone, increased salinity, high tide etc. The process helps to enhance the capacity and awareness level of stakeholders. The report also articulates what the current coping mechanisms are and what else can be done to reduce risks for promotion of livelihoods and food security of poor and marginalized communities. The report will be an excellent document for learning & sharing at different level.

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1. Background, Purpose & Methodology of the Participatory Vulnerability Assessment

Development Research Communication and Services Centre (DRCSC) in association with Bangladesh Centre for Advanced Studies (BCAS) with the help of The European Union is carrying out the India chapter of the project entitled " Collective Action to Reduce Climate Disaster Risks and Enhancing Resilience of Vulnerable Coastal Communities around the Sundarbans in Bangladesh and India".

The overall goal of the project is 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 and mitigation to climate change.

The project aims to upgrade the lives and livelihoods of the vulnerable community through sustainable management of natural resources and to enhance their adaptation capacity with the changing climatic situation.

Participatory Vulnerability Assessment (PVA) is one of the most important parts of this project. Before starting the main project activities, it is essential to have a clear idea about the climate change risks and vulnerabilities of the community. Without having a clear knowledge about climate change risks and vulnerabilities of the community, it will not be possible to reduce the risks and vulnerabilities as well as finding out adaptation strategies to cope up with the consequences of climate change.

The main objectives of PVA Exercise were-

- To determine the extent of the climate change related disaster risks and vulnerabilities.
- To identify present adaptation strategies of the community to deal with the changing situation of climate.
- To determine future adaptation strategies to cope with the climate change related disaster risks and reduce their vulnerabilities.

District	**|**	**North 24 Parganas**
Block	**|**	**Hingalganj**
GP	**|**	**Dulduli**
Village	**|**	**Ketarchak**

2. Methods of Participatory Vulnerability Assessment (PVA)

The PVA exercise was conducted to understand the disaster risk and vulnerabilities of the community, to identify the prevailing coping mechanism of the vulnerable community and eventually, develop an action plan to strengthen their present adaptation strategies and lessen down the vulnerabilities. Before starting the PVA, preliminary information regarding the village profile and baseline survey were reviewed. After this, participatory research tools like Transect walk, group discussions, Key inform an interview (KII), drawing of resource and hazard maps and seasonal calendar of hazard, vulnerability matrix etc. were used to know various aspects of climate change in the Ketarchak village under Dulduli Gram Panchayet. Besides, a workshop was also organized to share the PVA findings with the concern stakeholders and to develop an action plan for community. A clear picture of the vulnerabilities and climate change related disaster risks of the village communities, and its effects on their lives and livelihoods have emerged through the PVA.

3. Results and outcomes of PVA

3.1 Location, Geo- physical Environment and Ecosystem of the project area :

Dulduli Gram Panchayat under Hingalganj Panchayat Samity of North 24 Parganas District is in the southern side of the block head quarter. This GP is surrounded by Sahebkhali river in the west, Sandelerbil GP in the north, Ichhamati and kallindi river in the east, part of Sandelerbil GP in the south. The villages along the river are protected by the earthen dykes and some portions are strengthened by brick pitching. The villages are mostly vulnerable to land erosion and breach of embankments. Other natural disaster like cyclone, flood, tidal surge, land erosion and breaching of mud dyke etc. are very much concern for this GP. This GP is within 26 km of Sundarban Tiger Reserve area. The nearest Wildlife Watch Tower is located at Jhingakhali Forest. The villages in this GP are intersected by rivers and are scattered in three islands. Non integration of the GP is a problem. The lands of this GP possess medium to high salinity condition during dry season and becomes mostly unsuitable for crop cultivation. But in the rainy season soil salinity comes down through dilution and becomes favorable for cultivation of Aman paddy in the water logged condition. The soil PH is mostly normal. The major land type of this GP is low land (around 65% of net cultivable area) followed by medium high land (20%) and remaining (15%) is high land. As the

major portion of the land type is low, water stagnation in the fields is high (ranging from 0.5 to 1. m) during kharif season. The cultivable lands are mostly mono cropped with rain fed traditional & tall variety Aman paddy. The high lands are covered with HYV Paddy in khariff season's cultivation. The cultivation in Rabi season is limited due to scarcity of sweet water. In this area the scope of generating additional employment to the effective work force is limited. The major climatic disasters faced by this GP are cyclonic storms; storm induced tidal surge, flood and subsequently breaching of river embankments. Breach of river embankments either side of Ichhamati, Kalindi and Sahebkhali Rivers is a major concern of the GP as these embankments are very much vulnerable to the natural disasters. Land erosion & change in meanders are also eating away the cultivable lands and other assets of the villagers and making the GP vulnerable to natural consequences. Probable impacts of climate change may inundate the low-lying areas located alongside these rivers and make the inhabitants environmental refugees.

3.2 The socio economic status of the communities:

Dulduli GP is comprised of 8 Revenue Mouzas namely Bhandarkhali (JL. No. 92), Kothabari(JL. No. -93), Chotosahebkhali (JL- 102), Swarapkati (JL -103), Ketarchak(JL-104), Lebukhali (JL- 105), Putiamathbari (JL 106), Dulduli (JL 07) having a total geographical area of 29.13 km. Total population of the GP is 19,953 (2011). Total number of household is 3866. Most of them are cultivators and belong to marginal, sub marginal farmers, Sharecropper & Patta holder categories. Households belong to Below Poverty Line (BPL) are around 39% (not yet finalized). Percentage of population belongs to Scheduled Castes & Scheduled Tribes are 78 % & 10%.

Respectively, in totality it comes to 88% which is changeable. Number of total workers in this GP is. 8094 (around 40 %). The lands of this GP possess medium to high salinity condition during dry season and becomes mostly unsuitable for crop cultivation.

Being a mono cropped area, the scope of generating additional employment to the effective work force is limited. A portion of work force (more than 35%) is migrated to nearby districts, Kolkata and other states in search of employment. Livelihoods of the people are centered round agriculture, fisheries, wild shrimp and prawn collection, honey collection, crab catching, etc. Particularly in PVA village people are engaged in the following livelihoods like Agriculture, Animal Husbandry, Collecting fingerlings, Non-agrarian labourers, Agrarian labourers, Migration, Kutiali, Rickshaw pulling, Fishing, MGNREGA work. Most of the owner cultivators belong to marginal & sub-marginal farmers and tenant farmers and Pattaholders owning land holding less than 1 ha. Nearing 35% of the households are engaged in fisheries, small business, service & transport sector.

Dulduli GP has one Higher Secondary, two Secondary, and 14 primary schools. According to 2011 census literacy rate is 65 %. The people of this GP are to depend on the Primary Health Centre located at Hingalganj and at Sandeshkhali. Some private health clinics & dispensaries are also operating in adjacent areas mainly run by the NGOs. The ICDS centres are working for women & child health care. Hand operated tube wells are the main

source of drinking water supply in this GP. There are problems in the sweet water aquifer below ground level in some pockets of this GP. Model schemes for supplying drinking water from tank based sweet water reservoirs have been explored but not yet popularized. In this GP, there are 12 km black top road, 18 km double soling brick paved road, and 21 km kutcha road. The houses are mostly kutcha & semi-kutcha type built with local materials, which are very much vulnerable to cyclonic storms and flood. During AILA occurred on 25th May, 2009 more than 50 % of the houses collapsed mainly due to strong wind and saline flash flood. Most of the villages were under saline water submergence for days together after the occurrence of AILA, which made the lands unsuitable for cultivation in two consecutive kharif seasons and put the cyclone victim families in great distress.

3.3 Findings of PVA exercise

Location of PVA:
Village : Ketarchak, G.P. : Dulduli, Block : Hingal Ganj
District : North 24 Parganas
Venue of P.V.A. : Ketarchak Primary School

Resource Map

Chinmoy Mukherjee, a worker of A.R.T.C. Hingalgunj, introduced him and the organization and asked one of the villagers to draw a map of the village. Among the people present there, Chinmoy Mondal and Surendranath Ray volunteered to make the map. After consulting the other villagers, they drew the four boundaries of the village. Then they pointed out the metal roads, walk ways, unpaved roads, irrigation canals, high lands and the low lands. Along with these, they highlighted the I.C.D.S. Center, Tube well, Sluice Gate, Culvert, Tower and the Primary School.

Border : The Ketarchak Village is surrounded by the Saheb Khali River in the east, the Kothabari Village in the west, the Nebukhali Village in the south and the Swarupkathi Village in the North.

The venue of P.V.A. or the Ketarchak Primary School is just 5minutes away from the Sahebkhali River flowing down the eastern side. It takes around 15 minutes to reach the border of the Kothabari Village, while the border of the Nebukhali Village in the south is 2 minutes away. To reach the border of Swarupkathi Village from the primary school, it takes around 10 minutes.

A metal road constructed by the P.W.D. runs through the center of the village. Besides this, in the south-west region there is metal road constructed by the Pradhanmantri Gram Sharak Jojona. Other than these, most of the roads are unpaved or brick roads. When the river banks overflows, the water enters from one locality to the other through the metal roads, while the unpaved ones break. For this very reason, the villagers are unable to communicate from two different villages.

The Sahebkhali river flows in the eastern side of the village. It is said that the British

excavated this river. In May 2009, during Aila, this river flooded Ketarchak. The Villagers say that there are three I.C.D.S Centers in the village. But these I.C.D.S. centers cannot be operated during flooding because water stagnates there. There is also a primary school. The villagers cannot take shelter here as well because it gets drowned in flood. There is no high school in the village.

There is no big or small club in the village. Some of the villagers are associated with the clubs of the adjacent villages. There is no health center or sub health center in the village. If any of the villagers fall ill, he/she has to be taken to the hospital situated 12km away from the village. No local market is there in the village. The villagers have to walk for 30 minutes in order to reach the Bhandarkhali market.

There is a jetty on the eastern side of the village which helps the villagers to keep in touch with the people of the other villages. A sluice gate is there in the village. The villagers open this gate to release the excess saline water from the flood, cloud burst or the breaching of the embankments.

There are three culverts in the village. One of them goes under the P.W.D. road on the southern extent of the village. This culvert is used by the villagers to set up tents as shelters during the flood. The other two culverts cease to function when the river banks get breached. The villagers cannot move the stagnated water.

11 tubewells could be seen installed in different hamlets of the village. Most of these tubewells cannot lift water in summer (May-June). Villagers have to walk 2 km to fetch water from the neighbouring village. In case of a breach in the river embankment or cloudburst, water level rises to drown these tubewells which creates an acute crisis of water for the villagers. At that time, they have to fetch water from the neighbouring village or procure it from the market.

There is no cyclone shelter in the village. In the event of natural calamities, people take refuge in a cyclone shelter situated about 2 km away from the village, but it does not have the capacity to hold all the people seeking refuge, because at that time people from other villages also flock together to take shelter here. In such emergencies, the villagers set up tents on main roads or river embankments to live in. The only primary school in the village cannot shelter the people in distress as the building itself goes under water.

No large pond could be traced in the village. Individual villagers own small ponds measuring 2-5 kathas. In case of a breach in the river embankment all the fish reared in these ponds flow away. There is no fish gheri in the village.

On the northern extent of the village, there is a tower. A temple is also there. On the eastern side there is a brick kiln on the banks of the river.

Like in the other villages in this area, there are both upland and lowlands in this village also. Uplands are crop of rainfed paddy. Nature of soil is sandy loam. This is a single crop area. In the lowlands they grow paddy varieties like diar, swarna, DM20, masari, pathikkha etc. with chemical inputs. Individual land

holdings vary between 8 to 10 bighas. Besides paddy in the lowlands, on the upland ladies finger, pumpkin, ridged gourd, leafy vegetables etc. are grown. Amount of rice and vegetable production is falling due to rise in salinity in the soil due to breaches in the river embankments.

On the western boundary of the village flows the saline water canal. Beside this canal is a vested land measuring about 8 bighas. It is used by the villagers.

Social Map

The 280 families residing in the village are divided into two hamlets, namely Purbopara and Paschimpara. Except for a handful of general caste families, all the households belong to SC families as there is no ST family in the village.

Total number of families residing in Purbopara is 124, whereas in Paschimpara it is 156.

1. *Purbopara*

This hamlet extends from north to south. It is situated near the fringes of the Sahebkhali river. As a result, in case of a breach in the river embankment, Purbopara is affected the most. The mud huts in the hamlet get broken. It compels people to seek refuge in the cyclone shelter situated at a distance of 2 km. Livelihood of the people of this area also gets very seriously affected.

2. *Paschimpara*

The extent of damage in this hamlet is less than that in Purbopara. Apart from a small portion of asphalt road, most of the roads in this area are either brick-paved or simply mud roads. The PWD metal road on the eastern flank of the hamlet does not allow river water to flow in when there is a breach in the embankment. The asphalt road in this case acts as a dam. But vegetable and rice cultivation get severely damaged. There is huge loss of work. People have to resort to fishing in order to earn their living. The residents of this hamlet either live in temporary tents on the metal road or seek refuge in the cyclone shelter 2 km away.

Vulnerability Map

Out of the total land mass of 700 bighas in the village, 500 bighas is agricultural land. There is one brick kiln in the village. Most of the individual land holdings vary between 8 and 10 bighas. Gradient is from south to north. Beside a saline water canal on the western extent of the village lies a vested land of 8 bighas. Sahebkhali river flows by the eastern border of the village. Due to absence of timely maintenance of the earthen embankment on the south-eastern boundary, its condition has become deplorable. Further, cracks are developing in it from the depth of the river. At the midpoint of the eastern border is a ferry ghat (place for boarding the ferry). The embankment breaches on both sides of this ferry ghat.

In case of such a breach, river water at the first instance enters into Purbopara, which forces the inhabitants to take shelter in tents set up on the asphalt road or in the cyclone shelter 2 km away. River water gushing in through the breaches breaks the brick and mud roads of Purbopara. It becomes impossible for the villagers to commute between places even within the village. As the condition of the culvert in this hamlet deteriorates at the time of such

calamities, many many days pass before the stagnated water can be drained out. From Purbopara people have to wade through chest deep water to reach the cyclone shelter or the high embankment.

Vulnerability ranking by standards set by the villagers

South-eastern border of Purbopara – Zone 1
North-eastern border of Purbopara – Zone 2
West-southern border of Paschimpara – Zone 3
West-northern border of Paschimpara – Zone 4

The south-eastern border of Purbopara has been selected by the villagers as Zone 1 or the most vulnerable considering the fact that embankment forming the southern boundary of the village breaches every year. Most of the houses in this area are made of mud and bamboo. A section of the residing in this hamlet take shelter in tents set up on the embankment. Some families have to go to the cyclone shelter 2 km away. Brick roads and mud roads get destroyed by the force of the water gushing in through breaches in the embankment. It becomes impossible for the villagers to take along with them their cattle, ruminants, birds and harvested crops. Hence, over the years cattle population of the village has drastically reduced. Villagers have to face acute crisis of drinking water. Sanitation is a huge problem for both men and women during the period of water stagnation.

On behalf of the villagers Komal Mondal and Chinmoy Mondal listed the different types of natural calamities faced by the villagers. The list included -- (1) embankment breaches, (2) storm and thunder, (3) cloud burst, (4) water stagnation, (5) irregular rainfall. Out of all these, embankment breaches cause the greatest damage. According to Surendranath Roy, the embankment breach that happened in 2009 and 2010 caused the people to lose everything they had.

During the time of natural calamities, some of the affected families of Paschimpara take shelter on the asphalt road. Others go to the cyclone shelter. Like in Purbopara, in Paschimpara also brick roads and mud roads break under the force of water flowing in. There is huge loss of crops, animals, birds etc.

Vulnerability Matrix

Different natural calamities faced by the residents of Ketarchak are (1) flash flood, (2) erosion or breach in river embankment, (3) storm, (4) water stagnation, (5) cloud burst, (6) erratic rainfall.

Villagers' comments:

1. Between flash flood and embankment breaches, the villagers said that they were more affected by the latter than the former. In fact, there have been less incidents of flash flood in the last 10 years, but many more times there have been breaches in the embankment and the extent of damage towards agriculture and assets of people caused thereby has been the maximum.

2. Between flash flood and erratic rain, people are more affected by the latter, because in case of flash flood, the water drains out after a few days of stagnation, but erratic rains cause vegetable and paddy production to fall year after year.

3.Between embankment breach and storm, people get more affected by the former. Storm happens every year for a small period of time, but that does not affect people so much as does embankment breach it reduces crop production and increases salinity in the soil. Vegetable production gets completely stopped.

4.Between storm and cloud burst, people are more affected by the latter, because in the last 5 years there have been no damage due to storm, but the cloud burst that happened in 2011 destroyed all seedbeds and caused extensive damage to vegetable cultivation.

5. Komal Mondal from among the villagers said that between cloud burst and erratic rainfall people are more affected by the latter. In order to elucidate his statement, he said that in the last 5 years, cloud burst has happened only for once, but the trend of erratic rainfall is increasing, which has reduced crop production. In the recent times, production of paddy has reduced considerably. Besides, the production of vegetables like ladies finger, ridged gourd, pumpkin etc has reduced.

6. Between water stagnation and storm, the latter causes more damage, because storm creates a panic in the minds of the people. It causes extensive damage to the ears of ripe paddy. Apart from that it destroys the thatched roofs of mud houses.

Vulnerability Matrix Ranking done by villagers

1.Embankment breaches
2.Erratic rainfall
3.Cloud burst
4.Storm
5.Water stagnation
6. Flash flood

Seasonal Calendar of Income

Livelihood sectors the villagers are engaged in include

1. Agriculture
2. Animal Husbandry
3. Collecting fingerlings
4. Non-agrarian labourers
5. Agrarian labourers
6. Migration
7. Kutiali
8. Rickshaw pulling
9. Fishing
10. MGNREGA work

- *Agriculture*

  From June-July to September-October, the men are engaged in activitieslikepreparing seedbed, transplanting saplings, weeding etc. and from December-February they get engaged in harvesting and threshing paddy. Women also do the same work along with the men, but in the recent times much more women can be

seen getting engaged in agriculture, as in most of the households men do not stay back at home. But in case of any natural calamity, all agricultural activities stop. At that time, people catch fish, collect fingerlings or migrate to other places for work.

2. Animal Husbandry:
   Villagers said that the women rear cattle, goat, ducks, hen etc throughout the year. Men assist women in this work. Livestock population of the village has reduced drastically due to earlier natural calamities. Villagers had to sell off cattle and small ruminants at throw away prices.

3. *Fingerling collection*:
   Both men and women are engaged in fingerling collection, but percentage of women doing this work is maximum. The work continues almost throughout the year from January-February to September-October. In the event of any natural calamity, it becomes impossible for them to sell the fingerlings. At that time, they have to catch the saline water fish for their livelihood.

4. *Non-agrarian labour*
   Non-agrarian activities are mostly done between mid-November and mid-May. Both men and women are equally engaged in this kind of work. In case of natural calamity, no such work is available. Then people have no other option but to migrate to other places for work. Or else they catch fish and sell it for a living.

5. *Migration*
   Ravisankar, one of the villagers said, "The main income for most of the families come from outside. " Out of the people residing in the village, 25% women and 75% men migrate to other places for work. Maximum migration takes place between September and February. Men from some of the families work outside the village throughout the year. Compared to the last 10 years, trend of people going outside to work has increased this year as there is no work available in the village. The villagers said that those who work outside earn Rs.4000 to Rs.6000 per month. Side by side the earning of women ranges between Rs.3000 and Rs.5000. For both men and women staying outside, the arrangements for food and stay is not healthy. A lot of people have to cram themselves in a small room and have inferior quality food.

6. *Fishing*
   Villagers rear fish in their own ponds almost throughout the year, but fish rearing is mostly done between mid-June and mid-February. Along with men, women also take part in this activity. Over the last two years fish rearing could not be done due to embankment breaches and cloud burst. Villagers said that the native varieties like shole, latha, chang, mourala, puti etc. are getting lost for repeated entry of saline water in the village, but there has been a spate in the cultivation of salinity tolerant fish like talapia, tangra, shrimps etc.

7. MGNREGA work

Villagers work in projects under MGNREGA from mid-February to mid-June. 50% of the women population of the village take part in this 100 days employment guarantee scheme. No resident of Ketarchak village has applied to the Panchayet complaining that he/she has not received work under MGNREGA. Work under this scheme which was temporarily stopped in the village due to natural calamities has been started afresh.

8. Rickshaw-pulling

12% of the villagers are engaged in pulling rickshaws/vans as a means of livelihood. This is an entirely male profession carried out through the year. In the event of a natural disaster, condition of the roads becomes so deplorable that it is impossible to drive a rickshaw on that.

Chronological Analysis of Natural Calamities

Natural calamities faced by the villagers include (1) storm, (2) embankment breach, (3) erratic rainfall, (4) water stagnation, (5) cloud burst.

Collective Action to Reduce Climate Disaster Risks and Enhancing Resilience of Vulnerable Coastal Communities around the Sundarbans in Bangladesh and India" in South and North 24 Parganas districts.

Sl. No.	Nature of Calamity	Present Situation	10 years ago 2002-1992	20 years ago 2012-2002
1	Storm	Compared to the earlier situation, strength of the storm is increasing and its nature is changing,Compared to the earlier situation,strength of the storm is increasing and its nature is changing. Villagers said that from govt. sources sometimes they receive early warning and sometimes they get it after the storm has lashed.	Aila came in 2009 that that caused huge loss of livestock including cattle, small ruminants etc.	
2.	Embankment breach	The incidence of breaches in the river embankment is increasing. Volume of water in the river is rising. No trees are there on the embankment which is causing it to give way. Fishing the near the bank is also one of reasons for its erosion.	Breaches in the embankment happened only once in 2009. Less attention was paid by the govt. deptt.In 2009, there was no early warning for Aila.	No attention was paid by the govt. No incidence of embankment breach happened.
3	Erratic rainfall	Rainfall is becoming more and more erratic, which in turn is causing the cultivating season to shift. Komal Mondal said - "Rainy season has got delayed by full one month. " Transplanting time is also hanging. Amount of production is on the wane.	Rain used to come on time. Crop production was normal.	Rains were regular. People did not haveto think about rain water.
4	Water stagnation	With the canals silted up, the drainage system is not working properly. Habitations on the canal banks has made the drainage system almost non-functioning. Condition of the sluice gate is not good.	Condition of the drainage system was bad. Villagers said that at times they could not bring home fully ripened crops.	Drainage system was bad.
5.	Cloud burst	Incidence of cloud burst is increasing (2011). Seedbeds and vegetable crops got destroyed. Arable lands are left vacant.	There was less incidence of cloud burst.	

Seasonal Calendar of Disasters

1.	Flash Flood	Flash floods occur between mid-September and mid-October.
2.	Embankment breach	It happens between mid-June and mid-October.
3.	Storm	It happens mostly in the months of April-May-June an September-October-November.
4.	Water stagnation	This takes place usually in the months of June-July-August.
5.	Cloud burst	Cloud bursts happen mostly between mid-June and mid-October.
6.	Erratic rainfall	Usually it happens during the months of June-July-August-September-October.

Symbols used by villagers to denote different months

1.	Boishakh (Apr-May)	swastik
2.	Joishtha (May-Jun)	handfan
3.	Asharh (Jun-Jul)	rain
4.	Shravan (Jul-Aug)	plough
5.	Bhadra (Aug-Sep)	ripe Palmyra fruit
6.	Ashwin (Sep-Oct)	Durga
7.	Kartick (Oct-Nov)	scimitar of goddess Kali
8.	Aghran (Nov-Dec)	ears of ripe paddy
9.	Poush (Dec-Jan)	pithe puli (traditional Bengali sweets)
10.	Magh (Jan-Feb)	veena (indian string instrument in the goddess Swaraswati)
11.	Falgun (Feb-Mar)	colours (representing 'holi' – the festival of colours)
12.	Chaitra (Mar-Apr)	charak (weird acrobatic feats performed as offering to Lord Shiva)

Report of Transect conducted through the village

Transect was conducted with the villagers who participated in the PVA of Ketarchak village. It was found that most of the lands are single cropped. Only one crop of rainfed paddy is cultivated in Kharif. Nothing can be grown in the rest of the year due to lack of irrigation. During the winter potato, cauliflower, cabbage, spinach, brinjal, tomato, carrot, pumpkin, beans etc. are grown in the upland within the homestead. The same land is used for growing amaranth, greater and lesser yam, ladies finger, ridged gourd, snake gourd etc. during the rainy season.

The village does not have natural resources worth mentioning. Few small ponds are owned by individual families. Even these dry up in kharif. Out of the two canals one has been recently renovated, but in the dry season saline water enters the canals. As a result, it is not possible to use the canal water for irrigation. Some of the villagers catch fish from these canals. Land rights over 8 bigha vested land

has been distributed among the villagers. There is no large pond in the village. 12 tubewells have been sunk in the village, but all of them cannot lift pure water suitable for drinking. Polluted water enters the pipes of the tubewells during the rains and floods, as a result of which villagers drinking the water lifted by these tubewells get infected by gastro-intestinal diseases like diarrhea, amoebic dysentery etc. Flood water also enters the ponds which makes the water unusable for household purposes.

The village does not have much of forest resources either. There are very few trees like Geoan, Bani etc on the river banks. Villagers collect their fuel wood from these trees. About 20% of the families collect fingerlings from the river. A section of the villagers catch fish from the river, canals and the marshes.

Women rear ducks and hen, and also goats and sheep. Trend of rearing cattle is waning for difficulty in availability of fodder. Grass does not grow on the fields like it did previously. Birds like Indian Myna, crow, crane, dove, kingfisher, bulbul, black drongo etc. have considerably reduced in number. Number of beneficial insects like butterflies, spider, bees etc. is also quite low. Infestation of mosquito and flies is on the rise.

After discussion with villagers and a survey of the village it was found that villagers are most affected by breaches in the river embankment. Besides, other natural calamities like cloud burst, storm, water stagnation etc also affect the villagers.

a) Embankment breaches causes havoc on assets like cattle, houses, crops, fish reared in the ponds, timber trees etc. Fish flow out of the ponds. There is acute crisis of fodder. Plinth or base of the houses get damaged. Timber trees die. There is total loss of crops. Salinity of the soil increases.

b) Storms devastate houses, especially roofs get completely damaged or blown off. Trees fall. Crop loss is also huge.

Farmers are being affected by erratic rains in the recent times. Late rain is delaying the sowing and transplanting time. Sometimes seedbeds, vegetable gardens and even harvested rice lying in the field are getting destroyed by sudden unexpected heavy rain.

Primary school is the only shelter for the villagers in the event of natural disasters, but when it floods due to breaches in the embankment, water enters in the school also. The floor of the school is about 3 ft from the ground level, but flood water reaches 1/2 ft above that level. It is difficult to accommodate the villagers in the cyclone shelter in the neighbouring village about

4 km from here. Some of the villagers take refuge in tents set up on the high asphalt road where flood waters do not reach.

After inspection of the village it was found that the soil of the low lands is clayey and salinity level is quite high. Water holding capacity is very high. In dry season soil gets cracked and a light layer of salt deposits on the surface. Character of soil in uplands used for dwelling purposes is clayey loam, but here also salinity is quite high. Vegetable seeds after germination die in the scorching sun.
Varieties of fish lost from this area include shingi, magur, shole, boal, bantora etc. Animals lost from the area include buffalo, sheep, garhol, indigenous rabbits, fox etc. Birds getting lost from the area include gurguri, cormorant, sparrow, weaver bird, parrot, magpie robin, raven, kite, vulcher etc. Trees already lost or in the process of getting lost include garan, hogla, neem, nishinda, golpata, palm, date palm, coconut, mango, jackfruit, blackberries, wood apple etc.

Focus Group Discussion (Farmer Group Male)

Discussion with the farmers revealed that over the last 10 years temperature has increased a lot, especially during the months of March-April-May-June and August-September. With the increase in temperature crop production is falling.

Amount of rainfall is also reducing. Onset of rains and thereby the rainy season is getting delayed. In case of storms, number, wind speed and time of stay is increasing.

Natural calamities faced by the farmers in recent times include embankment breach, storm, irregular rainfall, flood, temperature rise etc. Twenty years ago calamities faced by farmers included storm, water stagnation, cloud burst, embankment breach etc.

Rise in temperature is causing saplings to die, lowering of production and infestation of pests in crops. Seed sowing or transplantation of saplings cannot be done at the right time due to irregular rainfall. Erratic rain is causing a fall in the amount of production. Crops are getting inundated due to cloud burst. Seedbeds and even transplanted saplings in the field are getting destroyed. Saline water is entering the cultivable lands due to breaches in the embankment which in turn is resulting in salinisation of soil and there by loss of productivity.

Farmers have not yet been able to adopt any suitable strategy to get rid of disasters caused by natural calamities. Some of them are keeping grains in store. One or two farmers are cultivating salinity tolerant varieties of paddy like hamai, N.C., gobindobhog etc.

According to them livelihood strategies that may be adopted are —

In order to reduce salinisation of the soil and to meet the deficit of water for irrigation, cultivation may be carried out with stored rainwater.

Salinisation may be reduced and production increased by reducing the use of chemical fertilizers and replacing it by organic fertilizers.

Impact of storm may be reduced by planting trees beside roads, canals, fisheries and homesteads. This will also help in addressing the scarcity of fuel and fodder.

Excavation of new ponds, renovation of existing ponds and canals, making of small storage

tanks within the homestead etc. may be done for harvesting rainwater and using it for irrigating crops.

In order to reduce the incidence of breaches in river embankment, mangrove plantation on the river bank and riverine fisheries may be of great help. But to implement this, the farmers expect some training, economic and technical support from the organisation.

Focus Group Discussion with Women

The discussion revealed that women are engaged in livelihood activities like catching fingerlings, agriculture, livestock rearing, 100 days' work and work in brick kilns. They are not associated with any NGO. Most of the women are members of SHGs. Some of them are workers of Asha or ICDS. In the rainy season they participate in agricultural activities. They catch fingerlings in the river from mid-February to mid-June. During the same period they also participate in MGNREGA work. They work in brick kilns from mid-November to mid-May. Their association with livestock rearing continues through the year.

In the event of natural calamities they are faced with scarcity of fuel and drinking water -- either they have to bring it from far or make use of contaminated water. It is not possible to boil the food properly due to scarcity of fuel. They are also faced with scarcity of fodder. Many a times they have to sell out domesticated animals at nominal prices. Sometimes they have to pawn their ornaments or spend their savings. Let alone nutritious food, after serving everyone else in the family they are deprived of even the food that can fill their stomach. At this time sanitation becomes a huge problem for them that often results in serious diseases.

Their livelihoods are getting seriously affected due to disasters induced by climate change. Agriculture is being hampered by excessive, low or untimely rainfall. Crops are dying or production is getting reduced. Cultivable lands are getting salinized due to river water inundating these lands by entering through breaches in embankments. It is hindering the grass to grow on these lands which, in turn, is affecting livestock rearing. Domesticated animals and birds are getting attacked by different diseases like goat cox & diarrhea in case of goats, ranikhet in case of ducks and hen. Naturally, in the event of such an epidemic, they are compelled to sell out their domesticated animals and birds at throw away prices.

They get early warning about impending natural disasters just before it comes through radio or TV. Sometimes 2-4 hrs before disaster lashes out, the Panchayet warns people by making use of a mobile public address system. Besides these, sometimes the news gets

circulated through the word of mouth. But in spite of such warnings, they do not want to leave their homes. In case of a dire necessity, they take refuge on an elevated place near the bridge. The decision to leave home and take refuge elsewhere outside home mostly rests with the men.

As measures for disaster preparedness, they organize a stock of rice, pulses, domesticated animals, cash money, important papers, children etc. Most of the families do it. They have learnt about the importance of these through campaign on radio and television.

Decision regarding disaster preparedness is shared by both men and women, like in case of selling or buying something or in deciding which is more necessary, they take a joint decision.

The women have not been able to develop a proper disaster risk response strategy. Some of the measures taken by them include --

a) Some of them keep a stock of food and fodder
b) Some have raised the plinth of their houses
c) Some of them have made the walls with mix of hay + mud or mud + paddy smut so that the walls do not get washed out in rain.

The strategies they think they should adopt in order to reduce the risks they usually fa during disasters are --

a) Plinths of the mud houses must be raised and the models changed.
b) Trees should be planted around the house to save it from storm.
c) Mangrove and other varieties of trees should be planted in the silted surface adjacent to the embankment in order to stop or reduce the incidence of breaches in the embankment.
d) Latrine should be made on a high platform.
e) Tubewells should be placed on a raised platform and the surrounding should be properly paved.
f) Provisions must be made for agro-based alternative livelihood, so that work might be available in leisure time.
g) Cultivation of fodder crops in fallow lands should be encouraged.

Focus Group Discussion with Panchayet Pradhan

- Interviewee Mitali Kayal
- Mobile No. 9593020205
- Address Vill. Santra 1, GP. Dulduli, Block - Hingalgunj
- Interviewer Asutosh Munda

Mitali in her interview expressed that she could feel perceptible changes in the local climate in the recent times.

- *Temperature*

  She believes that the present changes in temperature has been caused by the universal phenomenon of global warming. Day by day temperature is increasing. Winter can no more be felt as a season. Span of winter is gradually shrinking. She assigns reduction in the number of trees as one of the main reasons for global warming. This is affecting agriculture in many ways. One of them is increase in attack on crops by

pests and diseases like fruit and stem borer in eggplant, mosaic virus in ladies finger, leaf curl disease in chili, late blight in potato, brown plant hopper in paddy etc.

- *Rainfall*
  Rain is not coming in time. From 2009-2012, it could be seen that the entry of monsoon in the village has been late. Untimely creation of low pressure zone is causing heavy rain. As a result crops cannot be sown on time. Amount of rainfall is increasing towards the end of the season.
- *Storm*
  Post 2009, occurrence of storm has reduced. Before 2009, norwesters were a habitual incident. This year, there has practically no such thunderstorm. Number of storms has reduced this year. But in 2009, lots of people were affected by Aaila -- assets like crops, livestock, land etc. got devastated and 95% people were rendered homeless.

Natural calamities like storm, cloud burst, river embankment breach, irregular rainfall, water stagnation used to happen 20 years ago.

The natural calamities happening now include storm, embankment breach, cloud burst, salinization, irregular rainfall etc.

Aaila came in 2009. Embankment breached and water gushed in.
In 2010 also, the embankment gave way.
In 2011, there was cloud burst.

- *Bio-variety*
  Impact of climate change can be observed on different life-forms. Local varieties of fish like catfish (singi, magur), mourala etc., some birds like the Indian Myna, vulchers, owls etc., some animals like fox, jungle cat etc. are getting extinct. She feels that the reasons for this are (a) increase in temperature, (b) loss of habitat and (c) scarcity of food suitable for these living beings.
- *Health*
  Along with the calamities that risked the lives of the villagers, many diseases are spreading silently. These include unidentified fever, cancer, viral infections etc. Apart from these, women and children are suffering from malnutrition.
- *Natural Resource*
  Due to salinisation of water and soil, local breeds of fish cannot be cultivated, crop production is falling, fruit trees like custard apple, local variety of pomegranate (dalim) etc. are getting extinct.

She believes that natural calamities are having its toll on life and livelihoods of people in many different ways.

- *Storm*
  Fully ripe crop about to be harvested is getting destroyed. It is having widespread impact on trees.
- *Flash flood*
  The entire area goes under water that makes agriculture and other agro activities impossible. People are rendered jobless. Seeds and saplings of vegetables cannot be sown or transplanted in time.
- Salinisation
  Due to natural calamities, amount of land getting salinized is increasing. Crops cannot be grown in arable lands owing to the crisis of sweet water in kharif season. As a result amount of production is falling
- High tide
  Villagers are getting panicked due to high tide. Breaches are showing in the embankment. People are getting jobless. So villagers are migrating to other places to earn a living.
- Irregular rainfall
  Villagers are failing to produce crops in time due to either excessive rain or less rain or no rain. Production rate of paddy is falling. People are shifting their dependence on agriculture to other professions like driving cycle vans, working in brick kilns etc. Besides agriculture, women are adapting other livelihood options like rolling biri (Indian cheroot) and collecting fingerlings as means of supplementary income.

As pre and post disaster preparedness measures, villagers adopt certain measures. Pre disaster prepared measures include mending of houses, making arrangements for dry food, adding mud to the river embankment etc. As post disaster measure they raise the plinths of their houses, rebuild river embankments, migrate to other states of India for earning a living.

She think this climate change adaptive strategy of the villagers is not appropriate, because in the present geographical situation of Sundarban, in no way is it possible to resist breaches in the river embankment. She suggested that it would be wise to do rainwater conservation and use the stored water to grow a second crop, as the entire area is a single crop zone mainly dependent on the rains. Apart from this, she proposed the income of the villagers by creation of person days. Her other suggestions included cultivation of salinity tolerant crop and saline water fish. She invited NGO and other voluntary organisations to come forward and join hands with the Panchayet to implement these adaptive strategies.

No disaster preparedness strategy has been applied by the villagers as there was no training or awareness from either government or non-government sources.

So there is a general lack of awareness. People do not know what to do at the time of disasters.

She feels that a Village Rescue Corps should be formed, who should be provided proper training, so that they can help people out at the time of disaster.

Focus Group Discussion with Panchayet Member Interviewee Kamala Sardar

- Address Vill. & P.O. Kothabari, PS. Hingalgunj
- Interviewer Asutosh Munda

Kamala in her interview said that she also felt that there has been perceptible changes in the local climate in the recent times.

- *Temperature*
  She thinks in the last 2-3 years temperature has increased during summer and day by day it is increasing further. She pointed out reduction in the number of trees has caused carbon dioxide to increase in the atmosphere. This, in turn, is resulting in the increase in temperature.
- *Rainfall*
  In 2011 cloud burst happened. This year's rainfall has got delayed by one month. Villagers are facing tremendous trouble in growing paddy and vegetables due to this irregular rainfall -- sometimes it is very heavy, sometimes it is absolutely untimely.
- *Storm*
  Post 2009, occurrence of storm has reduced in the last two years, but its time of stay has increased. Wind speed has also increased and the impact has become stronger. She feels that it is all due to climate change.

Natural calamities like river embankment breach, norwester storm, water stagnation, cloud burst etc used to happen 20 years ago.

The natural calamities happening now include embankment breach, cloud burst, storm,salinization, water stagnation etc.

- *Bio-variety*
  She thinks that climate change is having its effect on the life of different living beings. Indigenous varieties of fish like shole, shingi, chang etc are getting extinct and more and more culture of salinity tolerant fish like telapia, gulshe tangra is increasing in the area. Reptiles like iguana and mongoose are also on the verge of extinction.
- *Health/Nat. Res.*
  Climate change is having its toll on the health and natural resources of the area. Old people and women are suffering from diseases induced by malnutrition. Amount of salinisation in the soil is increasing. There has been reduction in the number of trees. Grass is not growing in the lowlands, which is creating a crisis of fodder.Natural calamities are controlling the life and livelihoods of people.
- *Storm*
  Untimely storm is devastating fully ripe crop. There is a huge loss of fruit trees as they fall under its impact.
- *Salinisation*
  In the last 5 years, amount of salinity in the soil has risen to a great extent. Agriculture is not possible in any season other than monsoon.
- *Embankment breach*
  Residents of the area failed to grow any crop in 2009 and 2010 due to breaches in the river embankment. Consequently, they had to migrate to other states for earning a living.
- *Irregular rainfall*
  Irregularity in rainfall has become prominent in the last 2-3 years. Sometimes it is raining continuously for a number of days and sometimes there is no rain at the expected time. This is affecting agriculture and pisciculture very severely. It is having its effect on the life of women.

As pre and post disaster preparedness measures, villagers raise the plinths of their houses, reinforces the embankments with fresh mud, sets aside a stock of dry food etc.

She feels that livelihood status of the people can be ameliorated by cultivating salinity tolerant varieties of paddy & fish, local varieties of vegetable and through animal husbandry. In order to implement these adaptive strategies different types of training should be organized with the initiative of both govt and non govt agencies.

The area does not have any specific preparation for reducing risks posed by disasters. There is lack of awareness among villagers regarding the urgent need for disaster preparedness and management. She thinks that a Disaster Resistance Committee should be formed with the participation of villagers. This committee should form a Village Rescue Corps with trained young people for rescuing and helping people at the time of disasters.

Focus Group Discussion with Teacher

- Interviewee Biswajit Maity
- Address Vill. & P.O. Kothabari, PS. Hingalgunj
- Interviewer Asutosh Mund

Biswajit thought that prominent changes could be observed in the local climate in the recent times.

- *Temperature*
  In the last 5 years, temperature is gradually rising. This year they had to sanction 13 days extra leave over and above the official summer vacation. He is under the impression that the phenomenon of climate change will result in more rise in temperature.

- *Rainfall*
  Rain in the last few years is not falling during monsoon time as it did 10 years ago. This is affecting the farmer in sowing or transplanting crops. He feels that absence of trees is reducing the amount of rainfall.

- *Storm*
  Number of storms is reducing, but when it is coming, it is coming with amplified intensity causing widespread destruction of mud houses and crops.

Natural calamities like river embankment breach, cyclones, cloud burst etc used to happen 20 years ago. The natural calamities happening now include storm, embankment breach, irregular rainfall, cloud burst, salinization etc. The hurricane that came in 1988 severely affected 95% of the people, out of which 30% lost their lives. In 2009, river embankment breached.

In 2011 cloud burst happened

- *Bio-variety*
  He thinks climate change is having its effect on the life of different living beings. Birds like vulchers and crows, animals like fox, reptiles like different type of snakes, amphibians like toad, frog, snails etc are getting lost. Besides, domesticated birds like ducks and hen and animals like cows and goats are contracting different diseases.

- *Health*
  Women and children are being infected with vector diseases like dysentery, diarrhea, gastro-intestinal disorders etc. Acute malnutrition is making the people vulnerable to being attacked by viral diseases.

- *Natural Resource*
  Climate change is increasing salinity in the soil. Fruiting of coconut and beetle nut trees is falling. Different medicinal plants like tulsi, kalmegh, basak, nisinda are getting extinct.

Natural calamities are controlling the life and livelihoods of people.

- *Storm*
  Storms are devastating fully ripe crop and permanent fruit trees.
- *Stalinization*
  In comparison to the condition 10 years ago, salinity level in the soil has grow manifolds in the recent times. This has increased the cost of agriculture, but has not improved amount of production, which is reducing job possibilities of agricultural labourers.
- *Irregular rainfall*
  Irregularity in rainfall farmers are losing their confidence about growing rain fed crops. Sometimes it is raining continuously for a number of days and sometimes there is no rain at the expected time. This is affecting agriculture severely.
- *Temperature rise*
  Rise in temperature causes people to lose their vitality. In the months of May June, it is impossible to go out of home beyond 10 o' clock in the morning.Women are equally suffering. The situation is resulting in a fall in the amount of daily wages.

As pre and post disaster preparedness measures, villagers reinforce the embankments with fresh mud in order to increase its height and strength, raise the plinths of their houses, place the tubewells on raised platforms to avoid crisis of drinking water during disasters.

According to him, livelihood status of the people can be improved by cultivating salinity-tolerant varieties of fish, rearing ducks and hen, planting fruit trees, rearing small ruminants like goats and sheep etc. Apart from that he also suggested to make arrangements for harvesting of rainwater and use it to grow two more crops in winter and summer other than the rain fed crop during monsoon. In order to implement these adaptive strategies different types of training should be organized with the initiative of both govt and non govt agencies.

For reducing risks posed by disasters, following measures have been taken:
Trees have been planted to resist storms, mud has been put on embankments to reinforce and increase its height, and drainage system has been improved as a response to cloud burst.

There is lack of awareness among villagers regarding disaster response. He thinks that as a definite measure of disaster preparedness a permanent cyclone shelter should be made and arrangements should be made for providing training to the villagers.


বিপদাশঙ্কনতা মানচিত্র (VULNERABILITY) MAP
4
2
3
1


সম্পদ মানচিত্র RESOURCE MAP


আয়ের মরশুমী দিনপঞ্জী (SESONAL LIVELYHOOD) CALENDER

District	|	North 24 Parganas
Block	|	Sandeshkhali 2
GP	|	Bermajur I
Village	|	Polpara

Village Map

At 10.00 AM on 12.08.12 in BasuSardar's house, the exercise of drawing the village map was started in the presence of the members of the local Panchayet, ICDS workers, members of women's groups and important personalities of the village.

It started with a self introduction of those present. SankarSardar, an eminent person of the village and Debjani Das, an ICDS worker used a small stick to mark the place they were standing on the ground. On the western extent of the village is Dambalpara. It takes about 10 min to reach there from the reference point. Kalagachhiriver flows by the eastern border of the village. It is just about 1 min walk from the reference point. At a 5 min distance is Hatkhola which forms the northern border of the village. Aitpara at the southern extent of the village can be reached in 7 min. With the approval of all present, the stick was used as an unit to represent 1 min and the boundaries of the village were drawn at a distance of 10 sticks west, 1 stick east, 5 sticks north and 7 sticks south of the reference point. With the general approval of all present, the boundaries were then marked in white and connected. Thereafter, the brick roads, mud roads and canals in the village marked in red, yellow and blue respectively.

Social Map

Village Polpara abounds 4 hamlets. Number of families residing in all these hamlets sum up to 138.

No. of families in each hamlet

Sl. No.	Name of the Hamlet	No. of households
1	Tin Para	30
2	Jalkar Para	46
3	Bhangaa Pol	31
4	Jhautala	31

- Most vulnerable

  The most affected hamlets are Tin Para and Jhautala. River embankment breaches mostly on the side of these hamlets.

- Condition of houses

  Most of the houses have mud walls and roofs thatched with hay.

- Village landmark

  Bhanga Pol (Sluice Gate)

Resource Map

- Land Area — About 500 acres
- Land Pattern — Most of this area has lowlands with only a few ground level lands here and there.
- Land Ownership — Maximum land is owned bythe residents of the village. Owners of only a few plots live in the neighbouring village.
- School — One First Primary School is there in the village.

- ICDS Centre — The centre is there, but no separate building for it.
- Drinking Water Source — Tube wells
- Religious shrines — Haritala, Kali Temple, Shiva Temple

Systematic Analysis of Disasters

- Types of Disasters

  Flood, waterlogging, irregular rainfall, storm.

- Flood

  It has occurred once in the recent times. There have been 6 floods in the last 10 years. In the decade before that there have been 3 floods.

  ▶ **Extent of damage** Due to poorcondition of theriver bank embankment and drainage system floods caused significant damage to paddy, fish, animals, birds, vegetable gardens, houses along with the people living in the village.

- Waterlogging

  It has occurred once in the recent times. There have been 6 incidences of waterlogging in the last 10 years. In the decade before that there has been no such incident as the drainage system was better.

  ▶ Extent of damage Seriously affected cultivation of paddy, fish, rearing domestic animals and birds, vegetable gardens, availability of work. It hampered the normal lifestyle of the villagers. It all happened due to the poor drainage system prevalent in the village.

- Irregular rainfall

  It has occurred once in the recent times. There have been 5 incidences of irregular rainfall in the last 10 years. In the decade before that there have been 4 such incidents.

  ▶ **Extent of damage** Caused significant damage to paddy, fish and vegetable gardens. No proper measure could be taken in the village to save the villagers from this disaster.

- Storm

  It has occurred once in the recent times. There have been10 storms in the last 10 years. In the decade before that there have been 1 incidence of storm.

  ▶ **Extent of damage** Caused significant damage to people's houses,animals and birds, crop fields and vegetable gardens. People died being thunderstruck.

Seasonal Calendar of Disasters

- Flood

  The seasonal calendar that was prepared showed that floods start from Joishtho (May-June) and its impact continues till Aswin (September-October). Maximum damage is caused during Shravan-Bhadra (July-September). Floods cause significant damage tohouses, domesticated animals & birds and field crops. It also affects vegetable and fish cultivation. During the floods, villagers take shelter in the primary school or on some high place.

- Waterlogging

  It happens almost throughout the year between the months of Joishtho and Choitra (mid-May to mid-April). Cultivation in fields and vegetable gardens cannot be done due to waterlogging. It severely affects the availability of drinking water and communication within the village. During such periods, most of the people migrate to the city in search of work.

- Irregular rainfall

  By irregular rainfall is meant drought and excessive rain. It starts from the months of Magh-Falgun (mid-Februray-mid-March) and continues up to Boishakh, Joishtho and Asharh (mid-April to mid-July). But this also happens at any time of the year. It affects agriculture, animal husbandry and normal life of humans. At this time people go to work in the brick kilns and also migrate to the city in search of work.

- Storm

  Incidence of storms starts from Choitra (mid-March to mid-April) and continues till Aswin (mid-September to mid-October). Storms cause heavy damage to houses, trees and crops. At this time people go to the Panchayet to ask for tarpaulins to set up tents.

Disaster Map

- Types of Disasters

  Different disasters that usually happen in this village are cloud burst, drought, storm, waterlogging etc.

- Areas affected by disaster

  The affected hamlets were marked 1,2 & 3 according to the degree of vulnerability. Tin Para and Jhautala Para as the most affected areas were marked 1. Bhanga Pol identified as the next in degree of vulnerability was marked 2. According to similar considerations, Jalkar Para was marked 3 and parts of Tin Para and Jhautala Para were marked 4.

- Shelter

  In the event of any disaster, villagers usually take shelter in the local primary school or else they move to some raised places in the neighbouring village.

- Extent of Damage

  Disasters cause maximum damage to the crop fields. Houses get devastated. Villagers suffer from acute crisis of drinking water. All communication systems collapse. Many are forced to leave their houses and take refuge elsewhere.

Vulnerability Matrix

This exercise was done on 14.08.12. Natural disasters affecting the village include storm, flood, irregular rainfall and waterlogging. These were placed in a matrix to compare the degree of damage caused by one disaster against another. Through this exercise it was found that waterlogging causes the maximum damage. So waterlogging was marked 1. Similarly, flood was marked 2, storm 3 and irregular rainfall was marked 4.

In absence of a proper drainage system, water stagnates in the event of a cloud burst or river water overflowing the embankment or entering the village through breaches in the embankment. With no escape route the water stays for long periods of time causing maximum damage to the life and livelihood of the villagers. It severely affects crop fields,

vegetable gardens and fish culture.

In the scale of damage caused, flood comes next to waterlogging, but its impact is also huge. Without any kind of flood resistance system in place, it cause widespread damage to people's houses, trees and plants, birds and animals, vegetable gardens etc.

Storm comes next in the ladder of damage. It devastates houses, trees, crops and vegetables. It also causes loss of life for birds, cattles and even humans.

Transect or walk through the village

A group of men and women with representations from different sections of the society undertook this walk across the village.

- *Agriculture*

  Maximum land area of the village is covered by agriculture and in some lands fish culture is done. But the present phenomenon of climate change is causing extensive damage to both agriculture and pisciculture. In the post-Aila period agriculture is not yielding good results. Traces of salt can be easily seen surfacing on the land. Waterlogging in the fields for a long period of time makes them uncultivable. Previously traditional varieties of paddy like Hogla, Hamai, Pankaj etc. were grown in these fields. Presently cultivation of HYVs is affecting agriculture extensively. Waterlogging, salinization and floods are making vegetable cultivation impossible.

- *Nat Res Mgt*

  Once there had been many large trees in the village, but now there is none. In spite of the presence of a long canal in the village, its water cannot be used for irrigation as it is saline.

- *Safe Drinking Water*

  Tube wells are the only source of safe drinking water, but many of these have become defunct and fail to lift water any more. Traces of arsenic could be found in the water lifted by some of these tube wells.

- *Forest Res & Biovariety*

  Among forest resources, trees like Koni, Keora and

Nona Babla can be seen in the village. Cattle rearing has almost disappeared. Due to the application of chemical fertilizers ducks, chicks, varieties of birds and indigenous varieties of fish are getting extinct.

- *Nature & Type of Disaster*

  Incidence of natural disasters are increasing day by day. Calamities like storm, cloud burst, breaches in river embankment etc. are happening quite often. Previously, these calamities used to happen at definite times of the year, but now all previous natural rules are getting flouted. Impact and speed of storm are constantly increasing. Along with it, temperature is also rising.

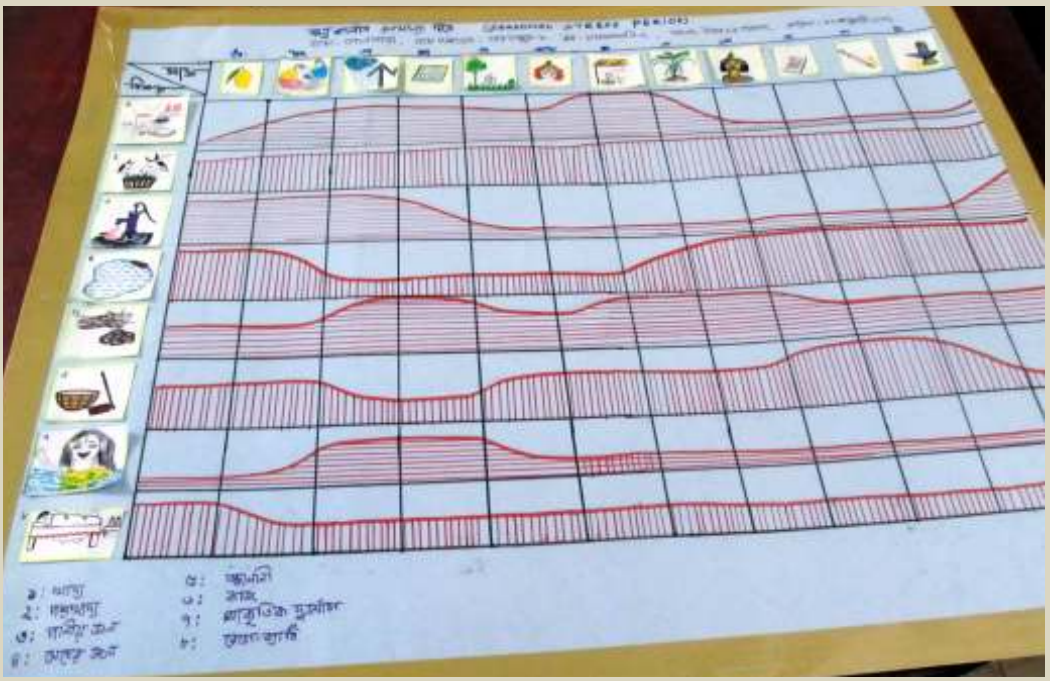
- *Disaster Management*

  No cyclone shelter is there in the village. In the event of a disaster, people take shelter in the local primary school.

- *Nature of Soil*

  In the recent times, the amount of salinity in the soil has increased. Most of the soil in the village is unfertile loamy, but sandy soil can be found along the riverside.


সামাজিক মানচিত্র (SOCIAL MAP)
N



District	**|**	**South 24 Parganas**
Block	**|**	**Patharpratima**
GP	**|**	**Brajaballavpur**
Village	**|**	**Gobindopur Abad**

This is a river-bound area. To the north of this village is the CarzonCreek; in its south is the seven point confluence and Wall Street river flows along the western boundary of the village. For their livelihood, most of the villagers are dependent either on the river or on agriculture. Climate Change induced disasters like flood, embankment breach, storm and erratic rainfall have caused the villagers to plunge into a deep crisis. IndraprasthaSrijan Welfare Society as part of a collaborative project being implemented in India and Bangladesh to reduce climate risks is working to bring people out of this crisis by trying to ensure their food security. A workshop for conducting PVA exercises was organised in Gobindopur Abad village between 9 and 11 October, 2012 in order to identify and analyse the problems evolving out of the phenomenon of climate and develop strategies for adaptation and mitigation of these problems.

Transect or walk through the village

A group of men and women with representations from different sections of the society undertook this walk across the village in order to collect data on the geographical diversity of the village. Panchanan Jana, one of the members of the Panchayet, informed that 1368 families live in the village. Villagers belonging to different religions like Hindus, Muslims and Christians live peacefully maintaining communal harmony.

- *Agriculture*
  Most of the people in the village have adopted agriculture as their livelihood. Total land area approximates to 2600 to 3000 acres, which is mostly dependent on rains. Rainfed paddy is cultivated during monsoon time. Usually, varieties of paddy cultivated in the area are Dudheswar, Morichshal, Malabati, some indigenous varieties and HYVs like 1017, IR 68, Good Luck, LalSankar, Hiramoti etc. As the soil is clayey and saline, relay cropping cannot be done. Seasonal vegetables like brinjal, ladies finger, spinach, amaranth, lablab bean, pumpkin, ridged gourd, snake gourd and others are cultivated on the uplands.
- *Nat Res Mgt*
  On three sides of the village can be seen mangrove forests on the silted land near the river bank. Poor people and other villagers collect pruning of the forest to use as fuel wood. Speaking on this issue Binod Bihari Maity said, “A committee has been formed for maintenance and conservation of the mangroves.” If needed, villagers are allowed to collect fuel wood from the forest. In absence of renovation, the old canals are getting silted. People are occupying these areas and turning them into private properties.
- *Safe Drinking Water*
  Panchanan Jana, a member of the Panchayet said, “Tube wells are the only source of safe drinking water. There are about 36 tube wells in the village, but as the platforms are low many of these go under water during flood and waterlogging creating a deep crisis of drinking water in the area. Shallow pumps are extensively used to lift ground water for irrigation, thus depleting the underground aquifers. As a result, in the months of Choitraand Boishakh (March to May), capacity of tube wells to lift water is reduced. At least 12 to 14 tube wells installed in the village fail to lift any water during this period.” He also said, “It is vitally necessary to install new tube wells as well as excavate large ponds in the village for harvesting rain water.”

- *Forest Res & Biovariety*
  Among forest resources, trees of indigenous and the mangrove varieties are getting severely affected due to collection of firewood and logs for making houses in order to meet the need of the ever-increasing population. Many of the indigenous varieties of fish like shole, boal, latha, lekha, koi, shingi, magur etc. are disappearing due to indiscriminate application of chemical fertilizers and pesticides in cultivation of HYV paddy. With the depletion in the number of indigenous trees, many birds and animals like vulchers, common myna, sparrow, falcon, civet, fox etc. cannot be found in the area. Due to the entry of saline water in the village through breaches in the river embankment many leafy vegetables like gima, shushni, chikni, helencha, swetfulka are disappearing. Speaking on the issue, Bandana Giri, a villager said, " Previously, the villagers used to collect and sell fingerlings of indigenous varieties of fish from the month of Ashar to Kartick (June to November), but now-a-days these are more and more getting unavailable, which in turn is increasing malnutrition as well as pecuniary crisis.
- *Nature & Type of Disaster*
  Beinga village in the coastal region of the Bay of Bengal and river bound on three sides, in case of any depression it has to bear the initial impact of the storm. The weak embankment breaks under the impact of the lashing waves of the surging river and saline water enters the village creating a flood situation. Incidence of storm mostly happens between the months of Falgun and Ashwin (March to October). Naturally, during this period a flood situation prevails. GangadharGhoroi, a villager said, "This year the amon crop (rainfed paddy) failed due to very low rainfall."
- *Disaster Management*
  Commenting on the issue Panchanan Jana, Panchayetmember said, "No disaster rescue committee or risk reduction committee has been formed as yet. Nor do we have a cyclone shelter." Due to a bad drainage system, water stagnates for a long time. Panchayet uses the public address system to make people aware about impending disaster. There is a board that alerts people about disasters through symbols. Unfortunately, this board set up by an NGO is not maintained properly. The symbols are not changed on time. Villagers said that they relied more on the weather forecast done by Bangladesh radio than done by All India Radio. In the event of any disaster, the villagers take shelter in the local school, ICDS and the SSKs.
- *Nature of Soil*
  In the last 15-20 years, there have been 4-5 incidences of river water entering the village through breaches in the embankment creating a flood situation. This resulted in saline water inundating the fields and salinizing them. The salt surfaces on the soil when it dries up during summer. With the onset of heavy rains, the salt gets washed out that makes it possible to cultivate the aman or the rainfed paddy, but the yield is much lower than what they had before salinization.

Resource Map

AnimeshBera facilitated the exercise of making of the village map with the help of the villagers.

He started by saying, "Many of us have seen the map of our country, state and district, but we have never seen the map of our village. We never sat together to draw the map of our village. Residents of one end of the village do not know about the hamlets on the other side of the village. But if we wish, we can do it." Then the exercise started.

The venue of the workshop was the hall in Netaji Bajar Bibekananda Shishu Udyan. Animesh made a mark on a full size art paper to denote the venue. Panchanan Jana, Panchayet member and BinodBihariMaity, the secretary with the help of the villagers assembled there demarcated the landmarks on the four sides. With respect to the landmarks the boundaries and the main roads were drawn. Then the brick paved roads were demarcated. After this, the drainage ways, canal, school, ICDS Centre, large pond, temple, mosque, church, market, health centre, rivers on the three sides, mangrove forest were marked with different colours.

After demarcating the plots of land in the map, it was found that most the area is single cropped. During monsoon, indigenous and high yielding varieties are cultivated -- but this amancultivation is completely dependent on the rains. Relay cropping cannot be done due to salinity in the soil. Gangadhar said, "About 8 - 10 years ago, here in these fields we grew chilli and watermelon. But now this has stopped due to climate change induced floods and pest infestation.

Social Map

Residents of Gobindopur Abad village with the help of Animesh started marking the homes of the families on the base map. At first the villagers were not being able to locate the roads leading to their homes, but later, with the help of Animesh they were able to locate their homes as well as the houses of their neighbours. Out of the 1368 families living in the village, the poor and the river dependent families have their homes close to the embankment. Climate Change is causing the river to change its course very fast, which in turn is necessitating theshifting of the embankment. Many of the families living by the earlier embankment have lost their homes and land due to this. The houses were drawn according to their specific shapes for easy identification. The hamlets were demarcated with different colours and denoted by numbers.

In the social map that resulted, the following hamlets were identified.

Hamlets of Gobindopur Abad

1 Patra Para
2 JanarGheri
3 MaityGheri
4 ChhotoDindarGheri
5 GholMannarGheri
6 BaroDindarGheri
7 Khal Para
8 MannarGheri East
9 MannarGheri West
10 DuerGheri
11 Adibasi Para
12 Adhikari Para
13 Neye Para
14 Christian and Muslim Para
15 Patra Para
16 Jana Para
17 GuriaGheri

Vulnerability Map

Climate Change induced disasters that happen in the village are embankment breach, flood, storm and erratic rainfall.

Villagers are under the impression that the phenomenon of climate change has raised the level of river water and has caused the river to change its course. Heavy soil erosion from the uplands is raising the rive floor thus reducing the river's carrying capacity. Gobordhonpur being at the edge of the mainland, the first impact of the storm caused by any depression in the sea lashes on this coastal village that often makes the weak embankment to give in allowing saline water to enter the village. It severely affects houses, crops, trees, sweet water fish, cattle, small ruminants and human health. Villagers said that at such times they have to migrate to other places in search of work.

Cultivation of the rainfed paddy in the village was delayed by more than a month due to erratic rainfall. Villagers apprehend that this will reduce the yield and increase pest attack. Continuous entry of saline water in the crop fields is resulting in widespread salinization of these lands. If it does not rain for a good length of time, the salt comes up on the surface and affects the crop.

Poor people of Gobindopur Abad comprising of ST, SC and the Muslim families catch fish, fingerlings and crab from the river. They enter the forest to collect honey. According to them, availability of fish, fingerlings, crabs etc. has reduced considerably due to irregularity in rainfall.

In the event of flood, it affects the entire village. River bank erosion happens most often in 4 places of Gobindopur Abad on both sides of Ganges, SiterGhat and Adibasi Para.

Vulnerability Matrix

Villagers present in the PVA workshop participated in this tool for developing the vulnerability matrix. This tool helped in understanding the recurrence of each type of natural calamities, their effects on life and livelihood and the strategies to combat them.

A list was made of the main calamities visiting the village. River bank erosion was found to be the most damaging. SukumarSamantasaid that climate change is causing water level to rise in the river. It is also effecting in increasing salinity and changing its course. In the case of a depression in the sea, the cyclone lashes on the weak embankment causing it to break. Saline water enters the village through breaches in the embankment and floods the area. It severely affects field crops, houses, mud roads, brick-paved roads, river embankment and sweet water fish culture. Recurrent floods are causing the agricultural fields to get salinized. Usually the poor people in the village have their dwellings near the river embankments. Naturally, they are the most affected by flood. Sheikh Jiad said, “Indigenous varieties of paddy can be grown in spite of saline water, but it is impossible to cultivate HYVs in this condition.”

Late monsoon has delayed the cultivation of rainfed (aman) paddy by almost one month. Villagers believe that this is going to affect the yield and increase pest attack. Long absence of rain causes the salt to surface on the soil. BedanaBhuia said, “This year there has been insufficient rain and no incident of depression in the sea. This has resulted in drastic reduction in the availability of Hilsa, fingerlings and crabs.” It has affected the SC, ST and Muslim communities whose livelihood depends on the catch of these fauna from the river.

As adaptation and mitigation strategies, the villagers suggested the following: (a) raising of the river embankment by making use of NREGA, (b) concreting the embankment, (c) rearing a mangrove plantation, (d) raising the plinth of the houses, (e) collecting and conserving seeds of native varieties, (f) placing tube wells for lifting drinking water on a raised platform, (g) making rainwater harvesting structures and (h) building cyclone shelter.

Panchanan Jana said, “Timely information about impending calamities can save a lot of assets from destruction and damage.”

Seasonal Calendar of Disasters

A chart was made to represent the different times in the year when the different calamities happen. While discussing, the villagers said that river bank erosion happens in the period between Asharh (mid-June to mid-July) and Kartick (mid-October to mid-November). Maximum incidence of river bank erosion happens in the month of Bhadra (mid-September to mid-October).

Soil salinity increases as a result of erratic rainfall. It starts from the month of Poush (mid-December to mid-January) and continues till monsoon arrives in Asharh.Storm or cyclone usually happens twice a year. First it comes as a nor'wester (kaalboishakhi) during the months of Boishakh-Joishtha (mid-April to mid-June). Next it appears as a cyclone or a storm in the months of Bhadra-Ashwin (mid-August to mid-October). Due to poor drainage system, many a times flood water or rain water do not find any escape route and waterlogging that starts from the month of Shravan (mid-July to mid-August) and continues till the month of Kartick (mid-October to mid-November). Besides these, thick fog and hailstorm severely affect crops.

Chronological Analysis of Disasters

While doing this tool, Sukdeb Doloi said, "In the decade before last, river bank erosion did not take place twice a year and the height of the embankment was also lower." Speaking about the issue, he further said, "Salinity of river water has also increased." Saline water entering the village is affecting crops, houses, fish and the health of humans and animals.

Due to climate change induced drought families dependent on river and forest are losing their livelihood and migrating elsewhere in search of work. Insufficient rain and no incidence of depression in the sea is resulting in low availability of hilsa and other fish, fingerlings and crabs.

Seasonal livelihood option

Livelihood Options		Apr-May	May Jun	Jun-july	Jul-Aug	Aug Sep	Sep-Oct	Oct Nov	Nov-Dec	Dec-Jan	Jan Feb	Feb Mar	Mar-Apr
Agriculture	M F				→	→			→	→	→		
					→	→			→	→			
Wage Labourer	M	→	→		→	→			→			→	
	F	→	→		→	→			→	→			
Fingerling catching	M	→	→	→	→	→	→	→	→	→	→	→	→
	F			*	*	*							
Fishing	M	→	→	→	*	*	*	*	→	→	→	→	→
	F												
Honey, crab,wood collection	M	→	→	→	→	→	→	→	→	→	→	→	→
	F				*								
Driving cycle van	M	→	→	→	→	→	→	→	→	→	→	→	→
	F												

* maximum availability

This chart of livelihood options was made as a result of discussion with the villagers. But people are migrating to other places in search of work as the y are losing their livelihoods due to climate change induced natural calamities.

Focus Group Discussion

Brajaballavpur GP is under the PatharPratima block in the Sundarban area. This is an island on one side of which flows the Carzon Creek and on the other side is Wall Street river. These rivers completely encircle the island. The village Gobindopur Abad under Brajaballavpur GP forms the last point of the main land of West Bengal.

Adibasi Para or the tribal hamlet in the Gobindopur village is beside the Carzon Creek river. The SC, ST and Muslim communities depend on this river as their only source of livelihood. Largest share of their earning comes from the collection of fish, fingerlings and crabs from the river.

Through a discussion with the local women, it was found that the principal vocation of the families residing in this village are fishing, collecting fingerlings and crabs, 100 days' work, agriculture, rearing ducks, hen & small ruminants and other activities. Gauri Mistri said, “About 5-7 years back, here we had a rich cultivation of chillies in the fields. Many women used to get work as wage labourers for harvesting chillies and also for watering and maintenance.” Now chilli cultivation has stopped due to virus attack.

After this, Animesh Bera asked the women about their perception of Climate Change. The women described their perceptions of change in environment and nature caused by the phenomenon of Climate Change.

1. Rivers have changed their courses. Levels of water and salinity in the rivers are rising.

2. Frequency and intensity of storms have increased. Incidence of sudden storms is also on the rise.
3. Absence of rainfall at the usual time is affecting agriculture, fishing and collection of fingerlings and crabs.

Golehar Bibi said, “Insufficient rainfall and no incidence of depression in the sea this year have resulted in low availability of fish, fingerlings and crabs from the river. Previously, during the months of Asharh to Ashwin (June to October) drawing the net for 2-3 hrs would fetch at least 10-15 thousand fingerlings, which could be sold at Rs.600-700 per thousand. Now the same hrs of labour in the river fetches only 2-3 thousand fingerlings that sells at Rs.30-40 per thousand. ”

Speaking about the low availability of fingerlings, the women said that catching of tiger prawn spawns by fishing trawlers has drastically reduced the availability of prawn spawns in the river.

Most of the women are members of NGO-run SHGs or SGSY groups. The Asha workers visit the families for vaccinating women and children. Women helped in the initiative taken by the Panchayet to plant mangrove trees on the silted lands near the river bank.

Women informed that they are facing a lot of problems due the effects of Climate Change. Low availability of fish, fingerlings and crabs in the river, absence of rain and increase of salinity in the soil affecting availability of work as agricultural labourer, delayed payment of the wages for 100 days' work are all summing up to compel women to migrate to cities and suburbs.

Before and during the disaster, the women face crisis of firewood and maintenance of cattle. And after the disaster especially after riverbank erosion, embankment breach and storm or cyclone the women, under the impact of saline water suffer from skin disease and gynaecological problems.

Women get information about impending disasters from the radio, announcement by the Panchayet on the public address system and from the men folk in the family. At the time of disaster, men take the decision of leaving home and shifting to a safe shelter. Women carefully organize the things that are absolutely necessary for their stay outside home.

As a disaster risk response strategy, some of these women keep aside some firewood, dry food and the essential documents like land deeds etc. Golehar Bibi said, “ As this village is highly prone to disasters like flood and storm, all the people residing in the village are ever alert to face these calamities.”

The women were of the opinion that in the pre-disaster period women should be made aware about what needs to be done during the disaster. They thought that it is necessary to raise the plinth level of the houses and the roads. It is also necessary to capacitate the women by introducing small income generation initiatives like rearing ducks, hen and goats, embroidery with zari (golden threads) and 100 days' work.


VULNERABILITY MAP


DATE - 11.08.2012


VULNERABILITY MATRIX
বন্যা
নদীভাঙন
জলমগ্ন
জলাবদ্ধতা
লবনাক্ততা
ঝড়
ঘনকুয়াশা
শিলাবৃষ্টি

District	**|**	**North 24 Parganas**
Block	**|**	**Sandeshkhali 1**
GP	**|**	**Hatgachhi**
Village	**|**	**Simulati**

Village Map

The work of drawing the village map started on 16.08.12 at 10.00 AM in the presence of vulnerable communities, other villagers including school teachers, workers of ASHA project, ICDS workers and members of women groups and eminent persons of the village. The venue was the room of Binay Badal Dinesh Sangha.

Work started with a session of self introduction. Then Samir Dayal and BhimDayal two members of the club used a stick to mark the place they were standing on. On the eastern side of the marked place is a canal. It takes 7 min. to reach there. Beyond that is PaschimJhupkhali. In order to mark that canal the stick was used as an unit and the canal was marked at a distance of 7 sticks east of the initially marked place. Similarly a canal and beyond that Rajbari (King's Palace) was marked at a distance of 20 sticks as it took 20 min to reach there. On the north is another canal and beyond that is Nalkondra village. It takes only a minute to reach there. Thus the northern border was marked at a distance of 1 stick from the reference point. On the southern extent of Simulati village runs a road. Beyond that is PaschimJhupkhali village. It takes about 7 min. to reach this place. So this border was drawn at a distance of 7 sticks south from the reference point. With the approval of all who were present, the borders were then connected to make a distinct boundary of the village. Brick roads, mud roads and canals were then marked with red, yellow and blue colours.

Social Map

A total of 403 families live in 8 hamlets of the village. The distribution is as follows:

Sl. No.	Hamlet	No. of households
1	Singh Para	34
2	Dayal Para	41
3	Paschim Para	36
4	Khal Para	21
5	Das Para	77
6	Char Para	82
7	Pakhi Para	25
8	Swarup Para	87
	Total	403

In the event of a disaster, the most affected hamlets are on the southern and western sides that include Pakhi Para, Khal Para and Swarup Para. Maximum houses have mud walls. The roofs are either thatched with hay or covered with terracotta tiles or galvanized tin sheets. The agricultural plots on the eastern and southern sides are low lands. So, in case of a disaster, the maximum crop loss happens in this area.

Resource Map

- Total amount of land in the village About 667 acres.
- Land pattern — Most of the land is medium upland with some upland and lowlands strewn here and there.
- Land ownership — Most of the owners of these lands are residents of Simulati village. Only a few land owners live in the adjacent villages.
- Crops — The principal crop is paddy. Only a few farmers grow wheat, sesame and mustard.

- Cultivation system — Irrigation is done with water from canals, ponds and underground aquifers.
- Salinity — Before Aila, amount of salinity was low. But now, both in the crop fields and the home garden soils, salinity is surfacing.
- Fallow lands — Amount of fallow land in this village is almost nil. In fact, fallows cannot be found except for places like the cremation ground, canal banks and roadsides.
- Ponds — There are about 400 ponds in the village, out of which 5~6 are large
- Shelter House — Previously, there was no shelter house in the village. Presently, a similar shelter is in the process of being built.
- Health Centre — With the exception of a Sub Health Centre, there is no other health centre in the village.
- School — The village has one Higher Secondary and one First Primary school.
- ICDS Centre — Two ICDS centres are running in the village.
- Drinking water source — Main source of drinking water is tubewell.
- Religious shrines — One Shiva temple, one Kali Sitala temple, 2 mosques are there in the village.

Disaster Map

- Types of disasters
  Various types of disasters that affect the residents of the village are cloud burst, drought, storm, water stagnation etc.

- Areas affected by disaster
  Affected hamlets were demarcated with nos. 1, 2 & 3 according to the degree of damage. The most affected hamlets were marked 1. Pakhi Para, Swarup Para and Khal Para were identified as belonging to this category. The hamlets where the degree of affectation was slightly less were marked 2. Char Para and Das Para were included under this category. The hamlets where the extent of damage was less the hamlets under category 2 were marked as belonging to category 3. Dayal Para and Singh Para fell under this category.

  In case of a disaster, the affected families take shelter either in the local school or on any elevated place in the neighbouring villages.

- Extent of damage
  In this village, maximum damage is caused in the field of agriculture. Many people have to leave their homes in search of livelihood. Disaster causes havoc in the agricultural fields, roads and houses. Most affected are the mud houses.

Vulnerability Matrix

The natural calamities faced by this village are storm, flood, irregular rainfall and waterlogging. The extent of damage caused by these calamities were put in a matrix and

compared. This exercise showed waterlogging causes the maximum damage, so waterlogging was ranked as no.1. Similar comparative study revealed flood comes second in rank, irregular rainfall third and storm fourth.

In case of river water entering the village through breaches in the embankment or by overflowing and if there is a cloud burst, the standing water does not find any escape route and stagnates. That is why waterlogging causes the maximum damage in the village. It causes havoc in crop fields, home gardens and fish ponds.

Flood comes second in vulnerability analysis as the extent of damage caused by it is less compared to waterlogging, but it has its effects far and wide. It causes damage to people's houses, trees and crops, animals and birds, fish, agricultural fields, home gardens etc.
According to vulnerability matrix, irregular rainfall has been ranked third. By irregular rainfall is meant both absence of rainfall and untimely rainfall in excess. Irregular rainfall causes damage to crop fields, home gardens, pisciculture and also drinking water.

Incidence of storm is less in Simulati than in other villages, but if it happens it causes havoc. Compared to the other disasters, it happens less frequently, that is why it has been ranked fourth in vulnerability matrix. Storm devastates human households, causes trees to fall and creates hindrance in the lives of animals and birds.

Seasonal Calendar of Disasters

- Floods
  According to the seasonal calendar of disasters, floods start happening from the Bengali month of Asharh (mid-June to mid-July) and its impact stays till Bhadra (mid-August to mid-September). Floods also take place during Aswin, Kartick and Aghran (mid-September to mid-December). Maximum damage is caused during the month of Shravan (mid-July to mid-August).

- Floods
  Destabilize human settlements, crops and trees, birds and animals, crop fields and home gardens and fish culture in the ponds. During floods people takes shelter on the high embankment or in any one of the neighbouring villages or in the primary school.

- Waterlogging
  In this village waterlogged situation lingers from the middle of Asharh to the end of Kartick (first week of July till the middle of November). This causes all agricultural activities both in the crop fields and in home gardens to stop. It also poses problems for getting drinking water. Commuting within the village or outside is highly disturbed. Due to suspension of agricultural activities, most of the people have to go out of the village in search of work.

- Irregular rainfall
  By irregular rainfall is meant both drought or absence of rainfall and untimely rainfall in excess. In case of drought or absence of rainfall, the phase continues from the middle of Falgun up to the middle of Joishtha (beginning of March to the beginning of June). Excess rainfall usually happens between middle of Asharh and middle of Ashwin (beginning of July to the end of September). Irregular rainfall affects agriculture, animals, birds and destabilizes normal life of human beings. This disaster forces people to migrate to other places in search of work.

- Storm
  There is possibility of storm between middle of Chaitra and Joistha (beginning of April to mid-June). Storm devastates human settlements, plants and trees and river

embankments. After the storm, the affected people have to seek tarpaulins from Panchayats. They also try to repair their houses in a way that it can withstand the impact of storm in a better way.

Continuous Analysis of Disasters

Different types of disasters faced by the village flood, waterlogging, irregular rainfall and storm.

- Floods
  Presently there is no flood in Simulhati village. In the last 10 years, there have been 3 incidences of floods in 2009, 2010 and 2011 and these floods had caused havoc on paddy, fish, animals, birds and home gardens. It devastated even the roads and the sources of drinking water.In the last 20 years, there have been 2 incidences of floods (1993 and 1997). These floods also caused havoc like those that happened later.
- Waterlogging
  At present there is no waterlogging in Simulhati. In the last 10 years there were 3 incidences of waterlogging in 2007, 2009 and 2011. In all these cases of waterlogging, it caused a lot of damage to paddy cultivation, pisciculture, rearing animals and birds, growing vegetables in home gardens and to all sorts livelihood. In the last 20 years there were 2 incidences of waterlogging in 1993 and 1997. These incidences caused equal damage to paddy and fish.

- Irregular rainfall
  By irregular rainfall is meant both excessive untimely rainfall and absence of rainfall or drought.
- Excessive rainfall
  In the recent times, there has been one incidence of it. The extent of damage has not been much, but it affected cultivation of paddy and vegetables to a certain extent.

  In the last 10 years, there have been 3 incidences of excessive rainfall (in 2007, 2009 and 2011). These caused havoc in cultivation of paddy, fish and vegetables.

  In the last 20 years, in 1998 alone there was an incidence of excessive rainfall. In spite of the fact that the extent of damage was not much, it caused a crisis of paddy, fish and vegetables.
- Drought
  At present, there is no drought situation.In the last 10 years, there has been only one incidence of drought in 2010. It severely affected the cultivation of paddy,fish and vegetables. In the last 20 years, incidence of drought happened only once in 1993. Extent of damage was of medium severity. It created a crisis of paddy, fish, vegetables and work.
- Storm
  In the recent times, there has been only one incidence of storm and that is in 2012. It has caused small damage to trees and human settlements.In the last 10 years, there have been 3 storms in 2004, 2007 and 2009. It caused severe damage to trees, animals and birds and human settlements. In the last 20 years, storm had occurred

only once and that was in 1997. The storm associated with lightning caused heavy damage to trees, animals and birds and human settlements.

Transect

A group of people with representations from different socio-economic status walked diagonally through the village to conduct this survey.

- Agriculture

  Agricultural activity is done in all lands of this village, but agriculture has been severely affected by climate change induced disasters like flood, storm etc. Since after Aila, the lands had become uncultivable due to salinization and waterlogging. Previously indigenous varieties of paddy like Talmugur, Kalomota, Hogla, Hamai, Dudheswar etc. were cultivated in all these lands. After that the farmers shifted to cultivating the high yielding varieties, which caused all the more damage during Aila. Apart from that the leaves, vegetables, grass, algae etc that used to grow in the paddy fields when the indigenous varieties were cultivated cannot be seen now. Climate change has affected agriculture quite severely.

- Natural Resource Management

  The large trees that were there in the village fell under the impact of Aila. At present one canal in the village supplies all the water needed for irrigation. Panchayet has chalked out a plan for renovating the canal.

- Safe Drinking Water

  Tubewells are the only accepted source of drinking water. Level of water in the underground aquifers has depleted. Crisis of drinking water becomes acute in the summer months of Choitra and Boishakh (March to May). Plans have been made to collect rainwater and use it for drinking purposes. Water lifted by tubewells in this area has unacceptable levels of arsenic.

- Forest Resource & Bio-variety

  In Simulhati, there is hardly any forest resource. With respect to bio-variety, number of cattles, goats, sheep, ducks, chicken etc has reduced in comparison to the earlier times. Many indigenous varieties of fish, birds and animals are on the way to extinction as an effect of the irresponsible use of chemical fertilizers and pesticides. In the recent times crows, sparrows and vulchers have disappeared from the area.

- Nature & Types of Hazards

  Hazards are increasing day by day. Incidence of disasters like storm, cloud burst, breaches in the river embankment have increased. Previously, storm and rain used to happen at definite times of the year, but now it has become irregular and the intensity has increased. Winter has become colder and temperature in summer has increased.

- Hazard Management

  There is no definite shelter house in the village. In the event of a disaster, villagers take shelter on high roads, in the local primary school or in the neighbouring villages. Work is going on for establishing a shelter house within the village.

- Type of Soil
  Previously, salinity level was low. Now, the soil is saline clayey in most of the areas, but in some places it is loamy.

Interview with a member of the Panchayet

Q. Do you think there has been any change in the weather and climate (temperature, nature of rainfall, storms etc)?

A. The climate is changing. Heat is excessive in summer. Winters have become colder. Storms come untimely and their intensity has increased. Rainfall has also become erratic rains do not happen at the usual time, but it rains heavily when it is unexpected.

Q. What are the different types of hazards you faced 20 years ago and what are the types you face now? (Mention in which year the disaster happened and what effect did it have on bio-variety, health and natural resources)

A. Storms and cloud bursts used to happen 20 years ago. In the recent times, Aila came, storms have become very irregular, cloud bursts have become untimely and the temperature is increasing. Many animals, birds and fish have disappeared. Incidences of many unknown diseases are increasing.

Q. What impacts did climate change induced disasters (storm, flash flood, salinization, high tide, embankment breach, excessive rainfall, drought, temperature rise etc) have on the life and livelihood of people (income & earning) especially on women?

A. Climate change induced disasters are causing food crisis and problems related to human settlements and health. Income is reducing, which is making the people poorer. The food that the women consume is nutrition deficient and it is hampering their daily life.

Q. In order to combat pre and post disaster situations, what are the strategies adopted by people and are these strategies sustainable?

A. The strategies adopted by people to combat pre and post disaster situations are nowhere near sufficient. At the time of disaster, they took shelter on an elevated place and lived on dry food.

Q. What other adaptive strategies may be taken for maintaining life and livelihood? What are the things that are necessary to implement those strategies and make them sustainable?

A. The first task should be planting of trees. Use of all types of agro-chemicals including fertilizers and pesticides should be totally stopped. Steps must be taken to reduce emission of smoke from vehicles and factories.

Q. What disaster preparedness measures are in place to combat disaster risks?

A. No disaster preparedness measure was there. Now, work is continuing to establish a shelter house.

Q. What are the problems in implementing disaster preparedness measures and management? What are the different types of training that you think are necessary?

A. There are so many problems. There is no shelter house, no provision for dry food, no

training to combat disasters. That is why, training in all these areas is necessary.

Interview with a school teacher

Q. Do you think there has been any change in the weather and climate (temperature, nature of rainfall, storms etc)?

A. In the recent times we are experiencing excessive heat, irregular rainfall, winters more cold than usual which, in turn, are causing crop production to fall. Storms are coming at unexpected time.

Q. What are the different types of hazards you faced 20 years ago and what are the types you face now? (Mention in which year the disaster happened and what effect did it have on bio-variety, health and natural resources)

A. 20 years ago we experienced winter at a definite time, time for storms and rain was almost fixed, so the farmers got a chance to harvest their crops on time. But now, nothing is happening on time. Animals and humans are becoming victims of unidentified diseases.

Q. What impacts did climate change induced disasters (storm, flash flood, salinization, high tide, embankment breach, excessive rainfall, drought, temperature rise etc) have on the life and livelihood of people (income & earning) especially on women?

A. Climate change induced disasters are affecting agriculture. Crisis in getting jobs is making the people poorer. Untimely storm, excessive rainfall and unnatural heat are causing different diseases to spread and increase.

Q. In order to combat pre and post disaster situations, what are the strategies adopted by people and are these strategies sustainable?

A. In adopting strategies to combat pre and post disaster situations, the people are absolutely helpless and weak. Compared to the number of affected people, relief materials sent by the govt. are absolutely insufficient. In the event of a disaster the families take shelter on an elevated place with a stock of dry food. It seems that this as an adaptive strategy is unsustainable.

Q. What other adaptive strategies may be taken for maintaining life and livelihood? What are the things that are necessary to implement those strategies and make them sustainable?

A. Establishing a shelter house and developing the drainage system of the area are the new strategies that may be adopted to combat disasters.

Q. What disaster preparedness measures are in place to combat disaster risks?

A. No disaster preparedness measure was there. Now, work is continuing to establish a shelter house.

Q. What are the problems in implementing disaster preparedness measures and management? What are the different types of training that you think are necessary?

A. No disaster preparedness measure or management system is in place. Villagers have not undergone any kind of training. They are in need of undergoing different types of training that would build their capacities to combat disasters.

Interview with non agricultural labour and small marginalized farmer groups

Q. Do you think there has been any change in the weather and climate (temperature, nature of rainfall, storms etc.)?

A. We are experiencing many changes in the climate. Monsoon does not appear in time,

but heavy rainfall takes place at times when it is unexpected. Excessive heat makes it impossible to stay indoors and forces people to come out in the open and sit in the cool shade of the trees. Storms happen at times when it is not expected.

Q. What are the different types of hazards you faced 20 years ago and what are the types you face now? (Mention in which year the disaster happened and what effect did it have on bio-variety, health and natural resources)

A. 20 years ago disasters happened at a definite time, now they come unexpectedly. Storm or heavy rain just before harvesting destroys our crops. This has caused many animals, birds, fish etc. to disappear from us.

Q. What impacts did climate change induced disasters (storm, flash flood, salinization, high tide, embankment breach, excessive rainfall, drought, temperature rise etc) have on the life and livelihood of people (income & earning) especially on women?

A. Climate change induced disasters like excessive rainfall, drought, cloud burst etc. are affecting the income of the farmers which is getting reduced. They have to migrate to other places in search of work. Food consumed by women is low in nutrition value. It is hampering normal life and livelihood.

Q. In order to combat pre and post disaster situations, what are the strategies adopted by people and are these strategies sustainable?

A. Strategies adopted by the villagers to combat pre and post disaster situationsare nowhere near sufficient nor are they sustainable. Strategies need to be developed to combat disasters.

Q. What other adaptive strategies may be taken for maintaining life and livelihood? What are the things that are necessary to implement those strategies and make them sustainable?

A. Shelter house is needed to save people from the floods. We need to conserve the seeds of indigenous varieties of crops and vegetables.

Q. What disaster preparedness measures are in place to combat disaster risks?

A. No disaster preparedness measure is in place.

Q. What are the problems in implementing disaster preparedness measures and management? What are the different types of training that you think are necessary?

A. Disaster preparedness measure or management system is not in place. Villagers have not undergone any kind of training. They need to undergo different types of training that would capacitate them to combat disasters.


সামাজিক ম্যাপিং (SOCIAL) MAP


দিনপঞ্জী


দুর্যোগের মরশুমী দিনপঞ্জী
বৈশাখ
জ্যৈষ্ঠ
আষাঢ়
শ্রাবণ
ভাদ্র
আশ্বিন
কার্তিক
অগ্রহায়ণ
পৌষ
মাঘ
ফাল্গুন
চৈত্র
ঝড়
আকাশ বন্যা
নদীবাঁধ ভাঙনে
অনিয়ন্ত্রিত বৃষ্টিপাত
লবনাক্ততা
জলাবদ্ধতা

District	**|**	**South 24 Parganas**
Block	**|**	**Basanti**
GP	**|**	**Masjidbati**
Village	**|**	**Gadkhali**

Village Map

It was through the reference of ChampaMahila Society that we went to do the PVA exercise in Gadkhali village. The villagers had assembled in a room to do the first exercise of making the base map of the village. At first, the room in which the exercise was being done was marked on the map. With reference to this point, the boundaries were drawn. After this landmark points of the village were identified and marked. The landmarks demarcated were as follows:

1. Primary School
2. ICDS Centre
3. Temple
4. Mosque
5. Sluice Gate
6. Culvert
7. Graveyard
8. Banyan Tree

These landmarks were coloured with colours like white, blue, pink, saffron, red, yellow and green.

Resource Map

Boundaries of Gadkhali village were demarcated. After that the resources of the village were pointed on the map. These included i) cultivable land, ii) canal, iii) sluice gate, iv) school, v) drinking water sources and vi) religious shrines. The discussion held about these is as follows:

- Cultivable Land
  At present all the cultivable lands in Gadkhali village grow only one rainfed crop. Previously the same lands had two crops, but with the increase in embankment breaches and other disasters, the lands have now become single-cropped. About 90% of the total landmass of the village is used for doing agriculture.
- Canals
  Water from three out of the four canals in the village is used for irrigating the fields. The water in the remaining canal is saline. But breaches in the embankment every year are causing saline water to enter into the village, which in turn is salinizing the sweet water of the three canals now in use as source of irrigation.
- Sluice Gate
  In the event of floods, now the sluice gates take a lot of time for releasing the water stagnated in the village. It affects the cultivation of both paddy and vegetables. Previously, the intensity of floods being less, the sluice gates could easily release the flood water outside the village.
- School
  This village has only one primary school. In case of flood, a large section of people living in the village use it as a shelter. No other shelter house is there in the village.
- Drinking Water sources
  Tube wells are the source of drinking water in the village. Number of tube wells in the village is 7. All these are installed in low lands along the riverside. In the recent times, flood causes most of these toget submerged and make them unusable. It creates a

crisis of drinking water at such times. Previously, intensity and spread of floods were less. It did not cause all the tube wells to go under water; thus, there was no drinking water crisis at that point of time.

- Religious shrines
  This village has 2 temples and one mosque. These were marked on the resource map.

Social Map

While making the social map of the village, the following hamlets were mentioned:

1 .Kachhari Para
2. Chowdhury Para
3. Ramgopalpur Para (Purba Para)
4. Char Para
5. Kabardanga Para

Number of people living in these hamlets sum up to 3990 out of which 2049 are men and 1941 women. 88% of the population belong to the scheduled castes and 12% belong to the minority community. Some scheduled caste and minority community families happen to be more vulnerable as they live near the river in mud walled and thatched roof houses.

Hazard Map

In the event of disasters, affected hamlets in the village are:

1. Kachhari Para
2. Chowdhury Para
3. Ramgopalpur Para (Purba Para)
4. Char Para
5. Kabardanga Para

The most affected hamlets due to disasters like embankment breach, flash flood, hailstorm, cyclone, erratic rainfall, temperature rise etc. are Kachhari Para, Char Para, Chowdhury Para and some areas of Ramgopalpur Para. So, this was marked as the no.1 risk prone and vulnerable zone. Reasons for its vulnerability are

- These hamlets are near the river embankment
- Their houses are in low lands
- The roads are made of mud and at a low level. In case of any breach in the embankment, the roads get easily submerged.
- The agricultural lands are in the midst of these hamlets which get affected in case of any disaster.

- Embankment breach
  Cultivation of paddy and vegetables, sweet water fish culture, animal husbandry, houses etc. get severely affected due to breaches in the embankment. In order to get rid of this situation, the villagers have come together for
  - repair and maintenance of the embankment
  - planting trees on the embankment and the silted land near it and

- building ring embankment through govt. Support
- organising important things of the house and keeping it handy, so that in the event of any disaster they can be easily shifted to a safe place
- informing others if there is any possibility of embankment breach

- Floods and flash floods

  These disasters salinize the entire land, thus foiling the possibility of the cultivation of any crop. Communication is entirely disturbed as the roads get submerged. The entire area gets waterlogged.

Strategies adopted to overcome the impacts of these disasters include:

- Application of compost, organic manure, cowdung manure, vermi-compost, heap compost etc. to remove or reduce salinization of the soil.
- Elevating the level of roads with govt. support, so that they do not get submerged in case of any eventuality.
- Constructing sluice gates, culverts and doles in order to save the area from getting waterlogged in case of flood or flash flood. Canals must be excavated further to make the drainage system more effective.
- And the most important is construction of a disaster shelter.

Some parts of Kabardanga Para and Ramgopalpur Para are comparatively less affected than Kachhari Para andChowdhury Para. The reasons for this are

- These two hamlets are at a higher level than the others.
- Their distance from the river embankment is greater.
- If water enters the village due to breaches in the river embankment or due to flood or flash flood, it has to cross Kachhari Para, Chowdhury Para and Char Para before entering these two hamlets, as a result of which people get the time to escape from these hamlets. Besides, the primary school which is the only shelter in the village, is in the midst of these hamlets. That is why the villagers consider it as no.2 risk prone and vulnerable zone.

Seasonal Calendar on Hazard

- River embankment breach

  Villagers of Gadkhali consider river embankment breach to be their main problem or risk, because it severely affects the life & livelihood of the people. It also devastates their assets mainly in terms of domestic animals and birds. In order to combat this disaster, the people have adopted the following disaster risk reduction strategies:
  They repair the embankment before the months of Joishtho, Asharh, Srabon, Bhadro and Ashwin (mid-May to mid-Oct) because the breaches mostly happen during this period.

  They keep the essentials, valuables and important documents like land deeds, cash money, gold ornaments etc. secured and handy, so that they can be easily shifted to some safe place in case of any eventuality.
  They always keep some dry food in stock.
  In case of any chance of an embankment breach, they also keep a plantain raft ready for use in emergency situations.

- Floods
  The residents of Gadkhali said that floods usually happen in the months of Srabon, Bhadra, Ashwin and Kartick (mid-July to mid-November), but most of the incidence of floods happens in the month of Ashwin (mid-September to mid-October). The disaster preparedness measures, whichthe villagers adopt in case of floods is the same as the ones adopted to withstand the havoc caused by embankment breach.
- Temperature rise
  According to the people living in Gadkhali, temperature rises usually in the summer months of Choitra, Boishakh and Joishtho (mid-March to mid-June). It causes the ponds and canals to dry up, which creates a crisis of water for use in different purposes like cleaning utensils, washing clothes, bathing and feeding cattle etc. Apart from that drinking water also becomes scarce as the tube wells fail to lift sufficient water. At times two tube wells fail to lift any water at all.

  As preparedness measure
  1. Ponds and canals are made deeper through NREGA scheme, so that they do not get dried up in summer. Water consumption is also made only to the extent it is absolutely necessary. They are also trying to stop summer cultivation.
  2. They are also trying to reduce the consumption of water lifted by tube wells in order to keep these working even in the summer months.
  3. If the installation of shallow pumps in paddy fields could be stopped through govt. intervention, it would have helped in mitigating the household water crisis especially in terms of getting drinking water.

- Cyclone/storm
  According to the villagers, strong cyclones and storms happen mostly during the months of Boishakh (mid-April to mid-May) and Ashwin (mid-September to mid-October). Also, storms of varying intensity take place almost every year during the months of Joishtho (mid-May to mid-June), Bhadro (mid-August to mid-September) and Choitro (mid-March to mid-April). Swapan Naskar said, “In our area, previously storm speed was about 80-90 km. whereas now the speed varies between 130 and 190 km or even more.

  As preparedness measure
  1. They receive the information about an impending storm or cyclone from radio, TV and govt. sources like the Panchayat.
  2. The posts of houses are set deep in the ground.
  3. If there is any large tree beside the house, it is felled.
  4. If there is any information about an impending storm, immediately the cattle and other animal resources are brought back home from the fields and securely harnessed in the cattle shed.

- Erratic rainfall
  The villagers said that in the recent times erratic rainfall is creating an acute problem in the area. The entire sowing season is getting delayed due to this climate change induced phenomenon.
  As a preparedness measure, some food is kept in stock to tide over the crisis in case no cultivation is possible due to erratic rainfall.
- Hailstorm
  The impact of hailstorms has increased in the recent times. This year fully ripened paddy got devastated due to hailstorm. Heavy hails broke the asbestos sheds.

Trend Analysis of Hazards

When the villagers were asked about the types of disasters they had been experiencing in recent times and about how they identified them as disasters, they said that river embankment breaches was the main disaster they were facing recently as it causes havoc in agriculture, trees, houses etc. Even there are chances of loss of life.

- River embankment breach

  Present situation

  This year the embankment in this area has not breached as yet, but there is every chance of it in the coming months of Bhadro and Ashwin (mid-August to mid-October),because usually the high tide in the rivers comes during this time and the embankments get weakened by the surging waves they have to withstand through the monsoon season. Besides, there is always the possibility of storms or cyclones happening during this time. But the most important is the weak embankment on the south-east. The river tide directly hits the embankment at this point. The situation makes it vulnerable to breach during these two months.

  Situation in the last decade

  Aila came on 25th May, 2009, which developed breaches in the embankment on the south-eastern side. Water entered through the breaches and inundated the area by saline water, thus salinizing the entire land. As a result, in the consecutive years of 2010 and 2011, no paddy or vegetable could be grown in the area. This year paddy and some vegetables could be grown during the monsoon. Entry of saline water in ponds and canals caused all the sweet water fish to die. Apart from this, cattle rearing was almost stopped as no grass could be grown in the salinized land.

  Situation in the decade before last

  Incidence of embankment breach happened in 1981, which flooded the entire area.

  This shows that compared to the last two decades climate change induced incidence of breaches in the river embankment has increased in the recent times.

- Cyclone or storm

  Present situation

  The villagers informed that a storm came on 9th March, 2012 at the time of the ripening of paddy, which devastated the entire crop. The storm also called mud walls to collapse which, in turn, killed cattle and goats. Some houses also collapsed due to the storm.

  Situation in the last decade

  On 25thMay 2009, a storm called Aila passed through the area. Till now, the villagers had not experienced a storm stronger than Aila. Most of the people lost at least 60% of their assets that included cattle, sweet water fish cultured in ponds, trees, houses etc.

  Situation in the decade before last

  At least 80% of the trees and mud houses collapsed under the impact of the storm that came in 1981. Most affected were the people who lived in houses having tin roofs. The storm blew the tin sheets away.

- Erratic rainfall

  Present situation

  Another hazard that came up in the course of the discussion was erratic rainfall. The

villagers said that erratic rainfall is deteriorating the existing standards of life and livelihood. This year no crop could be grown in summer due to absence of rain. Late arrival of monsoon has also delayed the cultivation of rainfed paddy by one month. This has affected the production by 25% in case of paddy and 50% in case of vegetables. At the same time it has been instrumental in increasing the price of vegetables many times more than the earlier price. At present, absence of rain has increased the infestation of pests.

Situation in the last decade
Although distribution of rains varied to a certain extent, in the post-Aila period distribution of rains has not followed the right course. It has seriously affected the cultivation of paddy, vegetable, fish etc. At the same time, it has increased pest infestation.

Situation in the decade before last
Amount of rainfall was the same and it followed a regular routine. As a result, there was no problem in doing agriculture. But in the last few years, the global phenomenon of climate change has caused the rainfall to become erratic.

- Flood

Floods seriously affect agriculture, trees, animal resources, fish, houses etc. All communications and transportation systems get snapped. That is why they consider floods to be a hazard.

Present situation
In 2012 or in 1419 according to the Bengali calendar, no flood has occurred in the area, but there is high possibility of floods appearing in the coming months of Bhadro and Ashwin when the river is in spate.

Situation in the last decade
Incidence of flood happened quite a few times. After the sowing of paddy in 2011, there was a cloud burst, which destroyed at least 70% of paddy sown in the area. In 2009, Aila caused breaches in the river embankment, which made houses to collapse and trees to fall. Sweet water fish and domestic animals died. Along with it, all roads and other communications in the area got delinked for a few days. Apart from that entry of saline water from the river salinized the entire land which made it impossible to cultivate any crop for quite a few years. People had to migrate to other places to save their life and livelihood. The flood that came in 2006-07 partially affected the area in many different ways.

Situation in the decade before last
Flood that came in 1981 washed away mud houses, cattle etc. The villagers had to leave their homes and take shelter in some safer place.

- Hailstorm

Present situation
On 9th March 2012 there was a heavy downpour with massive hailstorm. This caused serious damage to the houses, especially the asbestos roofs got shattered by the impact of the large hails. Besides, paddy and vegetable crops got completely destroyed. The villagers said that the hails weighed between 500 g and 900 g, which they had never seen before.

Situation in the last decade
Hailstorms happened, but there was no damage or the damage was minimum.

Situation in the decade before last
Hailstorms happened more frequently, but the amount and extent of damage was negligible.

- Temperature rise
  The villagers consider it as a hazard as it is seriously impacting humans and agriculture.

  Present situation
  In 2012, two persons aged between 40 and 50 died in the excessive heat while sowing in the field. From the middle of Choitra to the middle of Asharh (April to June), it becomes impossible to work in the fields after 10 o' clock in the morning. The intensity of solar heat caused the ponds to dry up thus killing the sweet water fish reared in them. Vegetable seeds could not germinate in most of the cases. In few cases it did, but the saplings shrivelled up in the intense heat.

  Situation in the last decade
  Temperature was not so high. It started rising since the Aila in 2009. Before that, the villagers could understand that the temperature was rising, but it did not affect life and livelihood.

  Situation in the decade before last
  Seasonal changes were normal as was temperature variance.

In a concluding note, the villagers said that the phenomenon of climate change is more perceptible now, which is increasing the intensity and thus, the impact of the disasters. This has caused many livelihood options to disappear from the area, which is forcing people to migrate in search of work.

Vulnerability Matrix

The main hazards affecting Gadkhali village are:

1. River embankment breach
2. Flood
3. Temperature rise
4. Storm or cyclone
5. Erratic rainfall

- River embankment breach
  Breaches in the river embankment are allowing river water to enter the village. It is inundating the entire landmass and salinizing the land. For the last 2-3 years no paddy cultivation could be possible. Considerable number of trees is dying. Now no grass grows in the area. Many cattle have died or are about to die. Sweet water fish reared in ponds or canals are dying.

  Strategies adopted by them to overcome the situation are:
  - Seeking Govt. support and intervention to replace the present structure with a ring embankment or dyke
  - In order to avoid complete inundation, houses are being built at a place that is higher than the other areas within the homestead. Mud walls are being replaced with brick walls or those made with chach (bamboo mat).
  - Applying heap compost, vermi-compost, farmyard manure etc. to

reduce and eradicate salinization of the land so that cultivation can continue.

- Seeking govt. and non-govt. intervention for making a shelter house

- Flood

  Floods seriously affect agriculture, trees, animal resources, fish, houses etc. All communications and transportation links get snapped. They have to migrate to other places in order to get engaged in embroidery work.

  Strategies adopted by them to save themselves from this disaster are:

  - In the event of a flash flood, they keep plantain rafts and boats ready to shift to some elevated place to take shelter there.
  - Seeking outside support to construct a shelter house
  - Seeking training in rescue measures
  - Seeking govt. support and intervention for making the roads at a little higher plane and paving them with bricks, so that quick shifting to a safe place is possible in case there is a sudden flood
  - Seeking govt. support and intervention for constructing more sluice gates and culverts so that flood water may drain out quickly.

- Temperature rise

  The villagers of Gadkhali are being severely affected by temperature rise. No agricultural activity is possible in the area at the moment. It has become impossible to work in the fields for a long time. This year i.e. in 2012 two persons aged between 40 and 50 while sowing in the field died in the excessive heat.

  Strategies that the villagers have adopted or thought about adopting to combat this hazard are:

  - It would be good if number of vehicles run by petrol or diesel could be reduced
  - Lot of trees will have to be planted

- Cyclone or storm

  A storm came on 9th March, 2012 at the time of the ripening of paddy, which devastated the entire crop. The storm blew away hay and tin roofs and also caused mud walls to collapse which, in turn, killed 4 cows and 2 goats. The super cyclone Aila that came in 2009 devastated the entire area. Many large trees fell. About 80% of the area was severely affected.

  Strategies that they have already adopted or have thought to adopt in order to overcome the impact of this type of disaster are

  - Listening to weather reports broadcast by radio, television or information from govt. sources to get information about impending storm or cyclone.
  - Making sure that there is no large tree adjacent to the house

- Erratic rainfall

  Erratic rainfall is pushing Gadkhali to the brink of a severe disaster. Late arrival of monsoon is delaying the entire cultivation system. Due to absence of rain, summer vegetables cannot be grown to the scale it was done earlier. It has been instrumental in increasing the price of vegetables many times more than the earlier price. In 2010, a large percentage of the fields could not be sown due to erratic rainfall. This is compelling the poor villagers to migrate to other places in search of work. A considerable section is getting engaged in embroidery work.

Strategies that they have already adopted or have thought to adopt in order to overcome the impact of this type of disaster are

- Trying to plant large number trees and seeking govt. support and intervention in the matter.

Seasonal Calendar on Income

Livelihood options available in the village are:

- Wage labourer (excavation work, harvesting paddy, sowing saplings etc.)
- Agricultural labourer (in their own land and in others' lands)
- Embroidery work (embroidery on saris etc. with gold and silver threads)
- Catching fingerlings from the river (spawns of prawns, lobsters and other fish)
- Going outside the village for work (helper of skilled workers, sowing paddy saplings etc.)
- Sailing in boats to catch fish in the river
- Driving vans for transporting people and goods (cycle van as well as motorised vans)
- Running a shop or a small enterprise (grocers, stationers etc)
- Poultry rearing (indigenous and broiler varieties)

- Wage labourer

  At least 30% of the people living in Gadkhali earn their livelihood by working as a wage labourer. Climate change induced disasters have reduced livelihood options available earlier like agriculture, catching fingerlings, fishing etc. It is compelling poor villagers to migrate to other places in search of work. Most of the wage labourers (90%) are male and naturally they form the worst affected section. Apart from that labour hours generated have also gone down due to temperature rise. This year, two wage labourers died while working in the field. At present daily wage is Rs.170/-. The work is available throughout the year. Previously 80% of the people used to get engaged as a wage labourer.

- Agricultural labourer

  In the yester years, the main occupation of the villagers of Gadkhali was doing farming or working as an agricultural labourer. But now, due to the global phenomenon of climate change, percentage of men doing farming or working as agricultural labourers has come down from 90 to 40. In case of women the percentage has come down from 10 to 2. Wages available per day is Rs.170/-.

  After Aila, absence of agricultural work has forced villagers to migrate to places outside the village and even the country. The work is available throughout the year especially in the months of Joishtho, Asharh, Srabon, Bhadro, Ashwin, Kartik, Aghran, Poush and Magh when the availability is higher than in the other months.

- Embroidery work

  About 30% of the villagers are engaged in zari work (embroidery with gold and silver threads) out of which 40% are men and 60% women. The zari work was introduced in the village in 2002. Now, the villagers earn in the range of Rs.150/- to Rs.1500/- by

doing embroidery work on saris with zari. This work has increased in the situation that emerged after Aila in 2009. Absence of all agricultural work has pushed the villagers to embrace this livelihood activity. Work is available round the year. Except for the months of Asharh, Srabon and Bhadro, women do this work throughout the year, but the men do this during the months of Boishakh-Joishtho and Falgun-Choitra.

- Catching fingerlings in the river
  About 20% of the people living in Gadkhali earn their livelihood by catching fingerlings of tiger prawn, lobster, ginger shrimp etc. out of which 80% are women and 20% men. They do this work throughout the year. They have a better catch in the months of Magh and Falgun. After Aila, more and more villagers adopted this as their principal livelihood as no agriculture was possible for at two to three consecutive years. The new problem that has emerged is previously they could freely catch fingerlings in the river throughout the year, but a law has been enforced in the recent times which bars them from catching fingerlings at all times of the year. The authorities say that by doing this activity, they are disturbing the fingerlings and spawns of other fish beyond their target catch.

- Migration
  Climate change induced disasters have caused almost all agricultural activity to stop in the area for the last few years. This was resulted by the massive breach in the river embankment by the violent cyclone Aila in 2009. This situation is forcing people to migrate outside the village and even the country for work as helper of skilled workers, wage labourer for transplanting and harvesting paddy, carpenter, embroidery worker, apprentice goldsmith etc. About 50% the villagers work outside the village to earn their living, out of which 90% are men and 10% women. Rate of migration has increased due to natural calamities.

- Sailing in boats to catch fish in the river
  Before Aila, only 10-15 persons from the village used to go for fishing in the river, but after Aila, at least 30-35 families are now dependent on fishing. Throughout the year, they sail in boats to catch fish in the river and run their families with earnings from it. The different varieties of fish they catch from the river include fasha, amude, nihare, moti, chingri, bholaetc.

- Driving vans
  About 10-15 van drivers in the village drive their vans throughout the year as their principal means of earning. In the post Aila situation, suspension of all agricultural activity in the area has forced them to adopt this livelihood. They transport both people and goods in their vans.

- Running shops or small enterprises
  At present number of shop owners in this village is 10, but before Aila there were 14 shops in the village. Four shops got completely damaged by Aila. Most of these shops are now run by women, as the men are migrating as there is hardly any work available in the area. These shops usually deal in all sorts of grocery items.

- Chicken rearing
  About 10 families in the village purchase small chicks, rear them for a certain period of time and then sell them for being consumed as meat. Apart from that almost all families have backyard poultry with 5-6 chicks, but diseases like bird flu, pox, chikongunia etc. that appeared after Aila has reduced this practice of chicken rearing at home. Availability of eggs and chicken meat has also dropped. Now poor villagers have to buy

poultry chicken and eggs from outside the village, which they can afford to buy only in small quantities, because it is not possible to rear chicken in their homes for the diseases that have surfaced.

Walk through the village

- Geographical Description of the area
  Bidyadhari river flows along the eastern and southern boundary of the village. Masjidbati village is in the north and in its west is Mokamberia village. In Gadkhali there are 5 hamlets viz. Kachhari Para, Chowdhury Para, Ramgopalpur Para (Purbo Para), Char Para and Kabardanga Para.
- Administrative Description of the area
  The BDO office of Gadkhali village is at Sonakhali situated at a distance of 15 km from the village. The Police Station at Basanti is about 12 km from the village. At a distance of 5 km is the Panchayet office at Masjidbati.
- Population
  Total population of Gadkhali is 3990, out of which 1941 are women and 2049 men.
- Agriculture
  95% of the people residing in Gadkhali practice agriculture as their prime source of livelihood. However, the recent phenomenon of climate change affects agriculture almost every year due to calamities like embankment breaches, storm, flood and hailstorm. As a result, agriculture is not practiced in the scale it was done in the yester years. At present cultivation is possible only in monsoon and winter. Summer crop is impossible. During Aila, the entire area went under saline water that made most of these lands uncultivable for the last three years. Over this period, the villagers have adopted many strategies to improve the condition of the soil. They applied dung compost, heap compost and vermi-compost. Besides, they also tried to make use of rainwater to wash away the salt from the soil surface. The villagers believe that these measures made it possible to cultivate at least 70-80% of the lands. But the monsoon cultivation had to be shifted due to late arrival of rains.

  At present, high yielding varieties of paddy like pankaj, masuri, hajarchhabbish, hajarshotero, rani, maharajetc. are being cultivated. Incidence of embankment breach every year has panicked the villagers who apply a lot of chemical fertilisers and pesticides to cultivate high yielding paddy in order to get a quick crop. This, in turn, has made the soil unsuitable for cultivating native varieties. In case of HYV, farmers are getting yield of 3-6 bags per acre more than what they used to get from the native varieties. Indigenous varieties that were cultivated earlier are patnai, kalomota, nonabogra, talmugur, hamai, sadamota, dudheswar etc. and previously the farmers used to get production of at least 18-21 bags per acre by cultivating these varieties. Unfortunately, at present the yield has dropped to a great extent. The HYVs were introduced sometime around 1995.

  Due to the entry of saline water during Aila, almost all varieties of grass and weeds like durba, samna, latadurba, chiknishak, halkolmi, dholkolmi, chuchkoetc. that used to grow in the fields have almost disappeared. Besides, aquatic flora like water hyacinth, azolla, moss, algae etc. that could be seen in the fields, canals, ponds and ditches have also disappeared after Aila. As a result, practice of cattle rearing in the area has reduced to a very great extent. Fish that live on water hyacinth, azolla, algae etc. has become very r are.

Entry of saline water due to embankment breaches salinized the land. This has caused the fish of native varieties to disappear. Local people know these varieties as shole, latha, koi, magur, shingi, pankal, nados, boal etc. Application of chemical fertilisers and pesticides for growing high yielding varieties of paddy and vegetables has also resulted in the disappearance of these varieties from the area. After Aila this phenomenon of disappearing of indigenous varieties has increased many folds. As a result, the villagers are now rearing fish of high yielding and fast growing varieties like hybrid magur, rui, tangram, pona, katla etc.

- Natural Resource Management
  In very old times, there was a large pond called KachariPukur, but now it has been dried up by people who took control over it. Besides, there are three canals, but due to absence of renovation and management these have also become unfit for drainage or supplying water for irrigation. Water flowing through one of these canals is still saline.

- Safe Drinking Water
  Water lifted by tube wells is only used for drinking. Capacity of tube wells to lift water has reduced in the recent times. This is due to the fact that underground aquifers are being depleted for extraction of ground water by shallow pumps installed by farmers for irrigating their crops. This causes a crisis of drinking water in the area during the months of choitra and boishakh (mid-March to mid-May). At other times of the year, pumping the tube wells 15-20 times fills up a bucket of water, while during the summer months it requires 25-30 pumping to lift the same amount of water. Apart from this, the tube wells having been installed in low lands along the riverside, in case of an embankment breach, all the tube wells get submerged by saline water. In such cases, villagers have to fetch water from a distance of 1-2 km. from neighbouring areas or villages.

- Forest Resource and Bio-variety
  There is nothing worth calling 'forest resource' in the village. In so far as bio-variety is concerned, number of cattle, small ruminants, ducks and chicks has reduced compared to earlier times. The reason for this is the unavailability of fodder as agricultural practice has reduced considerably due to the global phenomenon of climate change. Salinization of the fields is not allowing grass to grow. Apart from this, the domestic animals and birds are acquiring mysterious diseases by consuming leaves and farm wastes from vegetable gardens and crop fields where the latest generation pesticides have been applied. Many of them are suddenly having a rigour resulting in instant death. As a result domestic animal and bird population is on the decline.

  Application of chemical pesticides in vegetable gardens and crop fields are causing the death of many indigenous fish variety like nados, boal, shingi, magur, koi, shole, pankal etc. These varieties are on the verge of near-extinction.

  Birds that feed on these fish are also on the way to extinction. These include black and white egret, Asian openbill stork, kite, vulcher, weaver bird, house sparrow etc.

Nature and type of disasters

Recurrence and intensity of disasters have increased since the floods in year 2000 and the Sunami. As a result, the amount of loss due to disasters has also increased. Previously, storms used to happen in the months of Boishakh (Apr-May) and Kartik (Oct-Nov), but now they come at any time of the year. Wind speed and intensity of the storms have also increased, thus scaling up the amount of loss. Temperature has also increased many folds,

which caused the death of two agricultural labourers while they were working in the field. Erratic rainfall is severely affecting agriculture. Monsoon is either early or late. This year it has caused paddy cultivation to recede by a month.
Hailstorms are also assuming enormous proportions. Previously, hails were like small pebbles, but now their size and weight have increased. Now, many a times they weigh 500 g to 700 g. This is affecting agriculture as well as breaking roofs of houses covered with tiles or asbestos.

Disaster Management

Except for a small primary school, there is no other shelter house in the village. The primary school had served as the only shelter during Aila. It could accommodate with difficulty only 25% of the villagers. There is no tall building in the village. But this year a room has been built with govt. support.

Nature of Soil

Previously, the nature of soil was clayey and loamy, but Aila had salinized the land, which caused agriculture to fail in the last 3 years. But gradual changes brought about in the soil structure have allowed some agriculture practices this year.

Focus Group Discussion with Women Groups

- Livelihood activities with which the women of Godkhali village are involved are catching fingerlings in the river, fishing, embroidery work, doing vegetable garden, animal husbandry, agriculture and running small shops etc.
- Activities of women involving natural resource management are catching fingerlings in the river, participating in 100 days work for repairing the river embankments and making roads, animal husbandry, making vegetable garden, etc.
- In so far as activities relating to NGOs, SHGs and other related works are concerned, the women of Godkhali are associated with Chompa Mohila Society and Jaigopalpur Bikash Kendra.

- Due to climate change induced disasters like breaches in the river embankment, flood, storm, flash floods, hail storm, erratic rainfall, etc. the women are being affected or they are facing risks in terms of their livelihood activities like catching fingerlings in the river, making vegetable gardens, animal husbandry, 100 days' work and agriculture. These livelihood options are getting lost due to these disasters. For example, no agricultural activity could be done after Aila, not a blade of grass grew during this time. As a result of this, agriculture and animal husbandry was seriously hampered. This year, agriculture had to be deferred by one month due to erratic rain and ripened paddy was devastated due to storm and hail storm.
  - ▶ Problems faced by the women during disaster: crisis of water for drinking and other purposes, use of toilet and defecation, crisis of food, shelter house, livelihood and of clothes. Women had to face all these problems during the time of Aila.
  - ▶ Before the disaster: the women did not have to face any problem of serious consequence.
  - ▶ Post disaster situation: Due to salinization of the entire landmass including water bodies there is an acute crisis of water for use in different purposes. Women face

problems in fetching drinking water, catching fingerlings etc. and often there is water logging caused by disasters like cyclones or storms, floods or flash floods, etc.

- Women get information about the disasters mainly from sources like television, radio, mobile phones and sometimes through the announcements made by the Panchayat office through public address systems. This information comes to them almost at the brink of the disaster or sometimes it comes beforehand.

- As disaster preparedness measures the women keep a plantain raft ready, reinforce the embankments by putting mud through the 100 days work in order to resist a breach in it, keeping the valuables like cash money, gold, silver, land deeds, ration card, voter card, etc, in plastic packets to save them from getting soaked in water. They keep these handy so that they can be easily shifted if they evacuate their home. Besides that they also keep some dry food in stock for use during disasters. They also arrange for a safe place for sheltering the ducks, chicks, cattle, goat, sheep, etc. They also try to organize the agricultural resources like paddy, vegetable, etc. if there is any possibility of disaster.

- Decisions taken by the women in combating disaster are regarding animal husbandry, doing vegetable garden within the homestead, leaving the home temporarily and shifting to some safe place, arranging for some alternative livelihood, taking loans from the N.G.Os and C.B.Os, reinforcing the river embankment by providing soil. In this case the decisions taken by the men are sale of assets, evacuating the home permanently and shifting to some other place, collecting food from the ration, migrating to some other place, etc.

- As a preparatory measure for combating climate induced disasters, the women take part in activities like reinforcing river embankment by putting soil on it, using packaged water during the time of disasters, keeping the domestic animals and birds in a safe place, making the toilets in a safe place or maintaining them.

  - ▶ Before the disaster: getting the right information from the Panchayat office, television, radio, etc., raising the plinth of the toilets, installing the tubewells on a raised platform, making provision for a shelter house with separate arrangement for women, making provision for handicrafts or micro enterprises in 100 days scheme, getting support for doing animal husbandry.
  - ▶ During the disaster: Support in terms of food, water and clothes is needed, there should be provision for a shelter house with separate arrangements for women, eradicating water logging because it causes so many diseases like malaria, exhima, diarrhea, fever, etc., there should be separate toilets for women, tubewells should be installed in raised platform.
  - ▶ After the disaster: Provision for a shelter house and toilets must be made, in order to mitigate the food crisis providing some work for doing handicrafts or some business will help.

Interview with the main informant

Interviewee's name: MinatiMandal, Swapan Nashkar (N.G.O. worker)
Changes happening in the atmosphere and the climate in the recent times are as follows:

- Temperature
  Compared to earlier times the temperature has increased.

- Rainfall
  Rainfall is not happening in the usual time. Sometimes there is excessive rain and sometimes there is no rainfall causing drought.
- Storm
  Number of incidents of storms has reduced but the amount of affected area has increased.
- River embankment breach
  Number of incidents of breaches developing in the environment has increased and the amount of devastation caused by it has also increased.
- Floods
  The number of incidents of floods has also increased. There has been increase in their intensities and the amount of devastation caused by them is huge.
  - ▶ Situation in the decade before last - In 1981 the floods caused havoc in terms of agriculture houses were devastated and assets in terms of animal husbandry were entirely lost. In 1988, floods completely devastated the area. In 1989, it broke the river embankment and createdhavoc. In 1991, there was huge loss of life and assets due to breaches in the environment and floods.
  - ▶ Situation in the last decade - On 25th May 2009, Aila developed breaches in the river embankment and caused huge damage in the area. Huge amount of cattle, fish, snakes, frogs etc. got killed which vitiated the atmosphere causing health concerns for the humans. It was therefore necessary to remove the carcasses of the dead animals and sprinkle bleaching powder. Entry of saline water caused salinization of land which did not allow grass to grow in the fields. No agricultural activity could be done for 2-3 years. Lot of trees fell and died.

Climate change induced disasters impacted human life in the following ways:

- Temperature rise has caused salinity of land to increase. On the other hand, doing the job of a manual labour is becoming more and more difficult. Two persons have died in this village while doing excavation work.
- Storms, flash floods, high tides, breaches in the embankments etc. caused river water to enter the village and salinized the land which in turn has caused agriculture to stop in the last 2-3 years. Sweet water fish cannot be reared.No grass grows on the land which makes it impossible for rearing cattle. This has compelled the villagers to take to livelihoods like embroidery and most of the people are migrating to different areas.
- When the menfolk are going outside the village for work the women are being compelled to take responsibility of running the family. In absence of agriculture the women have to emphasize on catching fingerlings in the river and do embroidery work at home. They have to purchase everything from vegetables, paddy, firewood from the market in order to run the family.

Strategies adopted by the villagers in pre and post disaster situations are as follows:

- Use packaged water for drinking.
- Set up tarpaulin shades on the roads for temporary shelters.
- Reinforce the embankments with mud during low tide.
- Have to depend on the shelter house which do not have sufficient space nor are they strong enough to sustain fresh impacts of disaster.

Alternatives for running a livelihood may be:

- Raising the plinths of the houses and making brick walled houses,

- Raising the level of the house and making them stronger,
- Early warning system should be improved so that information from the panchayat office is available before the disaster comes,
- Tubewells must be installed at a higher level on a raised platform,
- It would be good to have a shelter house. In order to realize all these and make it sustainable economic support is necessary.

As a disaster risk response strategy:

- Canals should be excavated further and renovated so that stagnated water from the village can quickly get drained.
- Plantation may be done on the river embankment,
- It would be good to have a shelter house,
- Number of holes and sluice gates must be increased.

Problems for disaster preparedness and management are as follows:

- Lot of cow dung and organic manure is required to eradicate the salinity of the land.
- Plantation needs to be done on the river embankment.
- Tubewells are required.
- Shelter house is necessary.

No support is at present available from the Panchayat, so, in order to implement all these, economic support from outside is necessary. There is also necessity of providing training to raise the level of awareness of the villagers.

Interview with wage labourer

Changes experienced in the atmosphere and climate in the recent times are as follows:

- Temperature
  Compared to earlier times temperature has increased many folds. Earlier there was no problem working in the fields but now people are facing immense problem to work in the feilds. In Godkhali village alone 2% have died while working in the feilds due to rise in temperature.
- Breaches in river embankment
  As there is a rise in the river level, the incidents of embankment breach has also increased compared to earlier times. This has also increased the amount of devastation in the area. It is affecting fish and agriculture in a massive way.
- Storm
  Number of storms compared to the earlier time has decreased but their intensity has increased. It is affecting the mudhouses, trees and crops very seriously. Fishermen are getting scared to sail out in the river.
- Excessive rain and absence of rain
  Erratic rainfall is severely affecting agriculture and human health. Huge amount of crop loss has increased the price of vegetables in the market.

  At present
  Disasters faced by people of this area are river embankment breach, storm or cyclone, hailstorm, floods, flash flood, excessive rainfall etc.

  Situation in the decade before last
  Embankment breach, storm or cyclone, hailstorm, flood, flash flood etc. used to happen, but the intensity was less compared to the present time.

Climate change induced disasters affects the livelihood of the villagers in various ways.

- Storm and cyclone
  Storm and cyclone have affected the crop of both paddy and vegetables. The evolved state of affairs is causing people to migrate outside the village and sometimes the country.
- Embankment breach, flash flood, salinization, high tide etc.
  All these hazards and calamities have suspended the cultivation of paddy and vegetables. Animal rearing has become impossible as grass does not grow in the fields. Sweet water fish cannot be reared in the ponds. So the villagers are migrating to other places in search of work. And more and more women are getting involved in embroidery work and catching fingerlings and spawns in the river.
- Erratic rainfall
  Rain is not following its earlier schedule, which is seriously affecting agriculture and causing diseases in humans. Absence of a timely shower is causing the newly sown saplings to wilt. At other times, excessive rain is causing waterlogging and the saplings are getting decomposed. The situation is forcing people to migrate.

  Villagers get information about an impending disaster from the radio and TV news and sometimes from the public announcements done on behalf of the Panchayat office. They usually get the information at the last moment or after the disaster has hit.

As disaster preparedness measure, villagers of Gadkhali adopt the following strategies:

Before the disaster

- They keep some dry food in stock.
- They always keep a torch and radio with them.
- In the event of a disaster, they shift to some elevated place.
- They keep the valuables including gold & silver, land deeds etc. in a plastic cover and keep the packet in a safe and dry place.

After the disaster

- Organizing the home which is in shambles due to the disaster
- Sanitize the environment
- Clean up the dead fish and birds

In order to maintain life and livelihood, they feel that they should emphasize more on starting different types of small business. In order to realize this, monetary support and awareness is needed.

Focus Group Discussion with Group of Cycle and Motor Van Drivers

On 16.08.12, an FGD was organized with a group of van drivers of Gadkhali village to discuss the impact of climate change in the area. The information supplied by them may be summarized as follows:

- Temperature of the area has been gradually increasing in the recent times. Its degree has increased by at least one-third of the earlier standards. Rainfall has become erratic and the usual time for the arrival of monsoon has changed. Intensity and strength of storms are increasing associated with an increase in the intensity and the recurrence of hailstorm and thunder.
- When asked about the different type of disasters they experience, they said that embankment breach, temperature rise, cloud burst, erratic rainfall, hailstorm, cyclone, waterlogging, salinization are the main hazards of the area. This year 3 persons died while working in the intense heat. In the post-Aila period, the degree of natural

calamities has been rising day by day.

- In the decade before last, storm, cyclone, flash flood, embankment breach, flood, excessive rain, absence of rain, temperature rise, hailstorms happened, but their impact was much less than what they are experiencing now.
- Climate change induced disasters are seriously affecting their livelihood like it is becoming very difficult to drive the vans throughout the day due to the recent phenomenon of temperature rise.
- Although van drivers are not directly affected by storm and other kind of natural calamities, but since these are seriously affecting agriculture, the van drivers are being compelled to purchase rice and vegetables at a premium price. This is impacting their livelihood in an indirect way. Embankment breach, storm, salinization do not affect them directly, but have serious impacts on the life and livelihood of their neighbours who are farmers or wage labourers.
- They get disaster related information from the radio, TV and Panchayat office. The information usually comes at the last moment.
- As disaster preparedness measure they adopt the following strategies:

  Before the disaster
  - Keep themselves prepared so that in case of an emergency they can shift to some elevated place.
  - Keep some dry food in stock.
  - Keep a torch and radio ready at hand.
  - Keep the valuables in a plastic packet and keep the packet in a safe and dry place.

  After the disaster
  - Organize the home dishevelled by the disaster.
  - Sprinkle bleaching powder to sanitize the environment.
  - Arrange to bury the dead fish, ducks, chicks etc.

They think that in order to increase their income they should start small enterprises and in order to realize this thought, they will have to have economic support and expert advice.

Focus Group Discussion with Farmers' Group

On 16.08.12 a workshop was organized at 2.00 PM to hold a discussion with the small and large farmers of Gadkhali village. The purpose of this workshop was to understand the impact of climate change on the life and livelihood of these farmers and their families. The key points that came up in course of the discussion are as follows:

- Relating about the present situation of the environment and the climate, they said that in the last two years average temperature has increased by at least 30%. Rainfall has been erratic instead of Asharh-Srabon, monsoon is arriving in Bhadro-Ashwin. Winter is not appearing at its usual time. Sometimes it is very cold. Frequency of storms has decreased in comparison to earlier times, but their intensity and power of devastation have increased. A good number of storms that happen are cyclones. In the event of hailstorms, the size and weight of the hails are inconceivably large and varies between 750 g to 1 kg. Incidence of lightning and thunder has also increased.
- When asked about the different types of disasters that can be experienced in the recent times, they said that out of the several disasters, embankment breach, temperature rise, cloud burst, erratic rainfall, hailstorm, storm, waterlogging, salinization are the ones which affect the most. This year 3 persons died while working in the field in the intense heat.
- When asked about the situation that prevailed in the decade before last, a senior

member of the group said that the level of water in the river never increased to this height at that time, intensity of storms was less, as a result of which there were fewer incidences of embankment breach and flooding. Level of salinity of the soil was negligible. Temperature varied between 26° and 27° C. Rainfall was regular. Number of storms was more, but their impact was less. The impact of other calamities like hailstorm, excessive rain, absence of rain was much less. Storm and flood happened in 1388 according to the Bengali calendar (in 1981 AD) that destroyed houses, assets, domestic animals and crops. And even one of the expecting mothers had to give birth to her child in knee deep mud.

- When asked about how these calamities affect their livelihood, they said storms usually have widespread impacts on their houses, trees, field and vegetable crops. If the storm is associated with high tide in the river, it causes the embankment to breach and create flash flood. It damages the crops, renders the people homeless, causes loss of cattle and birds and uproots large trees. There is infestation of pest in crops at this time. Afterwards, when the water level recedes, it leaves all the lands salinized. In the lands where they could cultivate two crops of paddy, vegetables like chilli, ladies finger, lablab beans, potato, onion and pulses like mung, after Aila that came in 2009 in the same land nothing can be grown except a single crop of rainfed paddy. In the plot of land, where previously they used to have more than 500 kg of paddy, now in the monsoon period they do not have more than 150-200 kg. No vegetable can be grown on this land. Apart from this, sometimes excessive rain is inundating the ripened paddy. Sometimes the crop ready to flower is wilting without a single shower. Crops die. It is impossible to work in the fields for long due to intense heat. Heat and salinization are not allowing the grass to grow, as a result of which cattle rearing is decreasing day by day. Shift in the arrival of monsoon is causing a shift in the sowing and transplanting time.

The farmers of Gadkhali have adopted certain strategies to overcome the impacts of this disaster. These are:

- In order to resist the impact the impact of storms, they have used concrete posts to build their houses.
- Leafy vegetables like Indian Spinach, Garden Spinach etc. that can tolerate waterlogging and heat are grown.
- They use cow dung and heap compost in order to reduce or eradicate the salinity of the soil.
- They rear salinity tolerant fish like bhetki, different type of shrimps, crabs, tangra, telapia etc. in the ponds.
- They have learnt to adopt to the situation of shifting monsoon and have accordingly shifted the sowing and transplanting time.

They think that in order to combat these disasters, the adoptive strategies may be:

- Cultivate salinity tolerant varieties of paddy in the fields
- Plant trees on the embankment to resist embankment breach
- Grow salinity tolerant fish in the ponds
- Grow salinity tolerant leafy vegetables in the garden
- Introduce small enterprises to increase family income however small it may be.

In order to realize all these ideas, they feel that the level of awareness of the people must be raised and some economic support in the form of loan is absolutely necessary.

Focus Group Discussion with Boatmen

The following points could be deduced in the course of discussion.

As result of climate change in the recent times, the following are happening:

- Storm
  Number of incidences of storms has reduced, but the intensity and the extent of damage have increased a lot.
- Embankment breach
  Recurrence and extent of damage have increased. Sudden rise in the level of river water is causing panic among the boatmen to take their boats out in the river.
- Temperature rise
  Although it does not have any direct bearing with their livelihood, it is impacting agriculture which in turn is increasing the price of paddy and vegetables which they have to purchase from the market.

According to them, natural calamities happening in recent times are embankment breach, flood, water spate, storm etc.

In the decade before last embankment breach, flood, water spate, storm etc. used to happen, but their intensity was less than now.
Climate change induced disasters like embankment breach, storm, water spate, salinization, high tide etc. are scaring the boatmen to take their boats to the river in order to catch fish and fingerlings, because these are happening all on a sudden. They also think that the availability of fish and fingerlings in the river has reduced due to the effects of climate change. Besides this, they also feel that fishing in trawlers is causing the fingerlings to die. This is severely affecting the livelihood of the fishermen using boats.

They receive information about impending disasters from sources like the weather reports or warnings broadcast on radio, TV and also early warnings done by the Panchayat office through public address systems.

If they get the information of an impending disaster

- They do not venture out for fishing in the river.
- They keep some dry food in stock.
- They keep a torch and a radio at hand so that they can take these along if in case of any eventuality they have to leave their homes and shift to a safer place.

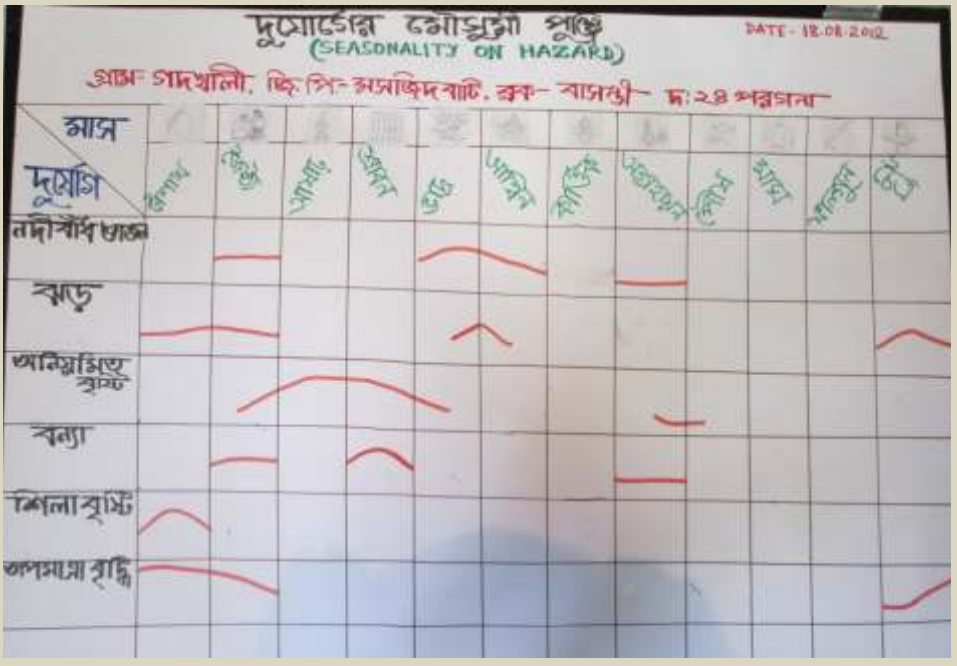
After the disaster

- They organize their homes.
- They sprinkle bleaching powder in and around their homes.

Apart from fishing in boats, they can also do some small home-based enterprises for increasing their income. These enterprises may be

- Making puffed rice
- Tailoring
- Embroidery work


দুর্যোগের ধারাবাহিক বিশ্লেষন
DATE - 17.08.12
(TREND ANALYSIS ON HAZARD)
গ্রাম- গদখালী, জি.পি- মসজিদবাটি, ব্লক- বাসন্তী, ২৪ পরগনা (দ:)
দুর্যোগের নাম
বর্তমান অবস্থা
১০বছর পূর্বে
২০ বছর পূর্বে
নদী বাঁধ ভাঙন
ঝড়
অনিয়মিত বৃষ্টিপাত
বন্যা
শিলা বৃষ্টি
অপমাত্রা বৃদ্ধি


দুর্যোগের মৌসুমী পুঞ্জ
DATE - 18.08.2012
(SEASONALITY ON HAZARD)
গ্রাম- গদখালী, জি.পি- মসজিদবাটি, ব্লক- বাসন্তী দ: ২৪ পরগনা
মাস
দুর্যোগ
বৈশাখ
জ্যৈষ্ঠ
আষাঢ়
শ্রাবণ
ভাদ্র
আশ্বিন
কার্তিক
অগ্রহায়ণ
পৌষ
মাঘ
ফাল্গুন
চৈত্র
নদী বাঁধ ভাঙন
ঝড়
অনিয়মিত বৃষ্টি
বন্যা
শিলা বৃষ্টি
অপমৃত্যু বৃদ্ধি