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Site-Level Field Appraisal for Wetland Co-management: IPAC Turag-Bangshi Site

1st Draft

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Executive Summary

1. Rapid Appraisal through PRA has been conducted to make a situational analysis of the IPAC Tuarg-Bangshi Site during April to mid June 2009, aiming at helping to shape the future activities for the improved management within IPAC Project. Specifically, the appraisals focused on identifying major stakeholders, understanding reasons for the wetlands and forest degradation and its underlying facts, identifying the challenges for the project and exploring the opportunities for its improve management. In addition to application of various tools, like trend and seasonal analysis, Venn diagramming, livelihood analysis, ranking, scoring, resource mapping etc., a series of household and group interviews, and focus group discussions were also conducted.

2. The main purpose of the present report is to present a synthesis of all findings from RRA and PRA exercises conducted by the IPAC Central Cluster Team in IPAC Tuarg-Bangshi Site during April to mid June 2009. The report also details the methodology and tools used and highlight the issues in forest management and biodiversity conservation and identify the challenges for the IPAC Tuarg-Bangshi Site. Finally the report makes suggestions on what the project, Department of Fisheries, Department of Forest and Department of Environment need to do immediately. Finally, the report puts forward set of recommendations for the improved management of the wetlands of Tuarg-Bangshi Site.

3. The project site is located in the north side of the Dhaka-Tangail high ways in Kaliakair Upazilla of Gazipur and part of Mirzapur upazila of Tangail Districts. The Bangshi and Turag rivers flow through the project area. The project area is at a distance of one and half hour road journey form Dhaka. The associated wetlands within the project area are located in 8 Unions of Kaliakair & Mirzapur Upazilla's of Gazipur and Tangail districts respectively. Within the project area, most of roads are *kacha*. During monsoon particularly in rainy days, roads are inaccessible while boat communication is very convenient. The geographical extent of the area is between 24º02 Ð N to 24º10 Ð N Latitude and 90º10 Ð E to 90º20Ð E Longitude. The annual average temperature ranges; maximum 33.3°c & minimum 12°c. Average annual rail-fall is 1274 mm.

4. Most of the area falls within the Pleistocene era landforms. The Turag-Bangshi River divided the area into two parts – south and north. Mokesh Beel is in the southern side of the Turag River and falls under Madhyapara and Mouchak Unions, Kaliakoir Upazilla.

5. In IPAC Turag-Bangshi Site area there are diversified aquatic habitats including rivers, seasonal & perennial Beels, seasonally inundated flood-lands and canals. Bangshi and Turag Rivers is the main wetland resources base in the project area. Both the river flow remains flowing for most part of the year. However, during dry season water level in the rivers goes down. Some parts of the rivers become completely dry and remain so for about a couple of months. Bangshi river receives rainwater runoff from surrounding catchments, which include the

Madhupur tracts and northern plains in Jamalpur district (April – May). The Bangshi receives also monsoon floodwater from its tributary rivers namely Jhenai and Pungli. Wet season water area is approximately 8,000 – 10,000 ha while the dry season water area is less than 1,000 ha.

6. A total of 23 Beels have been found within the proposed project area (from Guallar khal in Turag River of Kaliakoir to Fatepur Union of Mirjapur). Of the total Beels, five are seasonal and 18 are perennial. Most of the Beels are connected with one or more than one canals with river. However, many connected canals are silted up and causing drainage congestion. These canals act as the migratory route for fish between river and Beels. In addition, there are 10 other Beels (8 seasonal and 2 perennial) identified in Kanchanpur and Habla Union of Basail Upazilla (north to Mirjapur). The deep scour holes in the rivers are locally called *kum* or *doho.* 25 kums of different sizes were identified in Bangsai River from Kaliakair Bazaar point to Mirzapur bazaar point. Each of the kums was visited during boat trip information on depth; fish and fishing practices in *kum* were collected. These *kum*s are very important from fisheries point of view as these provide the critical habitat for the parent stock of fish in dry season refuge area. Fish grow in the *kums* over the entire dry season, attain maturity and repopulate the river and floodplains in the following year at the on set of monsoon. The fishermen reported there was no fishing regulation in *kums.*

7. The Turag-Banshi Rive has become merely a series of disconnect pools in dry season, instead of year-round and none of the old permanent beels retain water. Water shortages in the dry season are mainly a result of a combination of factors including deforestation in the upstream forests and riparian zones, excessive water for *Boro* rice irrigation and existence of the Farraka Dam.

8. An additional problem at this site is industrial pollution from industries on the Dhaka-Tangail Highway. This includes raw wastes from tanneries and from garments related industries. The residents of the Mokesh Beel area have identified pollution as their most pressing environmental problem. Other problems reported were reduced rice yields, dying fish, bad smells, inability to see the khals and Beels for stock watering, etc. Many permanent Beels, Khals and riverine scour holes have been lost or are in the process of disappearing due to rapid sedimentation of river, beels and khals. This is mainly due to deforestation of upland areas, loss of riparian cover, simplification of stream channels through stream canalization and flood control embankments.

9. A major problem is late dry season fishing in the deep scour holes of the Turag River. These scour holes are the only permanent water in the Turag Basin and remaining fish and other aquatic animals (including the endangered Gangeatic dolphins) seek refuge in these pools. The Turag / Bangshi are the main sources of brood stock and aquatic biodiversity in this region. Total identified fish species number is 43, some of them are very rare in local area as well as other parts of Bangladesh. The other floral and faunal diversity have not identified till date.

10. A total of 250 villages having varied degree of stakes with the project area have been identified. These villages spread over 133 Moujas. The villages belong to 8 Unions namely; Fulbaria, Chapair, Boali, Mouchak, Sreefaltali, Sutrapur, Maddyapara, and Azgona of the project area. Total project area is 341.06 Sq. Km. Total Household of 8 unions is 58,099 Nos. with population of 281,879 including 146,825 male and 135,054 female.

11. In the project area, there are 35 Non-Government High and Junior High Schools, 75 Government Primary Schools, 23 Registered Primary Schools, 43 Madrashas, more than 352 Moktabs, and 05 colleges. Out of these educational institutions, there are many kindergartens in all unions. There number is more than double of the number of Primary Schools.

12. Inhabitance of the project area consist different types of ethnic and religious groups, where the Muslims are the majority. The religious institutions within the project area are: Mosque 352 Nos., Temple 75 Nos. and Church 04 Nos. The community facilities within the project area are average comparing to the other part of the Bangladesh. There are 03 Hospitals, more than 23 Community Clinics, 185 Deep Tube Wells, and 43 Hats / Bazars.

13. Several NGOs and banks provide micro-credit to local people of the project area. About 21 NGOs involved in the project area. Bank loans are mainly given for poverty reduction and integrated rural development through creating opportunity of IGA and also as seed money for agriculture and handicraft. NGOs provide credit mainly for IGA. NGO's IGA programs concentrate on small business, fish culture, poultry, livestock rearing etc. Women's are mainly focused on NGO credit programs. It was seen that local people also take credit locally from neighbors, relatives and sometimes from Mohajons (Money Lender) etc.

14. One of the special phenomenons of the project area is having River Dolphin (*Platanista gangitica*) at the location of river's *Kum*s. These *kums* are not only providing habitat for fish, but also provide habitat for river dolphins. During field visit, IPAC field staff found dolphins in some of the scour holes. In dry season, when there is insufficient water in the river, dolphins take shelter in *kums*. During fishing in *kums* some dolphins are caught and killed by the fishers. It is reported that the fishermen catch the dolphin from *kum*s in the night for selling the oil extracted from them. The oil of dolphin is a costly item, 1 liter oil fetched about Tk. 1000. Therefore, the fishermen are very keen to catch dolphins. However, they know that catching dolphin is illegal. That is why they catch them at night. The oil of dolphin is used by the quacks (*kabiraj*) for various diseases particularly for rheumatic fever. River dolphin is one of the endangered species and the project can take up awareness program to save the dolphins in the river.

15. As per a census report of 2001, there are 6,919 households (HHs) in whole project area are involved directly fishing within project area at different location. Normally the fishers (traditional fishers) communities live close to the availability of fishing opportunities. The fisher community in the area in general found to be very poor and most of them are illiterate. They are involved in fishing from over generations. During the field visit, the team tried to identify the fisher village in the project area. Around 20 fishers, villages are identified which are dispersed in the area. The list of fisher community villages mentioned in this report regularly fish in the water-bodies within the project area. It is also learned that the fishers from distant villages like Basail, Delduar and Bhuanpur also come to this area for fishing. Notable fisher villages in the area are Nama Sutrapur, Chapair, Saturia-Sailhati, Banghata, Fatepur and Trimohani.

16. The project site is closed to semi-industrial area along Dhaka -Tangail road. Some industries are present in Kaliakair area. The Industrial effluents are continuously polluting the Beels and river water. In the dry season situation aggravates. Water of the Mokesh Beel is polluted by the industrial wastage. It is now great concerned of the community. In this regard, local people have already made appeal to the union council with copy to the concerned agencies including Prime

Minister Secretariat. At the Turag site, industrial pollution was identified by local residents as the most serious problem facing their community. Other major environmental problems that have contributed to the declining fish catch include: Lack of dry season water. Pollution, Sedimentation, Over-fishing and destructive practices, Lack of permanent water, etc. The pollution issue is being addressed through a combination of field studies to establish the nature of the pollution and plans to offer the polluting industries some technical ways to solve the problem. If these fail, legal recourse will be sought through the Department of Environment.

17. At least 3 categories of stakeholder could be recognized in IPAC Turag-Bangshi Site, such as: a) Primary stakeholder- involved with direct extraction of resources from the wetland or their activities directly affect the wetland, b) Secondary stakeholders – indirectly linked with the wetland, involved with trading or exert influences on the wetland, c) Institutional stakeholder- involved with developmental activities and administration of the adjoining areas. About 15 different primary stakeholder types, who directly extract different resources from the wetlands have been identified. Of them; fishermen, arotder, lease holder, boatman (round the year), subsidence user, sand collector are recognized as primary stakeholder. Out of 15 stakeholders: piker, boatman (only rainy season) musclemen, industrialist, local elite person, land encroacher as secondary stakeholder. Out of 15 stakeholders; RMOs & FRUGs, relevant government institutions, NGO as institutional stakeholder.

18. It may be mentioned that extrapolation of data was made based on limited data collected through RRA exercises. Now-a-day's 85-90% children go to primary school, only 70% go to High School and only 30-35% study in the colleges. Among the adult, about 45-50% are literate (above 30 years of age).

19. The major primary occupation of project area is agriculture (approx.40-50%), principally paddy cultivation, followed by day labour including (20-25%), fishermen (25-30%), small business (2-3%), service (30 - 35%), and overseas employment (5%). The PRA / RRA team members have got an idea about richness and poverty level of the project area which are; about 7-10% people of the area are rich, 20-25% is middle class and 40-50% is poor and 10-15% is very poor. Unemployment is another severe problem that puts pressure on over exploitation of wetland resources. In the project area, on an average, about 10-15% people are unemployed. Among the villagers, about 5-7% people are unemployed. In average, about 15% local surrounding people are unemployed. However, there is a strong seasonal trend in unemployment level in the area. Unemployment is a major concern/problem in the area. According to the local people, the number of unemployed people increases during dry season.

20. Problem ranking exercise was performed to identify and understand the local level problems and its causal factors. The major problems, according to the magnitude, are pollution, poverty, unemployment, road communication, electricity, drinking water, etc. A collation of problem rankings carried out during the PRA showed that poverty is cause for the use of wetland.

21. During MACH Project period a number of development activities implemented successfully. 49 RUG formed and their group saving is Tk. 2106,012. A total of 253 trainings conducted where 4,494 community members participated. These trainings programs include group management, leadership development, resource awareness, accounts keeping, and skill development training of different AIG trades. Under different types of awareness raising program 425 events conducted where nearly 43,000 people participated from different stakeholders' level. MACH also worked in sanitation, health care and other social activities. Under these activities 75 tube wells, 396 pit latrines, 932 pieces warm cloths distributed among the beneficiaries. Total 35 adult literacy courses conducted for the beneficiaries. Several agricultural and fisheries demonstration activities like pond fish culture, vegetable cultivation, plant nursery, maize cultivation etc. implemented that benefited poor stakeholders significantly. Under resource management activities a note worthy development achieved through RMOs formed. A total of 12 threatened fish species stocked in different water bodies. The total number of fingerling stocked is 213,700. 151,310 saplings planted in different areas of project site. 23 number of fish sanctuary established with tetra-pod, hexapod and RCC pipe. Out of 23; 7 are in river and 16 are in different Beels. These sanctuaries are well maintained by concerned RMOs.

22. Threats prevailing in the project as identified are: industrial pollution in Turag and associated water areas: siltation of different Beels and canals causing discontinuation of normal water flow; industrial and urban encroachment that squeezing water area, deforestation practices living several lands patches barren and excessive use of insecticides / pesticides in agricultural field resulting fisheries degradation. Besides, common irrigation practice, use of destructive fishing gears, over exploitation of resources is impacting negatively on wetland fisheries and biodiversity.
Among the identified threats industrial pollution is severe. A total number of 266 different kind of small to large scale industries situated around the project site. Most of these industries are ignoring environment law and discharging fatal pollutants like chromium, lead, dyes, zinc, and industrial sludge in Turag and associated Beels and canals and even in crop lands. The intensity of industrial pollution is so high that people are suffering from pollutant borne like diseases like skin disease, cancers, etc. Many crop lands became unfertile. Aquatic biodiversity and fisheries depletion trend is very first. This pollution issue must have to be address through IPAC immediately.

23. Challenges for future IPAC activities as identified are: result oriented actions against industrial pollution, prohibiting use of destructive fishing gears through fish act, aforestation program of barren lands and hillocks (commonly known as "Tag"), reducing local poverty and unemployment, and establish co-management raisings for biodiversity conservation.

24. A large number of people visit the project area. If infrastructures are developed this will attract more visitors and ecotourism could be planned accordingly. Also security of tourist must be ensured. A number of private picnic spots situated within the project area. There is good scope of developing Eco-Tourism in this site through IPAC. Development of extension materials, easy transportation facility from Dhaka, eco-cottage and other living facilities, introduction of tourist vehicle, handicraft of forest resource, tourist shop, eco-guide, etc can be introduced.

25. Attempts should be made to bring the local elites on board with the concept of wetland protection. In particular, the project needs to consult local public representatives, including local Chairmen and Members of Upazila / Union Parisad and MP, and involve them, at least in advisory role. The project should also work with existing local community organizations identified under the appraisals. Awareness raising activities should be carried out on a priority basis in the area to make the people understand how they would get benefit from this project. It is felt that the illegal resource users get shelter from local authorities hence strong dialogue should be initiated among them involving the higher authority. A similar approach may be taken with local community based organizations to ensure the effective involvement of them. Awareness campaign groups at local level can be developed by involving Boys Scouts, BNCC, School / College students who will conduct street drama; pot songs on sustainable use of wetlands / forest resources.

26. Finally it can be said that, to revive the natural wetland resources as well as fisheries resources of Turag and Bongshi River would be the most prior challenge for IPAC. These can be achieved by bringing down the rate of dependency of the local people on natural resources. To achieve these challenges, introduction of Alternative Livelihood Activities (AIGA) is very much important. The future action plan of IPAC needs to be centered with this message in thinking.

Acronyms

Acronym	Detailed name
ACF	Assistant Conservator of Forest
ADB	Asian Development Bank
ADRA	Advantage Development And Relief Agency
AIGA	Alternate Income Generating Activities
ASA	Association for Social Advancement
ASPADA	Agroforesty Seed Production And Development Association
BASA	Bangladesh Association of Social Alliance
BCAS	Bangladesh Centre for Advance Studies
BDR	Bangladesh Rifles
BELA	Bangladesh Environmental Lawyers Association
BNCC	Bangladesh National Cadet Core
BO	Beat Office / Beat Officer
BRAC	Bangladesh Rural advancement Committee
BRDB	Bangladesh Rural Development Board
BREB	Bangladesh Rural Electrification Board
BWDB	Bangladesh Water Development Board
CAP	Center for Advancement Program
CBO	Community based Organization
CBSDP	Charge of Bangladesh Social Development Program
CMC	Co-management Committee
CNRS	Center for Natural Resource Studies
CODEC	Community Development Centre
Dept.	Department
DF	Damien Foundation
DFO	Divisional Forest Officer
DoF	Department of Fisheries / Director of Fisheries
DoE	Department of Environment
DHHS	Department of Health and Human Service
EPA	Environmental Protection Agency
e.g.	Example
etc.	Etcetera
FD	Forest Department
FG	Forest Guard
FGD	Focus Group Discussion
Fig.	Figure
FRMP	Forest Resource Management Plan
FRUG	Federation of Resource User Group
FSP	Forestry Sector Project
GD	Group Discussion
GI	General Interview
GIS	Geographical Information System

Acronym	Detailed name
GO	Government Office
GoB	Government of Bangladesh
Govt.	Government
HHs	Households
HYV	High Yielding Varity
hr.	Hour
IGA	Income generating Activities
Int.	Interview
Intr.	International
IPAC	Integrated Protected Area Co-management
IRG	International Resource Group
ISH	Institutional Stake Holder
kg	Kilogram
KI	Key Informant Interview
LGED	Local Government Engineering Department
MACH	Management of Aquatic Ecosystem through Community Husbandry
Mat.	Material
MCC	Mennonite Central Committee
MoEF	Ministry of Environment And Forestry
MoFL	Ministry of Fishery And Livestock
MP	Member of Parliament
NACOM	Nature Conservation Management
NFE	Non Formal Education
NGO	Non Government Organization
Nos.	Numbers
NP	National Park
NSP	Nishorgo Support Project
NTFP	Non Timber Forest Product
OSHA	Occupational Safety and Health Administration
PA	Protected Area
PDB	Power Development Board
PIDIM	A Bengali named, microfinance organization
PRA	Participatory Rural Appraisal
PSH	Primary Stake Holder
RDRS	Rangpur Dinajpur Rural Service
RDS	Rural Development Sangstha
RDSM	Rural Development Social Mobilization
RMG	Ready Made Garments
RMO	Resource Management Organization
RF	Reserve Forest
RO	Range Office / Range Officer
RRA	Rapid Rural Appraisal
SF	Social Forestry
SH	Stakeholder
SME	Small Medium Enterprise

Acronym	Detailed name
SRVE	Society Relation and Vocational Education
SSH	Secondary Stake Holder
SS	Samajik-Seba Songoton (a Bengali name)
SSS	Society for Social Services
TMSS	Tengamara Mahila Samobay Somity
UP	Union Parishad / Upzilla Parishad
USAID	United States Assistant for International Development
VOST	Voluntary Organization for Social Development

1. Introduction

1.1 Project Background

The US government funding agency USAID financed two separate project namely: MACH (Management of Aquatic Ecosystem through Community Husbandry) and NISHORGO respectively with the GoB agency; The Department of Fisheries and Forest Department. The carryover of these two projects will be mainstreamed through Integrated Protected Area Co-management (IPAC) project.

This project follows the successful completion of the MACH Project funded by USAID from 1998 – 2008, to support the Department of Fisheries and local stakeholders in the management of Aquatic Ecosystem through Community Husbandry (MACH). IPAC also continues support provided to the Forest Department Nishorgo Program aimed at promotion the co-management of forest protected areas.

Collaborative management, or co-management, is an approach used by government technical agencies to collaborate with local communities and other stakeholders in the management of designated natural resources like forest, wetlands etc. To implement a co-management approach, managers engage these local stakeholders through a participatory process that empowers them with a voice and well defined role in decision-making and provides sufficient economic incentives to engage their interest and commitment to the successful achievement of the agreed upon natural resource management objectives.

IPAC is being implemented through the Ministry of Environment and Forest (MoEF), and Ministry of Fisheries and Livestock (MoFL). The primary technical implementing agencies of the Government of Bangladesh are the Forest Department (FD), the Department of Fisheries (DoF) and Department of Environment (DoE).

The principal targeted beneficiaries of IPAC are the men, women and youth of poor rural households living within the landscapes around the targeted protected areas. However, the successful implementation of IPAC will generate benefits for the entire country over the medium and long term.

IPAC is also designed to communicate with and to support the development of a wide range of constituencies with a stake in conservation of natural resources as well as those in a key position of influencing decisions about the use and management of natural resources. This includes political and opinion leaders, religious leaders, university students, journalists, scouts and other youth program participants, tourists and other visitors to protected areas, environmental and conservation organizations as well as corporate leaders and private sector partners.

IPAC project mobilization began in June, 2008, and the project is being launched in November, 2008. IPAC will be implemented over a period of five years, and is schedule to end in June, 2013.

Bangladesh is rich in natural resources especially water and soils. Its freshwater wetlands are among world's most important, harboring hundreds of fish, plants and wildlife and providing a critical habitat for thousands of migratory birds. The productivity of this valuable wetlands has come under increasing pressure as the human population has spiraled, and as forest clearance, drainage for agricultural development and the construction of flood embankments in tandem with over exploitation and pollution has decimated fish stock and other aquatic life, including edible plants harvested by the poor. The consequences have been devastating for millions of fishing households.

"Saving Bangladesh's forest for future Generation" is the principal slogan of Forest Department Nishorgo Program. In recent years Bangladesh's forest have also came under relentless human

pressure as its population grows and forest land are converted To Whom It May Concern: agriculture and other land issues. As a result, Bangladesh now has one of the smallest areas and protected and intact forest in the world, and many rural livelihoods that are depended on the continued existence of forests are threatened.

In order to secure these natural resource-based livelihood while improving the socio-economic well-being of rural communities and protection these valuable natural resources and the associated with natural beauty of Bangladesh's wetlands and forests, USAID / Bangladesh is pleased to extend its support to the government of Bangladesh as well as the people of Bangladesh.

1. 2 Information Needs of IPAC Turag-Bangshi Site and Logical Basis for Conducting PRA / RRA

For any project either development or research based, information are required for designing and planning project interventions, setting implementation strategies, evaluation and monitoring of project performance and impacts. Information at the initial stages of the project thus helps the project in carrying out its activities effectively and efficiently.

Turag-Bangshi is an existing site of Integrated Protected Area Co-management (IPAC) site. This site is situated in two Upazillas namely; Kaliakoir and Mirzapur. Kaliakoir is under Gazipur District, Dhaka Division. Mirzapur Upazilla is under Tanjail District, Dhaka Division. For successful implementation of identified interventions in this site, it will concentrate on collection of relevant information by using appropriate methodology. Therefore, it was necessary to carefully scrutinize the information needs and determine its relevance to the project objectives and activities. Wet season water area is approximately 8,000 – 10,000 ha while the dry season water area is less than 1,000 ha. The geographical extent of the area is between 24^{o}02 ÐN to 24^{o}10 Ð N Latitude and 90^{o}10 Ð E to 90^{o}20Ð E Longitude.
The generation of information, in principle, is guided by project objectives and goals. The IPAC Turag-Bangshi Site is particularly concerned with the establishment of co-management mechanism of forest resources in one hand and developing a prescription for the technical management of its resources, on the other hand. Therefore, generation of information is thus centered on the characterization of local community (stakeholders) likely to be involved with the project and local resources that are to be managed.

- **Co-management** ----- stakeholders and their activities, socio-economics, behavior, community power structure, their needs and expectations, conflict, challenges etc.
- **Resource management** ---- resources and its status, trend and causes for resource degradation, resource exploitation, threats to local resources and biodiversity

This preliminary assessment of information needs for IPAC Turag-Bangshi Site through scooping exercises provided precursors for brainstorming for identifying specific information needs that will be collected through subsequent appraisals. It was thought that at the initial stage of the project a rapid appraisal would be very appropriate in terms of cost effectiveness, usefulness, reliability, and overcoming time constraints.

Rapid Rural Appraisal (RRA) / Participatory Rural Appraisal (PRA) are packages of methods and tools for collection of qualitative information about local people, their life, environment, resources within the landscape, activities and living conditions in a short time. The purpose is to utilize knowledge of the local people in designing and setting implementation strategies of a project / program and / or to monitor and evaluate project performances and impact. It is also considered as a process for involving local people in the project planning and / or implementation and monitoring. In fact, RRA / PRA is thus considered as an integral part in down-top planning process in many development or resource conservation projects.

RRA was carried out as an initial activity in the field with primary focus on stakeholder assessment and also equally intended for generating information that will help to get a sense of range of key issues and challenges that need to be addressed and be better informed on the context (social, economic, ecological) in which the project is likely to intervene.

Built upon the outcome of the RRA, subsequently PRA was planned to collect in depth information on the identified issues and to ensure greater participation of local people in information collection.

1. 3 Purpose of the Report

The main purpose of the present report is to present a synthesis of all findings from RRA and PRA exercises conducted by the IPAC central Cluster Team in IPAC Tugar-Bangshi Site during April-June, 2009. The report also details the methodology and tools used and highlight the issues in forest management and biodiversity conservation and identify the challenges for the IPAC Turag-Bangshi Site. Finally the report makes suggestions on what the project, Department of Fisheries, Department of Forest and Department of Environment need to do immediately. Finally, the report puts forward set of recommendations for the improved management of the forest of Turag-Bangshi Site, by which IPAC Project will run successfully of a continuous process of MACH Project's activities.

1.4 Outline of the Report

The site level appraisal report, at first, provides an executive summary which summarizes the entire ranges of the findings, methods used, issues and challenges identified during PRA. The report starts with general introduction in **Chapter 1** that includes the background information of the project, information needs of IPAC Turag-Bangshi Site and logical basis for conducting PRA / RRA, the purpose of the report etc.

A brief description of the site is provided with a site map in **Chapter 2**.

Chapter 3 sets out the methodology of the study that deals with the approach taken for the implementation of the fieldwork of RRA and PRA, study team and study period, objectives and methodology of the study. The chapter also includes study period, setting RRA and PRA issues and questions, formation of RRA and PRA field teams, selection of RRA and PRA spots, choice of RRA and PRA methods and tools and the limitation of the field work.

Outcomes of the RRA and PRA exercises are described in **chapter 4** which contain major findings and analyses. The findings are mainly presented as situational analysis of the forest resources, stakeholder analysis, resource and resource extraction, trend analysis, socio-economical situation of the surrounding area, seasonal trends in resource extraction, etc. In short, this chapter reflects the current status of the forest dynamics with social dynamics. The achievements of MACH Project has included in this chapter.

Chapter 5 presents issues and challenges for IPAC Turag-Bangshi Site, an extended section based on PRA / RRA outcomes, identifying present issues of concern and challenges for IPAC Project and highlights the opportunities for the project.

The final **Chapter 6** embodies a set of suggestions and recommendations regarding the implementation of the project. At last a number of necessary references of all documents consulted and photographs are appended as annexure with the report.

2. Description of the Project Area

2.1 Location:

The project site is located in the north side of the Dhaka-Tangail high ways in Kaliakair and Mirzapur Upazilla of Gazipur and Tangail Districts. The Bangshi and Turag rivers flow through the project area. The project area is at a distance of one-hour road journey form Dhaka. The associated wetlands within the project area are located in 8 Unions of Kaliakair & Mirzapur Upazilla's under Tangail and Gazipur districts. Within the project area, most of roads are *kacha*. During the monsoon particularly in rainy days, roads are inaccessible while boat communication is very convenient in the areas. The geographical extent of the area is between 24°02 Ð N to 24°10 Ð N Latitude and 90°10 Ð E to 90°20Ð E Longitude.

2.2 Historic background of the area:

Most of the area falls within the Pleistocene era landforms known as the Madhupur Tract. The Turag-Bangshi River divided the area into two parts – south and north. Mokesh Beel is in the southern side of the Turag River and falls under Madhyapara and Mouchak Unions, Kaliakoir Upazilla.

2.3 Aquatic Habitats

In Bangshi-Turag project area there are diversified aquatic habitats including rivers, seasonal & perennial Beels, seasonally inundated flood-lands and canals. Local people reported that so far no step has been taken to develop wetland resources. However, little attention was made to keep the canals active, about 4-5 years back Narandra canal (link canal between Ujan Beel and Turag River) was re-excavated under local initiative with the assistance from the concerned UP.

Wet season water area is approximately 8,000 – 10,000 ha while the dry season water area is less than 1,000 ha. The annual average temperature ranges; maximum 33.3°c & minimum 12°c. Average annual rail-fall is 1274 mm.

2.3.1 Rivers

Bangshi and Turag Rivers is the main aquatic resources base in the project area. Both the rivers are flowing for most part of the year. However, in the dry season water level in the rivers goes down. Some parts of the rivers become completely dry and remain so for about a couple of months. Bangshi river receives rainwater runoff from surrounding catchments, which include the Madhupur tracts and northern plains in Jamalpur district (April – May). The Bangshi receives also monsoon floodwater from its tributary rivers namely Jhenai and Pungli.

Variable information was obtained about tidal effects in the river. Some people mentioned that it is a recent phenomenon- they observed tidal influence over the last 6-7 years. Some people mentioned that they observed the tides in the river over the last 10-12 years in the dry season. Other people said that a tidal effect in the river is an old phenomenon (about 25/30 years) when many people did not feel the effect due to higher water flow in the river. Now the tide is distinctly visible in the dry season due to very low flow of water. They also mentioned that the tides come from Sitalakha and Buriganga River lies at the south of Turag. More information and data would be collected while participatory problem census and planning exercise to be done at the community level. Data need to be collected to know the details of tidal influence in the river. In dry season, framers use water for winter crops irrigation mainly *Boro* (HYV). Local people told that since last 10-12 years navigation in the river becomes disrupted in the dry season (March - April) as some points dried due to shortage of water.

Scour Holes:

The deep scour holes in the rivers are locally called *kum* or *doho*. 25 kums of different sizes were identified in Bangsai River from Kaliakair Bazaar point to Mirzapur bazaar point. Each of the kums was visited during boat trip information on depth; fish and fishing practices in *kum* were collected. The size of the *kum*s is roughly determined. Depth of *kum*s was taken with bamboo pole. However, more information would be collected using GIS technology. These *kum*s are very important from the fisheries, point of view as these provide the critical habitat for the parent stock of fish in dry season refuge area. Fish grow in the *kums* over the entire dry season, attain maturity and repopulate the river and floodplains in the following year at the on set of monsoon. The fishermen reported there was no fishing regulation in *kums.*

2.3.2 Beel, Floodplain and Canals

A total of 23 Beels have been found within the proposed project area (from Guallar khal in Turag River of Kaliakoir to Fatepur Union of Mirjapur). Of the total Beels, five are seasonal and 18 are perennial. Most of the Beels are connected with one or more than one canals with river. However, many connected canals are silted up and causing drainage congestion. These canals act as the migratory route for fish between river and Beels. In addition, there are 10 other Beels (8 seasonal and 2 perennial) identified in Kanchanpur and Habla Union of Basail Upazilla (north to Mirjapur).

2.3.3 Some Potential Beels for the Project

Mokesh Beel: Mokesh is a perennial Beel located at the West Side of Turag River in Mouchak union of Kaliakair Thana. In monsoon, the area of this Beel is around 800 acre and in dry season, it is 20 acre. About are 5.75 acres land has in the Beel. The Beel is surrounded by several villages namely Taltoli, Baraibari, Saturia -Solahati, Saturia challa, Laskarchalla, Mazukhan, Ratanpur, Kouchakuri, Matikata, Sinabahor. The water of this Beel is polluted by the industrial wastage. In the past, all indigenous fish species was available in the Beel. At present diversity of fish species is reduced in the Beel. One of the causes mentioned by the people is water pollution due to accumulation of industrial effluents from Safipur area. The local people mentioned that they get bad smell from fish in the dry season. Therefore, the local peoples never purchase the fish of this Beel. The Beel connected with Turak River by Saturia-Solahati canal. The length of the canal is about 1km. The canal is partially silted up. To enhance wetland productivity as well as to increase bio-diversity, the people suggested for rehabilitation of the canal, for establishing Beel sanctuary.

Kaliadaha Beel: Kaliadaha Beel is a perennial Beel covering an area of 50 acre in monsoon and 10 acre in dry season. It is located on the northwest of Mokosh Beel in Mouchak union of Kaliakair Thana. As learned, there is has no land in this Beel. The village Taltoli and Bastoli are adjacent to the Beel. This Beel is also linked with the Turag River through Saturia-Solahati canal. In -late canal links between Turag and Kalidaha Beel already closed by local elite for seasonal fish culture. This type of fish culture practice started in that area since 1993.

Kamlai Beel: Kamalai is a perennial Beel. In monsoon, area of the Beel is 50 acre and in dry season, area becomes 8 acres only. There is has no land in the Beel. It is located in Maddyapara union of Kaliakair Thana. The village Gupinpur and Saturia Solahati are adjacent to the Beel. A small canal (Kamlai Beelar canal) connected the Beel with Turag River through Saturia - Solahati canal. Length of the canal is .5 Km. the canal is partially silted.

Ukai Beel: It is a perennial Beel. The area of the Beel is 25 acre in monsoon and 10 acre in dry season. It is located in Maddyapara union of Kaliakair Thana. Local small fish is available in the Beel. There was land but, now landless people get the possesional rights. Ukai Beel connects with the Khunai Beel by Ukai canal. Now the khal is silted up.

Khunai Beel: Khunai is a seasonal Beel. The area of the Beel is 125 acre in wet season. Has no land present. It is located in Maddyapara union of Kaliakair Thana. The village Golachipa, Oliar challa covered the total Beel area. The Beel is connected with Turag River through Golachipa canal. Length of the canal is .5 Km. the canal is partially silted.

Ujan Beel: Ujan is a perennial Beel. The area of the Beel is 150 acre in monsoon and 50 acre in dry season. No khas land. It is located in Boali union of Kaliakair Thana of Gazipur district. The Beel connected with the Turag River through dakurail and Narandra/ Boali canal. The length of the canal is 2 km. Most part of the canal is silted up. The village dakurail, Golaia and Piprashit are adjacent to the Beel.

Aola Beel: It is the biggest Beel within the Bansai-Turag MACH project area. The area of the Beel is around 1200 acres. It is located in two unions namely Chapair and Ajgana of Kaliakair and Mirzapur thana respectively. Out of the total area only 20-25 acres of land is has. It is a perennial Beel. The Beel fisheries are managed by the community. Traditional fishermen and community people have easy access in the Beel. The Beel was connected with the rivers Turag and Bangsai. At present only one connection with the river Turag through Nikni khal. The bed of khal is raised. The landowner of nearby the khal encroached. There are 26 fishers families live in Medi village. Now a day, some Muslim families also take fishing as their livelihood. As a result fishing pressure in Aola Beel increased. In the dry season a large area of land used irrigation water from this Beel.

The UP Chairman has a plan to construct a new road passing through the Aola Beel. The then Upazila Chairman opposed it and he suggested for improving the existing road. On this issue, there is social conflict in the community.

2.4 Lack of dry season water:

The Turag-Banshi Rive has become merely a series of disconnect pools in the dry season, instead of year-round and none of the old permanent beels retain water. Water shortages in the dry season are mainly a result of a combination of factors including deforestation in the upstream forests and riparian zones, excessive water for *Boro* rice irrigation and existence of the Farraka Dam.

2.5 Pollution:

An additional problem at this site is industrial pollution from industries on the Dhaka-Tangail Highway. This includes raw wastes from tanneries and from garments related industries. The residents of the Mokesh Beel area have identified pollution as their most pressing environmental problem. Other problems reported were reduced rice yields, dying fish, bad smells, inability to see the khals and Beels for stock watering, etc.

2.6 Sedimentation:

Many permanent beels, Khals and riverine scour holes have been lost or are in the process of disappearing due to rapid sedimentation of river, beels and khals. This is mainly due to deforestation of upland areas, loss of riparian cover, simplification of stream channels through stream channelization and flood control embankments.

2.7 Over-fishing and destructive practices:

A major problem is late dry season fishing in the deep scour holes of the Turag River. These scour holes are the only permanent water in the Turag Basin and remaining fish and other aquatic animals (including the endangered Gangeatic dolphins) seek refuge in these pools. The Turag / Bangshi are the main sources of brood stock and aquatic biodiversity in this region.

2.8 Flora and Fauna:

Total identified fish species number is 43, some of them are very rare in local area as well as other parts of Bangladesh. The other floral and faunal diversity have not identified till date.

Fig. 1: IPAC Turag-Bangshi Site

Fig. 2: IPAC Turag-Bangshi Site (Arial photograh)

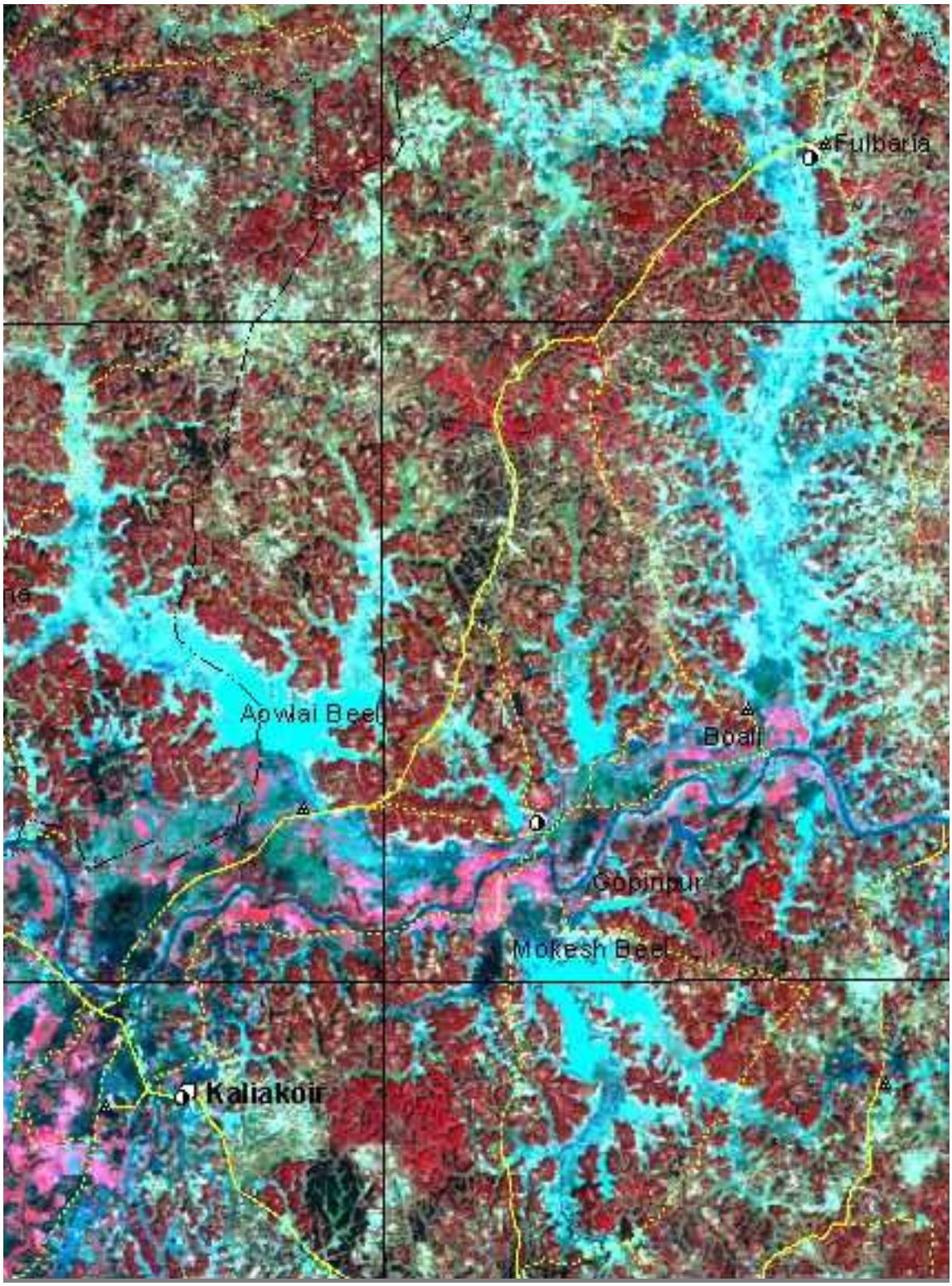


Fig. 3: Social Map of Fulbaria Union Parisad

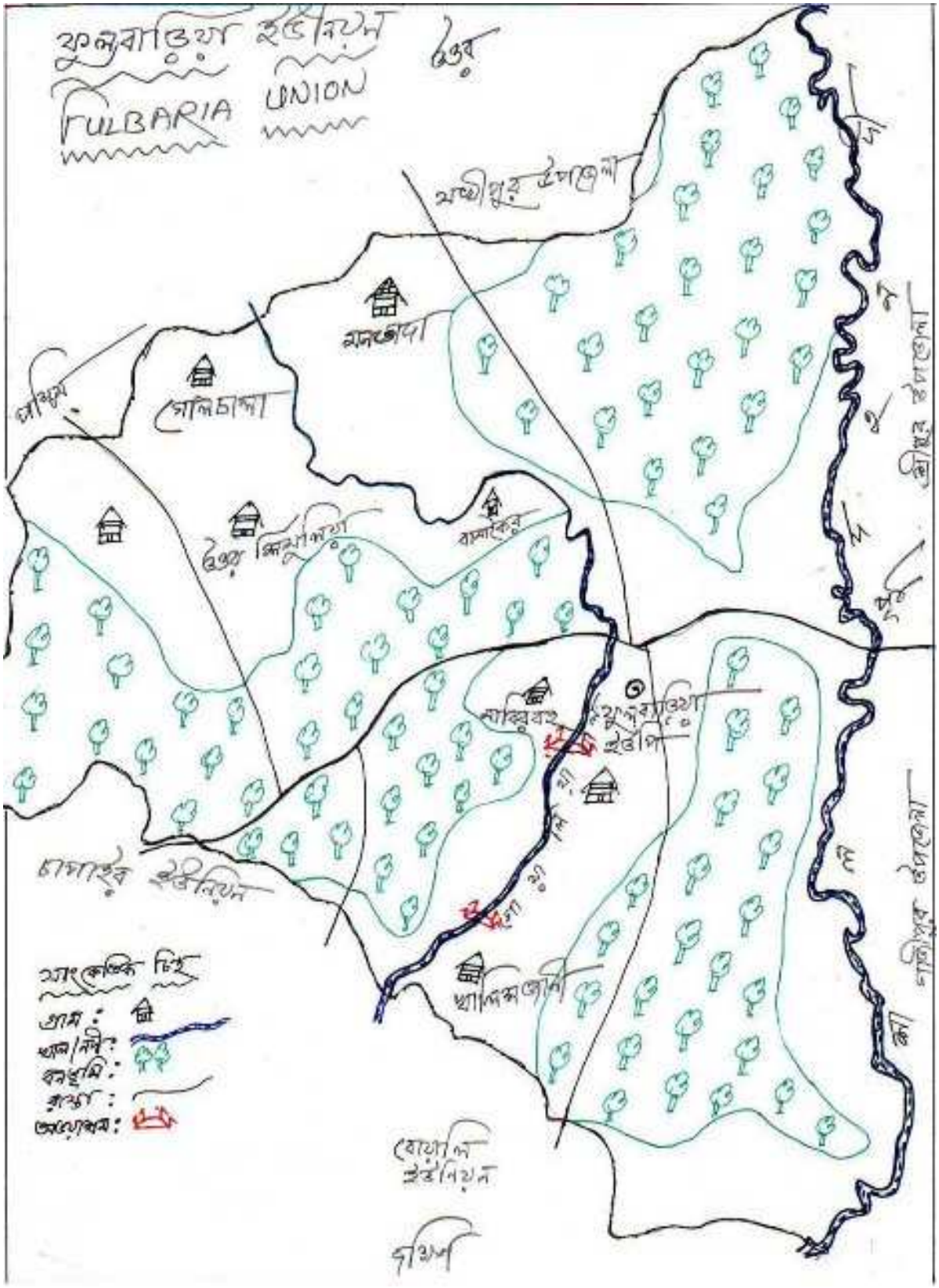


Fig. 4: Social Map of Chapair Union Parisad

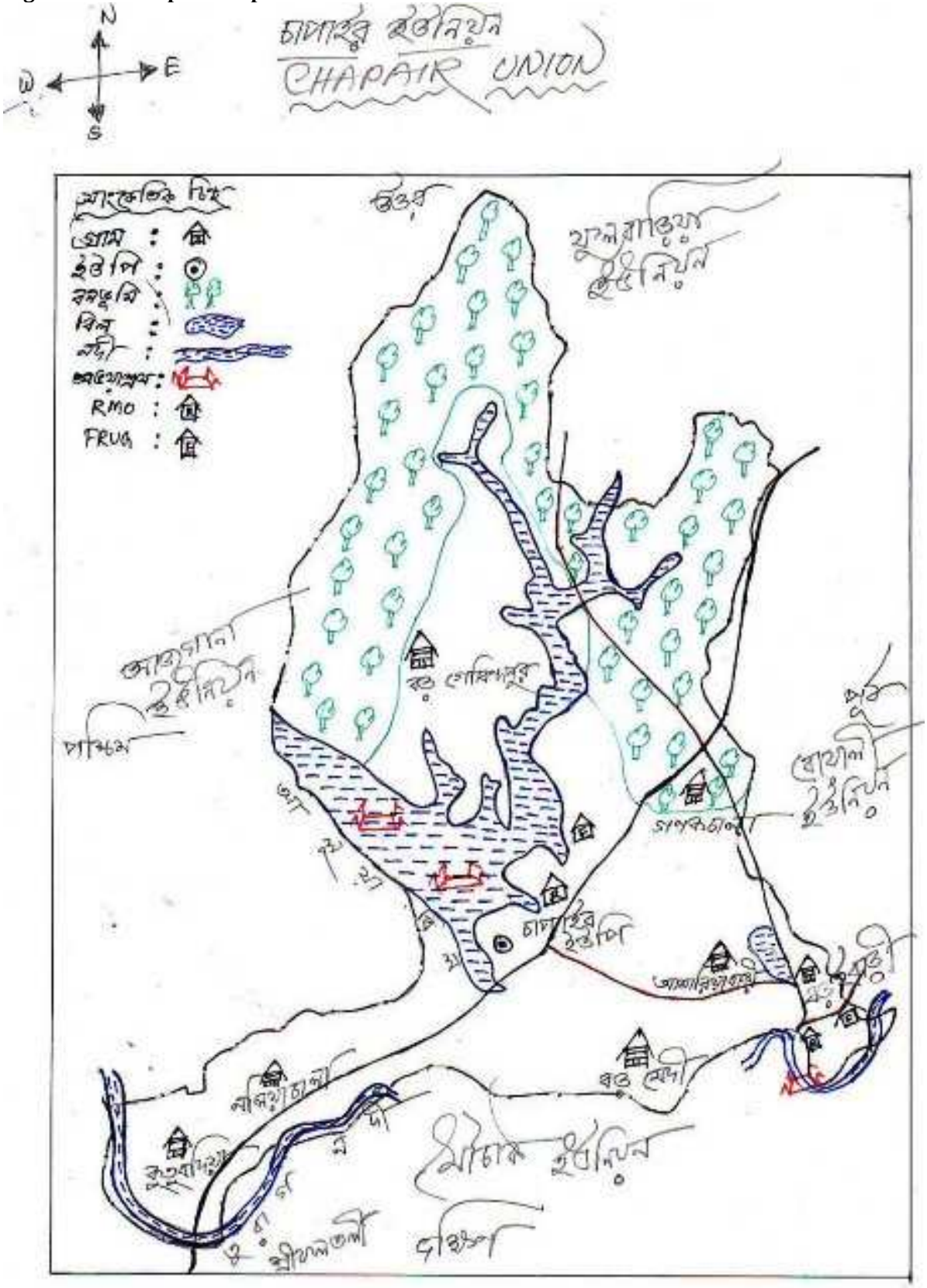


Fig. 5: Social Map of Boali Union Parisad

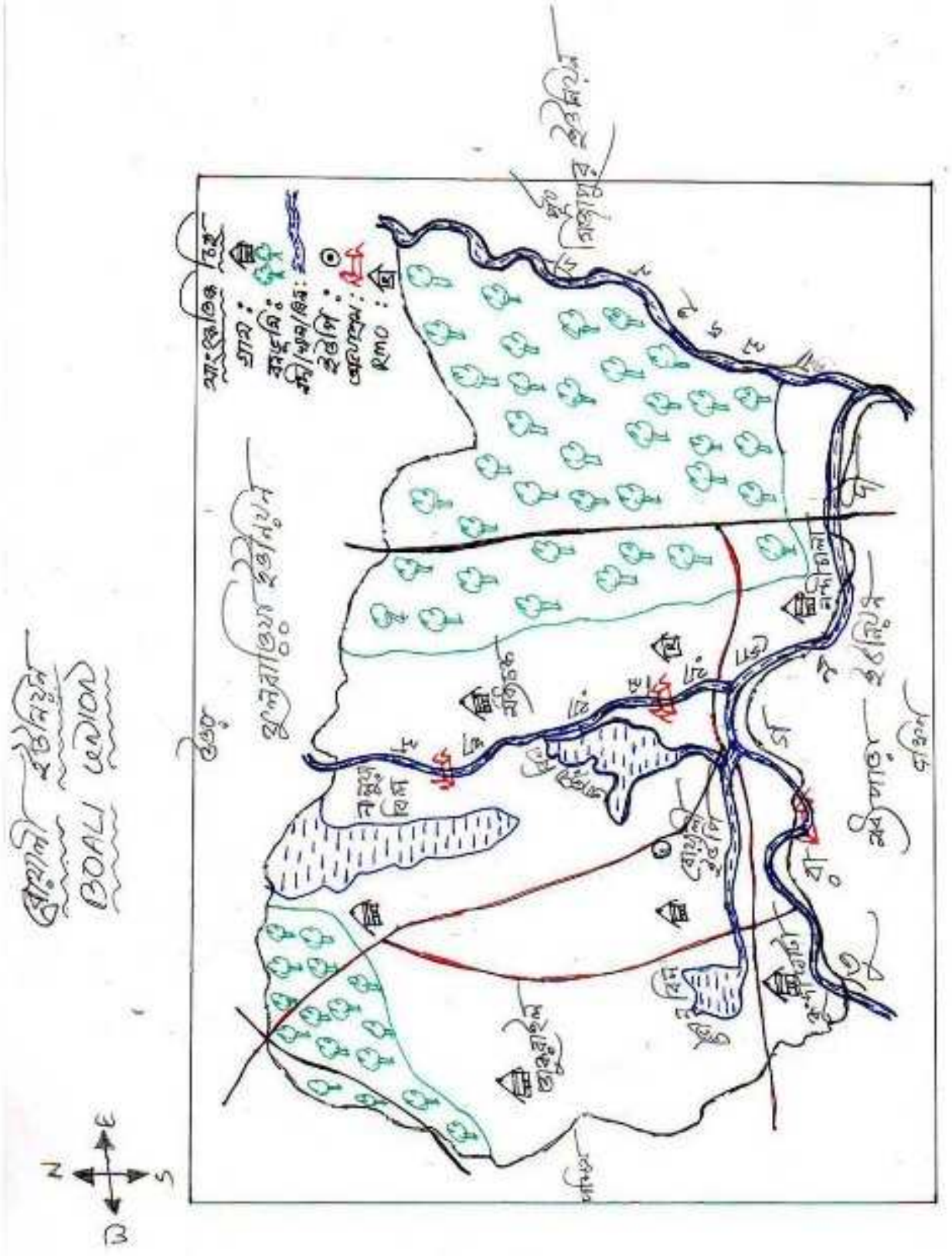


Fig. 6 : Social Map of Mouchak Union Parisad

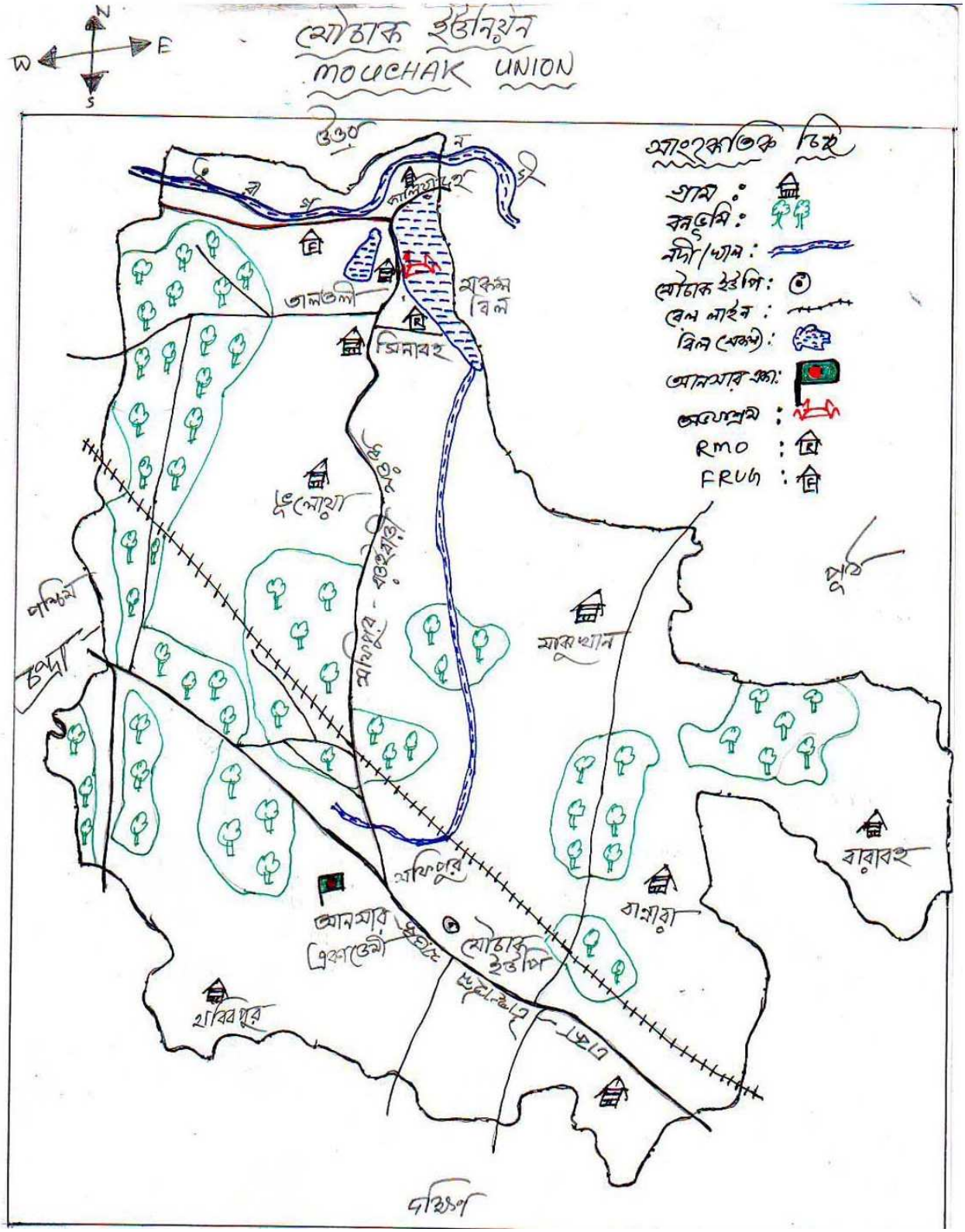


Fig. 7 : Social Map of Sreefaltali Union Parisad

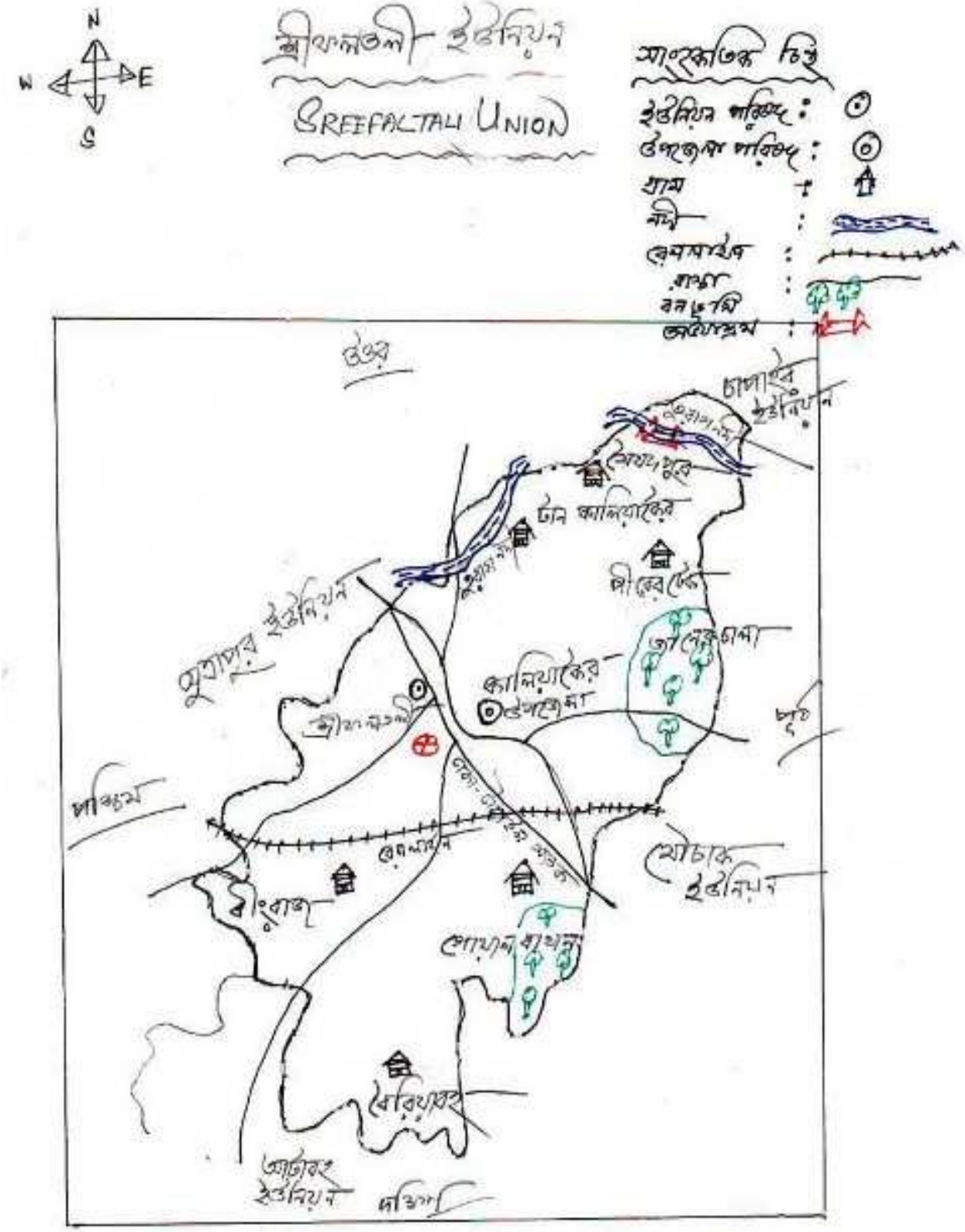


Fig. 8 : Social Map of Sutrapur Union Parisad

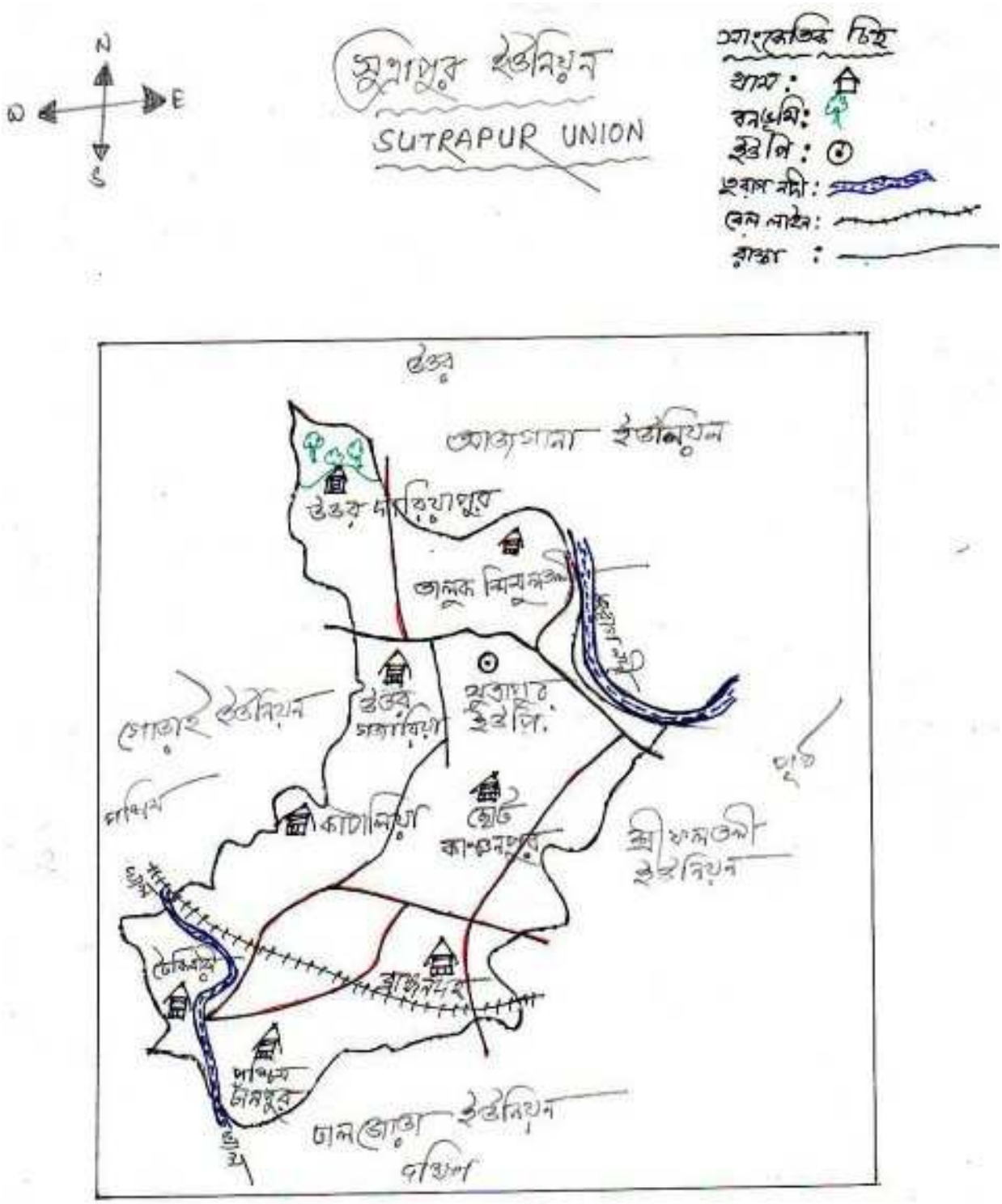


Fig. 9 : Social Map of Maddhapara Union Parisad

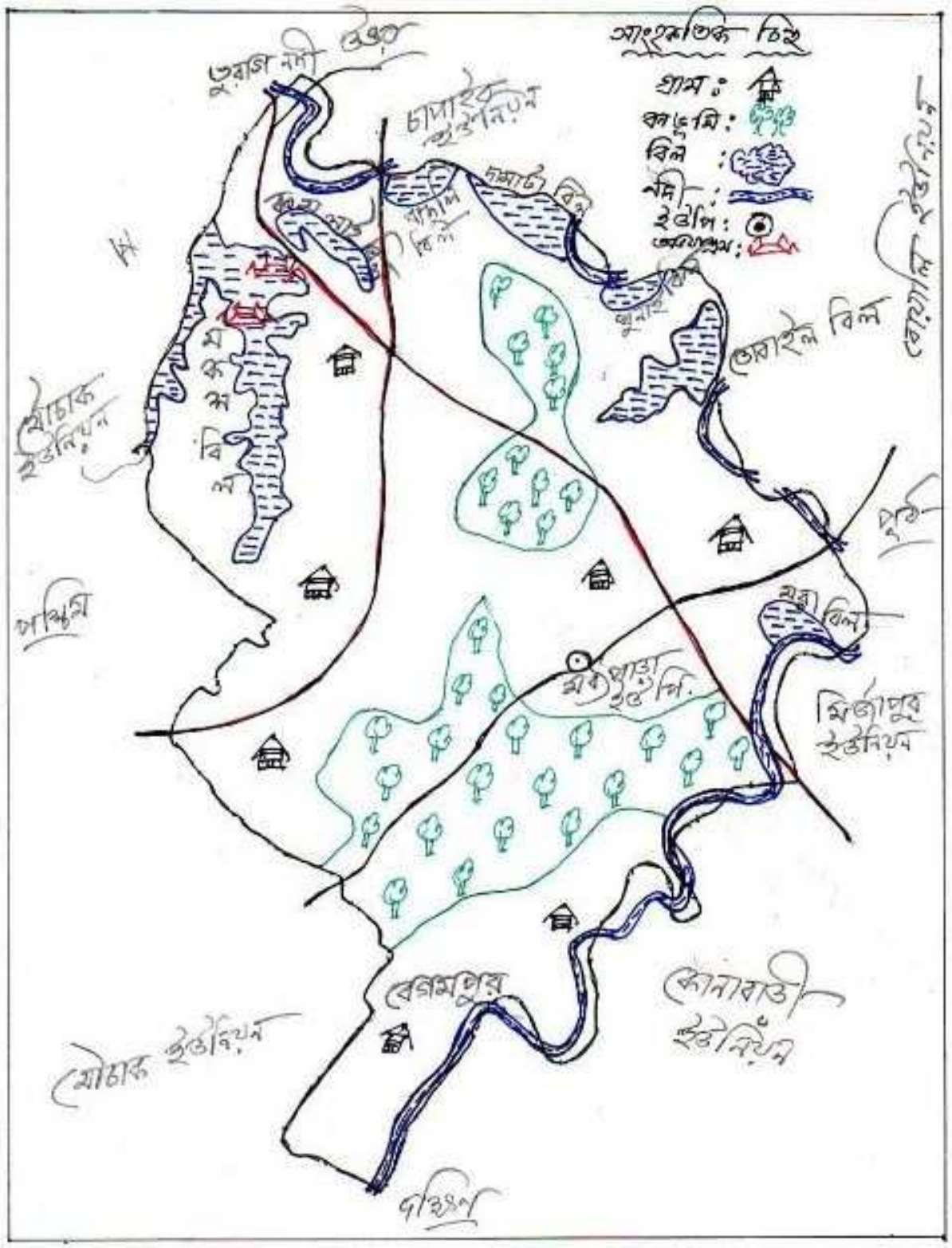
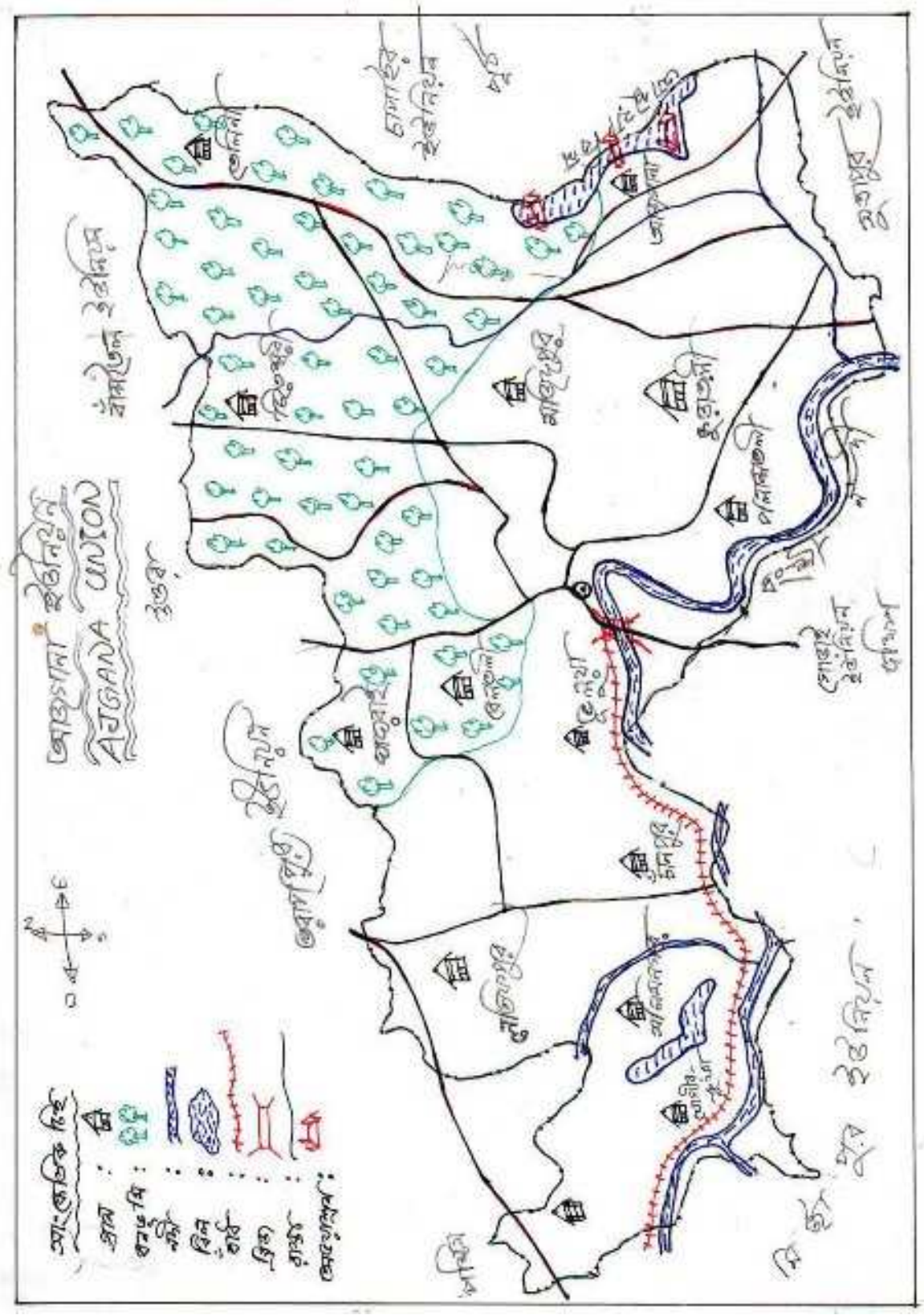


Fig. 10 : Social Map of Ajgana Union Parisad



3. **Methodology**

As mentioned in the preceding section a two-step rapid appraisal strategy has been conducted. RRA was conducted in the initial stage during the appraisal process, followed by PRA. RRA was carried out as an initial activity in the field with a primary focus on generating information that would help to get a sense of the range of stakeholders, key issues and challenges that need to be addressed and provide information on various context (social, economic, ecological, etc) in which the project will operate. Built upon the outcome of the RRA, a subsequent PRA exercise collected in-depth information on the identified issues and was designed to ensure greater participation of local people in information collection.

The overall purpose of the RRA and PRA was to come up with a comprehensive situational analysis of the IPAC Turag-Bangshi Site with a view to understand:

- Who destroys the wetland and forest & why?
- How the wetland and forest being destroyed?
- What are the underlying driving forces for wetland and forest degradation?
- Livelihood and behavior of local people;
- Opportunities for improvement in wetland and forest management;
- How IPAC can be involved in the process?

3.1 Developing the RRA and PRA: Issues and Methods

An interactive and consultative planning workshop was organized on 23rd and 24th April 2009 at IPAC Turag-Bangshi Site Office, Turag-Bangshi to identify, prioritize and finalize the RRA issues and questions. The type and nature of issues, the research team's accessibility and mobility in the area, the behavior of local people and their rapport with the field staff were all taken into consideration in the design of these methods and tools. The workshop was attended by specialists and representatives from IPAC team; field implementation partners (RDRS) and local DoE, DoF & FD staff, who were likely to be involved in the RRA field exercise. This workshop provided an opportunity to prepare a field protocol, decide and agree on approaches, methods and tools to be used and also to make and consolidate team understanding.

The detailed methodology for these activities was embodied in a manual and used in training workshops with the field teams to give instruction in using the research tools and ensure that the methodology remained same across the team and across the sites. A one-day training workshop was organized for the RRA team members on 23rd April 2009. A similar workshop was also held for PRA on 24th April 2009. The purpose was to give the RRA and PRA field team instructions in using various tools. The workshop was held at the IPAC Turag-Bangshi Site Office, Turag-Bangshi, on RRA and PRA, respectively.

The RRA was mainly based on unstructured and semi-structured household interviews, KI interviews, group interviews and focus group discussions (FGD). A limited number of other RRA tools were also used like trend analysis, seasonal analysis, sketch mapping etc. The issues and activities covered in the RRA are shown in Table 1. During the fieldwork, the team contacted the local fishers, farmers, boatmen, local leaders and members of concerned UP (Union Parishad). A checklist (Annex 2) was used in carrying out the RRA in the project area.

Table 1. Selected RRA Issues for IPAC Turag-Bangshi Site, Specific Activities and Tools Used

Sl. No.	RRA Issues	Specific activities	Tools	Participants
1	Stakeholder Assessment	-Identification of settlements, resource users, local institutions and agencies and organization, community organizations etc and their roles and activities	HHs Interview, KI, FGD, GD Sketch mapping & review records	Local HHs, Local school teacher, Doctor, Upazila level GO / NGO Offices; Community people (villagers, elites etc) Local community people Local people
2	SH Demographic profile	-Settlement wise no. of HHs / population HH occupation, education, -Dependency on forest resources, land holding	Secondary Info HH Int., KI, GD, FGD, Trend Analysis	Local union Parishad; HHs heads / members Community people School / College teachers & local public representatives
3	SH Economic Activities / Livelihood Strategies and Human Capital Development	-HH primary and secondary income sources -HH Richness / poverty Unemployment and its seasonal trend credit and alternate income generating (AIG) opportunities -Skill and skill development opportunities -Seasonal workload of male and female	HH Int. GD, KI, FGD, Seasonal Calendar	HHs heads / members Teacher, retired officers, old people, Public representative, Local elites, Community people
4	Gender Issues	General impression on living standard, education and health status etc. -Participation in decision making (household and PA management) -Women mobility in the area -Access to IGA and credit etc	HH Int., GD, FGD, KI, Direct observation	HHs heads Women group Community people Local elites RRA team members.
5	Behavior local people of	-Initial response of the local people and FD staff towards the project -Sources of conflict and conflict resolution	FGD, GD HH int.	Local community, DoF staff, HHs heads
6	Local Level Awareness	-Awareness and perceptions about resource degradation and conservation -Willingness for resource conservation -Awareness about the existence of nearby park / game reserve and reserved forest -Knowledge about forest and wildlife preservation acts	HH int., GD, FGD	HHs heads Local community FD staff
7	Resources / resource status	-Trend in changes in major resource bases -Endangered / extinct plant and animals -Causes for the decline in different resources	Trend analysis, HH int., FGD, GD , KI	Local people / FD staff Local HHs heads FD staff Community people Local educated old,

Sl. No.	RRA Issues	Specific activities	Tools	Participants
8	Resource exploitation	-Major forest resources collected, including NTFPs -Reasons and extent of exploitation of different forest resources -Dependency on the forest / forest products -Seasonal trend in resource exploitation -Future risks -Medicinal plant uses and reason for not using these	HH int., FGD, GD KI, Trend analysis, seasonal calendar	Local HHs heads Public representatives & Community people Local educated old, Local elite and DoF staff HHs interview and KI
9	Resource regeneration practices	-Plantation status in the locality -Problem with natural regeneration in the forest -Plant nursery -General land use pattern in the buffer zone -Major agricultural crop -Seasonal pattern in agriculture	Secondary Information, FGD, GD, KI, Seasonal calendar	Secondary data from FD staff Community people Local elite, teacher Community people
10	Legal aspects	-Access to the forest by locals -Forest villagers and land use agreement	FGD	DoF staff and villagers
		-Conflict and negotiation with FD staff -Land encroachment/recovery -Law enforcement mechanisms in the PA -Illegal tree felling and forest cases	GD, KI, FGD, KI	Local community and local govt. members Local elites, community people Teacher, ex-officers
11	Power structure	-Local influential and their role, -local hierarchy Nature and sources of power and their domain of influence -Conflict and conflict resolution Social cohesion and adhesion	HH int., FGD, KI, GD	Local HHs heads, Local community, and local govt., Local elites
12	Others	-Access to areas and settlements, -NGO activities in the locality Challenges for conservation Local problems, -Mobility in the area	HH int., FGD, GD, KI	HHs heads Local community and local govt. Local people & DoF staff Local elites

PRA issues and questions were developed by a three-person team of experts on the basis of field experience and outcomes of the RRA exercise. During the PRA, tools like Venn diagramming, resource mapping, seasonal analysis, trend analysis, mobility, livelihood analysis etc., were used in addition to interviews, focus groups and more informal discussions. More than one tool was used to explore any particular issue to allow the research teams to triangulate the information gathered. The issues and activities performed in the PRA are summarized in Table 2.

Table 2. PRA Issues, Specific Activities Performed and Tools Used in IPAC Turag-Bangshi Site

Sl.	Issues	Specific activities	Tools	Participants
1	Wetland make up dynamics	-observation on wetland physiographic and topography and wetland make up -land use cover, resource exploitation and regeneration areas, animal distribution -changes in wetland cover its vegetation, settlements, flora & fauna and availability of resources	Transect walk, KI, Resource mapping Secondary data, FGD, KI Trend analysis	PRA Team Local elite,
2	Local governance system and community structure and functions	-Decision maker -influential people -Local community organizations and institutions and their linkages -Local conflict and conflict resolution -Social cohesion and adhesion -Collective action -Local problem, cause and possible solution	Venn diagram FGD & GD and Ranking	As above and local elite
3	Livelihood strategies	Income and expenditure sources, Livestock, Richness and poverty	Wealth ranking HH interview	Women group and local people
4	Gender issue	-Role in family decision making -mobility -workload -Education and access	Decision making chart, Mobility map, Daily and seasonal work chart, HHs Int. & FGD	Women and local educated people
5	Wetland resource collection	-Information on collector -Purpose and driving force for collection -Dependence on the extraction for their livelihood and its extent -Uses and marketing channel of the resource -Level of extraction and seasonality -Conflict with Govt. agencies or other people over the extraction -Negotiation for carrying out the activity -Alternate source for the collection of the resources -Needs and expectation of the collector -Impact on the wetland and future risks for the collector	FGD & GD, seasonal analysis	Fishermen, community people, local hotel and tea stall owners, local Imam and other religious person

Sl.	Issues	Specific activities	Tools	Participants
6	Illegal fishing	-Information collector -key people behind the activity and network -Purpose and driving force for collection - uses and marketing channels and dependence -What encourages them to take up the activity -Anybody protect them, if they are in problem -Protection by DoF or by any other agencies (e.g. Police etc.) -conflict and negotiation with Govt. agencies or other people -needs and expectation of the fishermen -impact on the wetland & adjacent forest and future risks for the illegal fishermen -Seasonality and trend in fishing	FGD, GD and KI, Seasonal calendar and trend analysis	Illegal timber feller, DoF staff and community people, teacher and local elite
7	Collection of fingerling	-Information on collector -purpose and reasons for collection -uses of the resource and extent of extraction -dependence on the extraction and marketing -conflict and negotiation with DoF or other people over fishing -alternate source for the collection of the resources -needs and expectation of the collector -impact on the forest and future risk for the collector	FGD, GD, KI	Community people, FD staff , forest villagers, local public representative and elite
8	Reed and Hijol collection	-Information on collector -purpose and reasons for collection -uses of the resource and extent of extraction -dependence on the extraction and marketing -conflict and negotiation with DoF or other people over the extraction -alternate source for the resources -needs and expectation of the collector -impact on the forest and future risk for the -seasonal changes and trend in abundance	FGD, GD Seasonal calendar and trend analysis	Reed and Hijol collector, community, people and local people
9	Information on villagers and Ethnic people	-Distribution of forest villager's & ethnic communities settlements -Registered and actual number of forest villagers -Compliances to FD agreement -Present economic activities -Resources exploitation and dependence on forest resources -land encroachment by the forest villagers or by their dependant -relationship and conflict with FD -internal governance system -needs and expectation	FGD Secondary data	Ethnic Community and DoF & FD staff

Sl.	Issues	Specific activities	Tools	Participants
10	Jackfruit, Mango, Palm, Dates, Pineapple, lemon, papaya, banana, cultivation	-distribution of Lemon yards within and approximation of its number -historical perspective of flourishing the activity in the area -information on cultivator -ownership of land -dependence on the activity -Impact on the forest resources -Conflict with DoF	FGD, GD, GD	Jackfruit, Mango, Palm, Dates, Pineapple, lemon, papaya, banana, cultivator, Local community

Each PRA tool was used to collect information about more than one issue, as shown below:

Venn diagramming: local power structure, local community organizations, local institutions and agencies, local conflict and conflict resolution, family decision making, mobility of women & men, local NGO / CBOs

Seasonal calendar: fuel-wood, bamboo and timber collection, unemployment, workload, accessibility to forest, transportation problem, brickfield / sawmill operation, forest patrol, agricultural activities, collection of building materials, hunting, vegetable collection, damaged by wild bore, sun-grass extraction.

Trend analysis: availability of fish and fisheries item, unemployment, local solvency, land encroachment, forest cover, forest thickness, tall trees, herbs and shrubs, forest use, settlement / population solvency / income, livelihood expenditure, literacy, unemployment, use of wetland and forest for income, use of forest for HH needs, transportation and mobility, homestead plantation, food scarcity, credit and IGA, occupation, damages by wild bore, wildlife, hunting, illegal tree felling, fuel wood collection, reed and branch of Hijol collection, fruit bearing trees in the wild, livestock, turtles and tortoises, agricultural activities, medicinal plants.

Ranking and scoring: local problem ranking, wealth ranking, and livelihood analysis

Transect walk: soil, wetland, vegetation, land use, elevation, crops, wildlife, human activities, etc

Wetland resource mapping: wetland covering area, resource zones, resouce exploitation zones, faunal distribution, etc.

Forest resource mapping: forest land use cover, resource zones, resource exploitation zones, animal distribution, settlements.

Mobility: Identified **v**arious professional groups with their daily and seasonal movement.
Road Networking: Inter district roads, secondary roads within the locality, pacca (metallic) and semi pacca, non-metallic roads and forest tracks identified by using local maps and physical visits.

3.2 Preparation of Fieldwork

3.2.1 Formation of RRA and PRA Field Teams

The RRA field teams were formed with representatives from RDRS Bangladesh, Worldfish Center, and DoF & FD local staff, having biological and sociological background. The teams make up for the RRA and PRA field exercises are provided in the table 5. During RRA and RRA field teams were formed a common team (Table 3). The teams worked simultaneously in the field of different locations.

Table 3. Team of PRA and RRA of IPAC Turag-Bangshi Site

Sl. No.	Name	Organization
01	Masood Siddique	IPAC-Worldfish Center
02	Shital Kumar Nath	IPAC-RDRS Bangladesh
03	Touhidur Rahman	IPAC-RDRS Bangladesh
04	Parvez Kamal Pasha	IPAC-RDRS Bangladesh
05	Md. Zakir Hossain	IPAC-RDRS Bangladesh
06	Md. Abdul Jalil	IPAC-RDRS Bangladesh
07	Primus Pahan	IPAC-RDRS Bangladesh

3.2.2 Selection of RRA and PRA Sites

On the basis of information provided by local DoE, DoF, FD and other GO agency staffs and the field implementing NGO (RDRS), various sample locations were selected for the purpose of information collection. These locations are hence called RRA and PRA spots. The selection of locations was based on a number of selection criteria. The selection process was completed during planning workshop. While the number of sites visited during the RRA was limited, the team focused on gaining an overview of issues covering the whole of the Reserve Forest area. However, because of the size and geographical location of the RF, it became clear there would have to be a trade off between the size of the study area and the depth and quality of the information collected. Therefore, a decision was made that the PRA would focus on only issues and stakeholders relating to the management of forest within the Turag-Bangsi area. A list of the selected RRA and PRA spots for IPAC Turag-Bangsi Site is given in Tables 4 and 5.

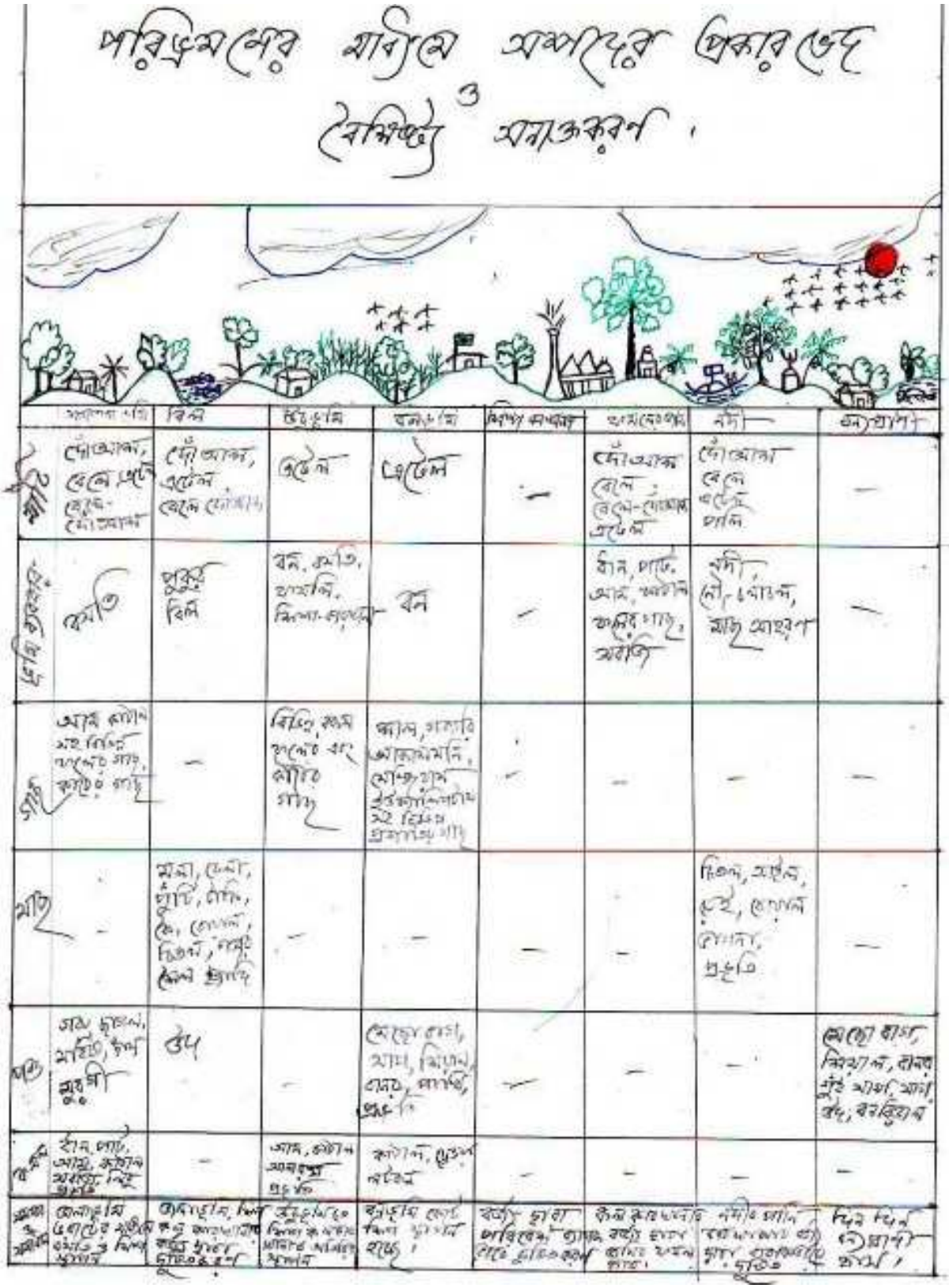
3.2.3 Selection of RRA and PRA Transect Route

To get a quick physical view of the whole project area four transect conducted from different direction as Table 4 and Fig.9

Table 4. List of Transect Schedule

Sl. No.	Date	From	To	Route and area coverage
01	25.04.09	Taltali	Fulbari	Through forest area; Taltoli to Shafipur Road, then Shafipur to Mouchak Road, then Mouchak to Fulbari, then Fulbari to Taltoli
02	26.04.09	Taltali	Kalikoir	Throug forest type area; Shohag Palli road; from east to west.
03	06.05.09	Baroibari	Boali	Through wetland area; Boali UP Road.
04	07.05.09	Boroibari	Azgona	Through Beel area; Fulbari-Kaliakoir Road and Kalikoir-Azgonga Road; east to north-west.

Fig. 11: Transect walk of IPAC Turag-Bangshi Site



3.2.4 PRA Schedule, Spots and PRA Activities

There are 61 villages within the project area under 8 unions. Out of those main PRA spots of the project area listed in table 5.

Table 5. PRA Schedule, Spots and PRA Activities in Turag-Bangshi Site

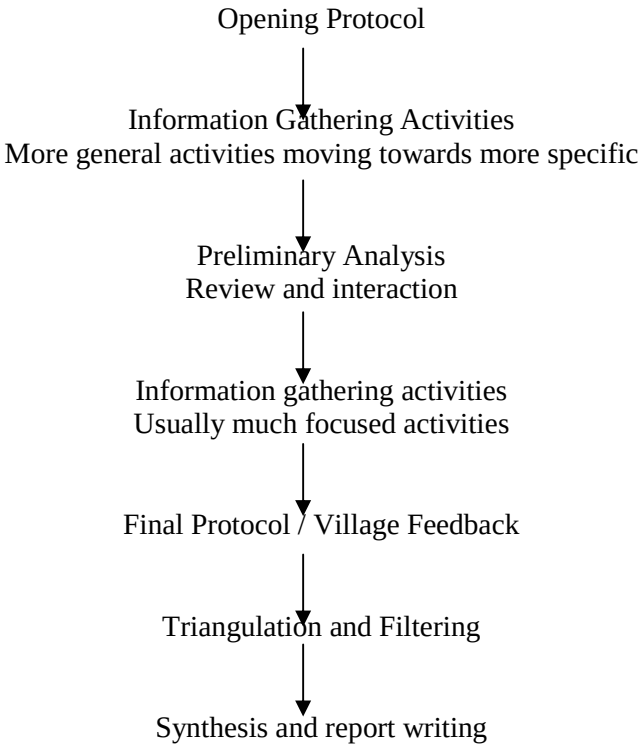
Date	Village/ Location	Performed activities	Remarks
11.05.09	Mouchak UP	GD(1), HH interview(3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
11.05.09	Village: Shinabaha, Moucahak	GD (1), HH interview (3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
17.05.09	Chapair UP	GD (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
17.05.09	Village: Baroibari, Chapair	GD (1), KI (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. KI with local UP member ,Social Mapping with local people
18.05.09	Boali UP	FGD (1), KI (1), HH interview (4) Social Mapping	FGD with forest villagers, KI with head man of forest village, HH with female group
18.05.09	Village: Sholakuri, Boali	FGD(1) Forest resource mapping, Transect work	FGD with forest staff, Forest resource mapping, and FD Staff
24.05.09	Maddyapar UP	GD (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
24.05.09	Village: Haturiacala, Maddyapara	GD(1), HH interview(3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
08.06.09	Azgona UP	GD (1), HH interview (3) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
08.06.09	Village: Azgona, Azgona	GD (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. Social Mapping with KI
10.06.09	Sutrapur UP	GD (1), KI (1) HH interview (4) Social Mapping	GD with local community & HH inter view with female participants. KI with local UP member ,Social Mapping with local people
10.06.09	Village: Sutrapur, Sutrapur	FGD (1), KI (1), HH interview (4) Social Mapping	FGD with forest villagers, KI with head man of forest village, HH with female group
13.06.09	Fulbaria UP	FGD(1) Forest resource mapping, Transect work	FGD with forest staff, Forest resource mapping, and FD Staff
10.06.09	Village: Nabirbaha, Fulbaria	FGD(1) Forest resource mapping, Transect work	FGD with forest staff, Forest resource mapping, and FD Staff
15.06.09	Sreefaltali UP	FGD(1) Forest resource mapping, Transect work	FGD with forest staff, Forest resource mapping, and DoF Staff
15.06.09	Village: Sayedpur, Sreefaltali	FGD(1) Forest resource mapping, Transect work	FGD with forest staff, Forest resource mapping

3.3 Field Implementation Strategies

3.3.1. Organization of RRA and PRA field work

The organization of field exercises involved a series of logical steps. The field teams put their efforts to adhere those steps. The flow of activities is shown in the following flow chart.

Fig. 12. Flow of RRA / PRA Field Activities (Duration: 3-4 days)



During RRA exercise, a total of 40 HHs interviews, 2 focus group discussions, 4 group interviews, 4 key informant interviews, were conducted. The other RRA tools were applied during above mentioned interviews and discussions. Similarly, during PRA a total of HH56 interviews, 12 Group interviews and 7 focus group discussions, 6 key informant interviews were conducted. This is summarized in Table-6.

Table 6. Summary of Performed Activities in IPAC Turag-Bangshi Site during PRA and RRA at a glance

Appraisal	Village covered	FGD	GD	KI Interview	HH Interview	Transect	Resource and social mapping
RRA	8	2	4	4	40	4	7
PRA	14	7	12	6	56	4	7

The other PRA tools were used either during the above exercise or in separate exercises dedicated for this purpose. Further details on the implementation of the fieldwork methods used are provided below.

3.3.2 Household (HH) interview

- Individual / HH interviews were conducted with random selection of interviewees, typically visiting one household at each stop.
- Both male and female respondents were considered.
- Typical HH interview last for about 1 hr – 1:30 hr
- The interviewees were treated as respondents to a questionnaire, active participants in an unstructured / semi-structured interview. A checklist of issues was used as a basis for questions, not necessarily addressing all questions in each interview and sometimes departing from basic questions to pursue interesting, unexpected or new information, relevant to the project and situation.

3.3.3 Key informant (KI) interview

Key informants are local people who have extensive knowledge on the local environment, situation and events. The purpose of this interview was to utilize them in collecting information from them that would be relevant to the project needs.

- KI interview was by prior appointment. A local guide helped in making appointments with the KI. The interview was taken by paying visit to Key informant HH or by inviting him to the team base
- A preliminary discussion with local FD staff, IPAC field partner staff and interview of local people gave adequate clue for selecting KI. Preferably local school teachers, retired officials, local elites or local public representatives were selected as the KI.
- A typical KI interview lasted for about 1.5 hrs. The entire team took part in the interview taking session
- As with HH interview, a similar checklist of questions used for the purpose of KI interview.

3.3.4 Group Interview (GI)

- The purpose of the planned Group Interviews was to collect some information on the locality and local situation based on the consensus of the local people.
- Interviews were conducted at places, preferably at local tea stalls, road junctions and other local community places, where local people gathered spontaneously. No formal invitation to the local people was made for participating at the group interview.
- Mapping, seasonality, ranking and scoring exercises, whenever possible, were done in such group interviews.
- Typically a group interview lasted for about 1.0 - 1.5 hrs
- At least one group interview was held each day
- This was basically an unstructured interview and a checklist of issues was used as a basis for questions

3.3.5 Focus Group Discussion (FGD)

Focus Group Discussions were carried out with different professional groups, resource user groups, local public and government representatives with a view to collect information on specific areas.

- During PRA, FGDs were principally conducted with different stakeholder groups, mainly with local FD staff, forest villagers, local public representatives etc. other professional groups, like fuel-wood collector, sawmill owner, etc.
- The FGDs were conducted by invitation and a local guide was used to invite the people.
- Senior project personnel /or senior personnel from the partner NGO /and or senior DoF & FD Official and/or experts were usually present in the FGD sessions.

3.3.6 Other PRA tools

Other PRA tools were either incorporated into the interview and discussion processes outlined above or carried out through separate exercises dedicated for this purpose. Resource mapping, Venn diagramming, seasonal calendaring, mobility, trend analysis, ranking, scoring, record reviewing etc. were done usually in separate sessions dedicated to these activities. However, sometimes, these exercises were also performed during group, focus group and key informant interviews. The participants were either invited local people or local people instantly gathered at places.

3.3.7 Direct Observation

The team while walking through the project area, talked to local people, discussed many things and made observation on the resources, people's behavior and their activities, etc.

These observations and informal discussions helped to triangulate collected information and generate new questions for interview or discussions.

3.3.8 Secondary Information Collection

Some demographic data was collected from the relevant local Union Parishad sources. The secondary information collected from several sources for report preparation.

3.3.9. Reflection and Analysis

After each day of fieldwork, the team sat together for about 1 ½ hours for team interactions and triangulation. The activities performed during the session included:

- Reviewed information gathered that day and made summary of the information, triangulated whenever necessary. The person designated for report writing took note of discussions
- Next day's activity planning
- Methodological review

3.3.10 Triangulation and filtering

Single information may be collected by using several tools or from several sources. The team cross-checked their results and accepted the most logical analysis. During these feedback sessions and subsequent data analysis, team members were required to use their own judgment to ensure the most reliable analysis of the situation.

3.4 Limitations of the Fieldwork

No remarkable limitations observed in PRA and RRA period. The main limitation of the field work was that it took place during the paddy cultivation period. This made working conditions difficult, and in particular meant that the traditional PRA approach of participants working together to complete large scale matrices on the ground was impossible, and researchers recorded information in note form and by completing matrices themselves either during the group discussion or afterwards. Therefore this work does not match the usual requirements of a PRA where information is analyses and owned by the participants. During the paddy and vegetable cultivation period most of the local people were engaged cultivation field. So, gathering for data collection was not smoothing process. With the interruption of rain the logistic supports were not sufficient in favor of PRA / RRA works.

Fig. 13: Social map of Nabirbaha (a village of Fulbaria Union Parishad)

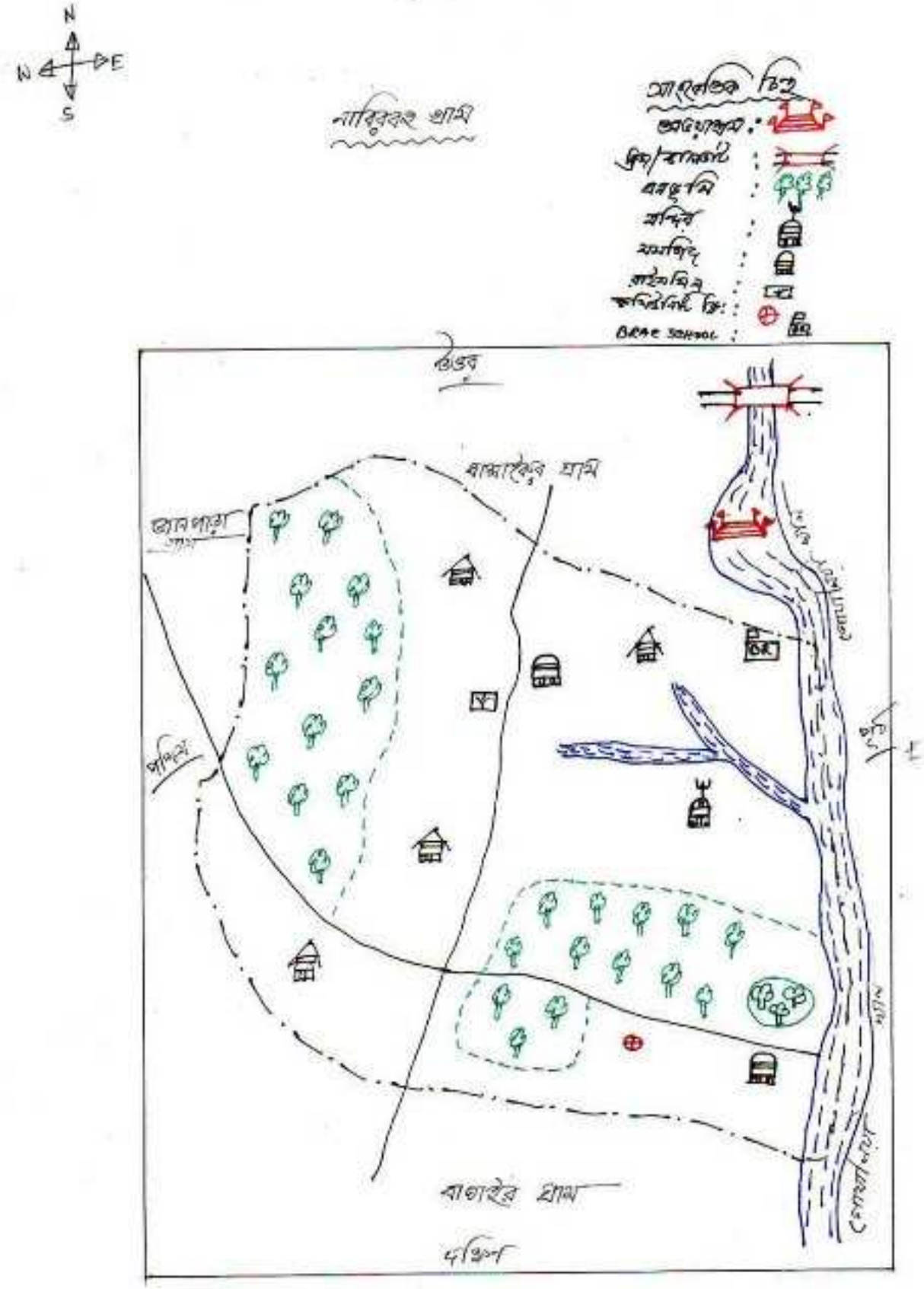


Fig. 14: Social map of Baroibari (a village of Chapair Union Parishad)

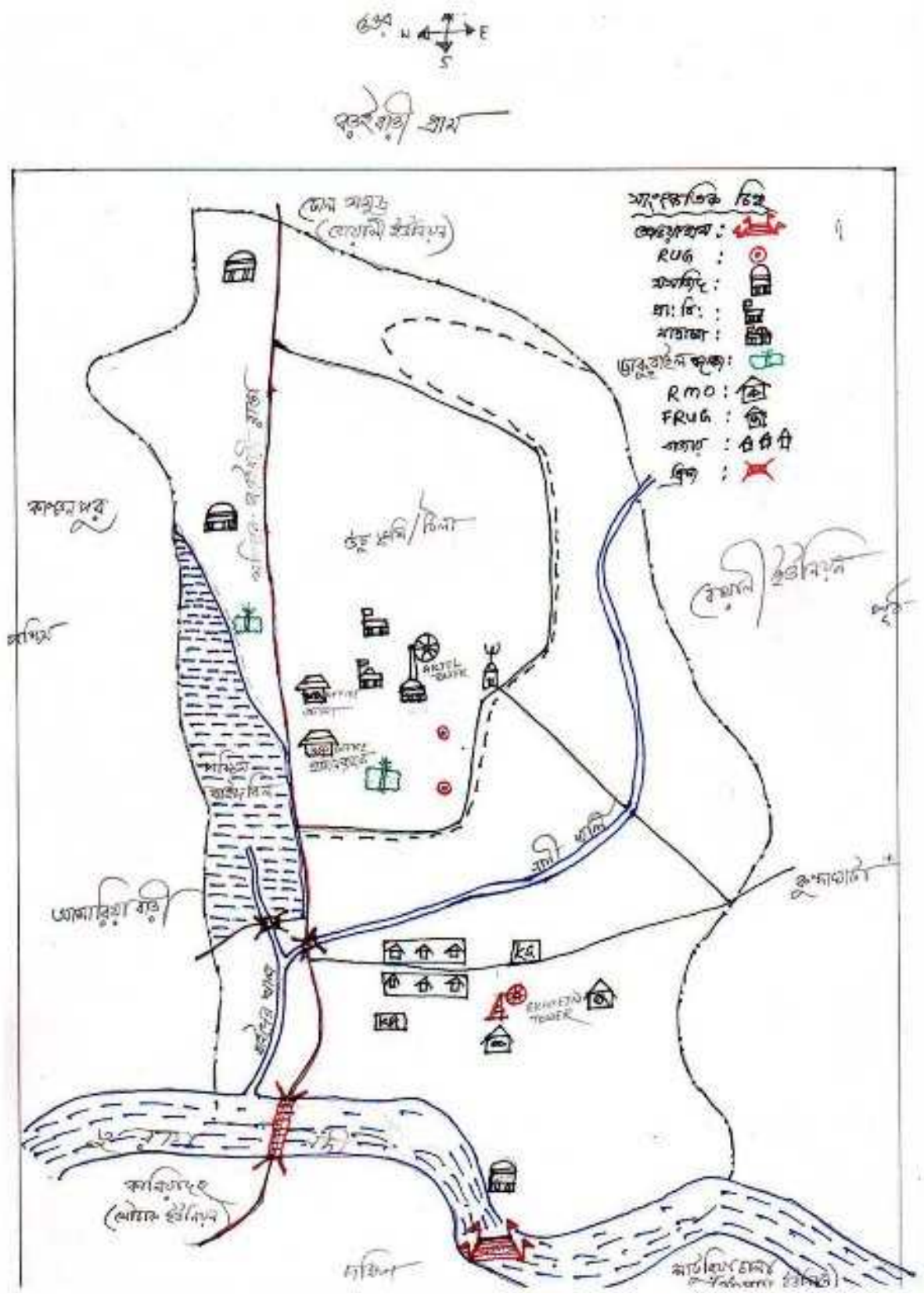


Fig. 15: Social map of Kundaghata (a village of Boali Union Parishad)

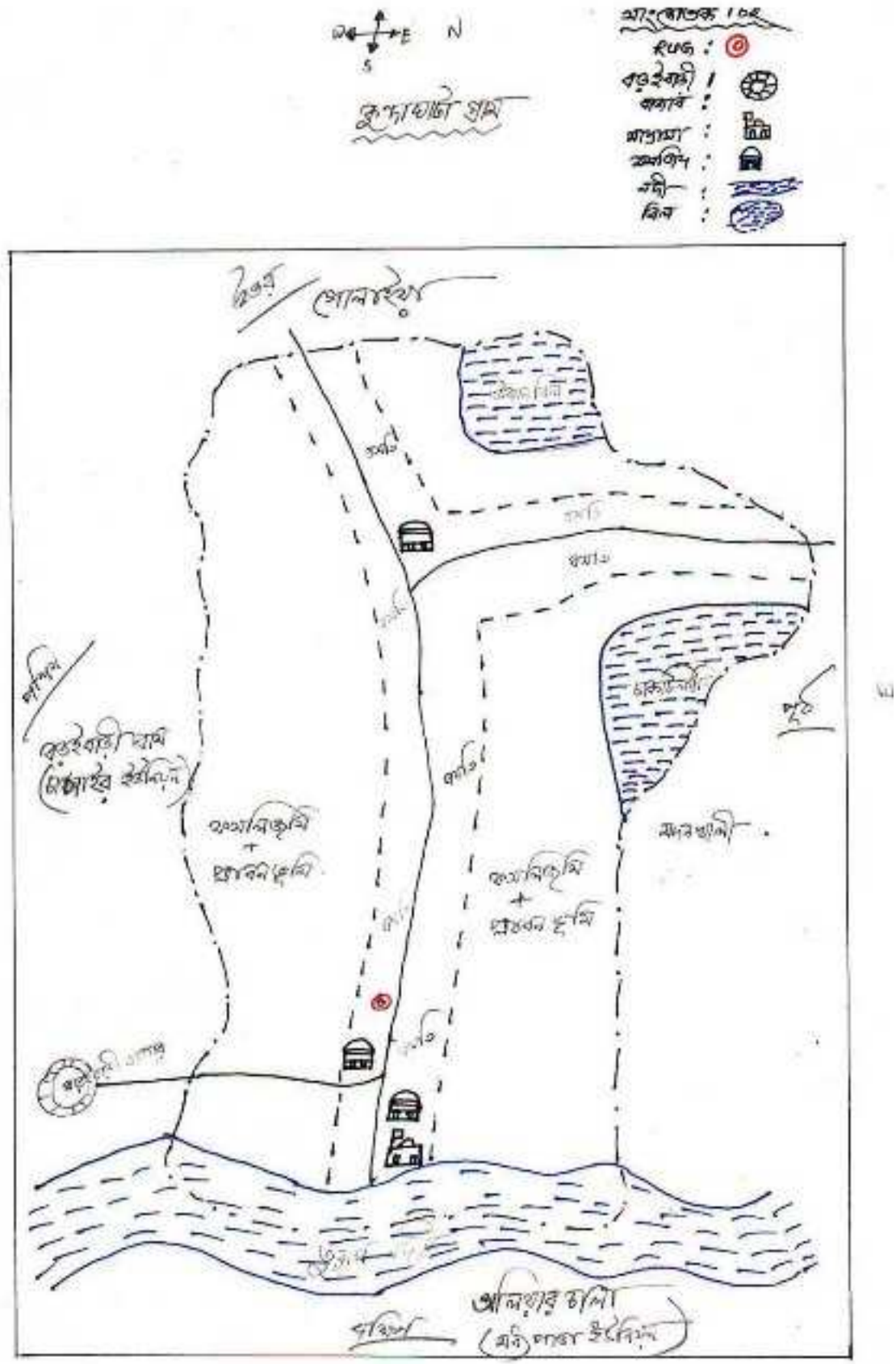


Fig. 16: Social map of Shinabaha (a village of Mouchak Union Parishad)

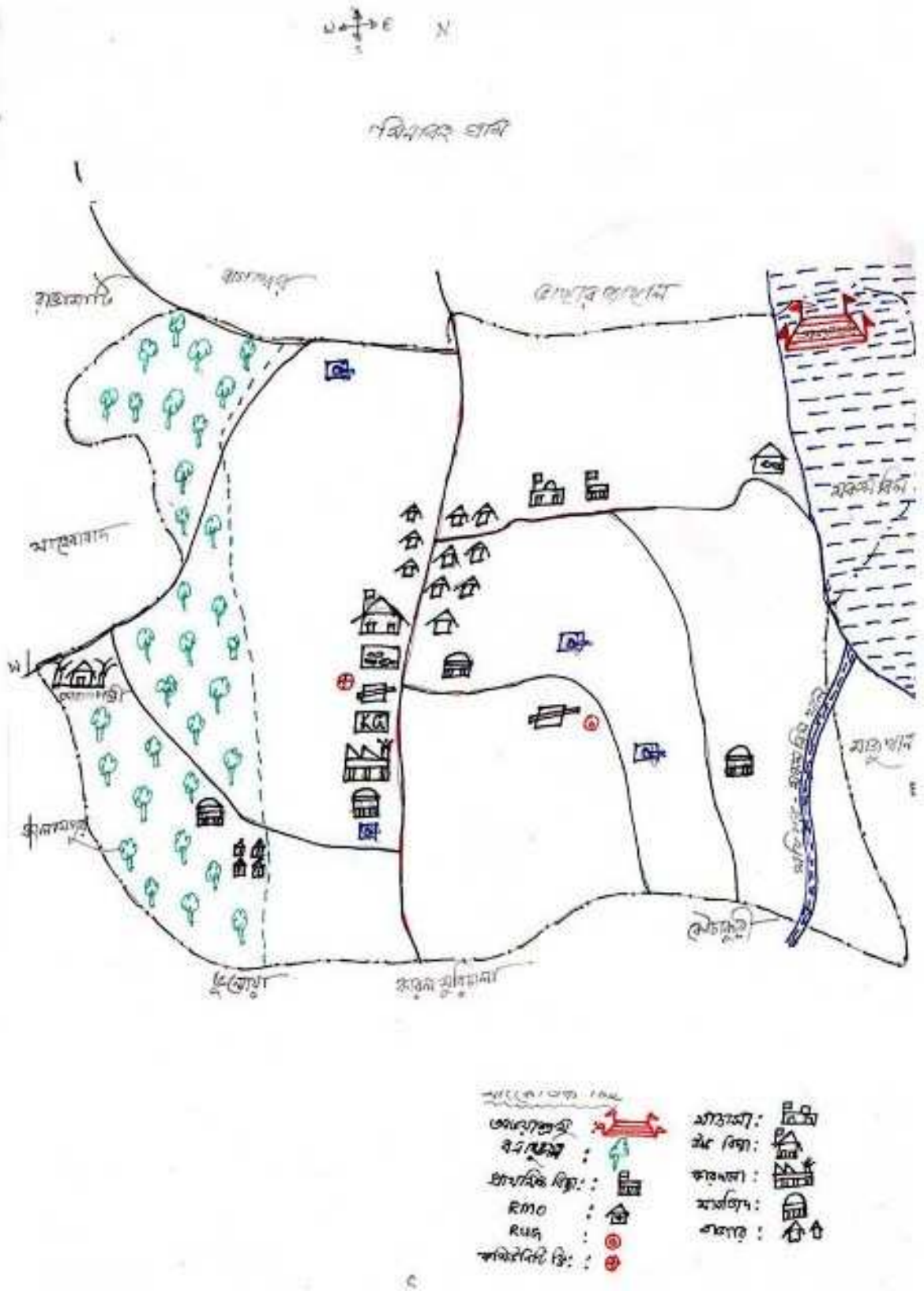


Fig. 17: Social map of Sayedpur (a village of Sreefaltali Union Parishad)

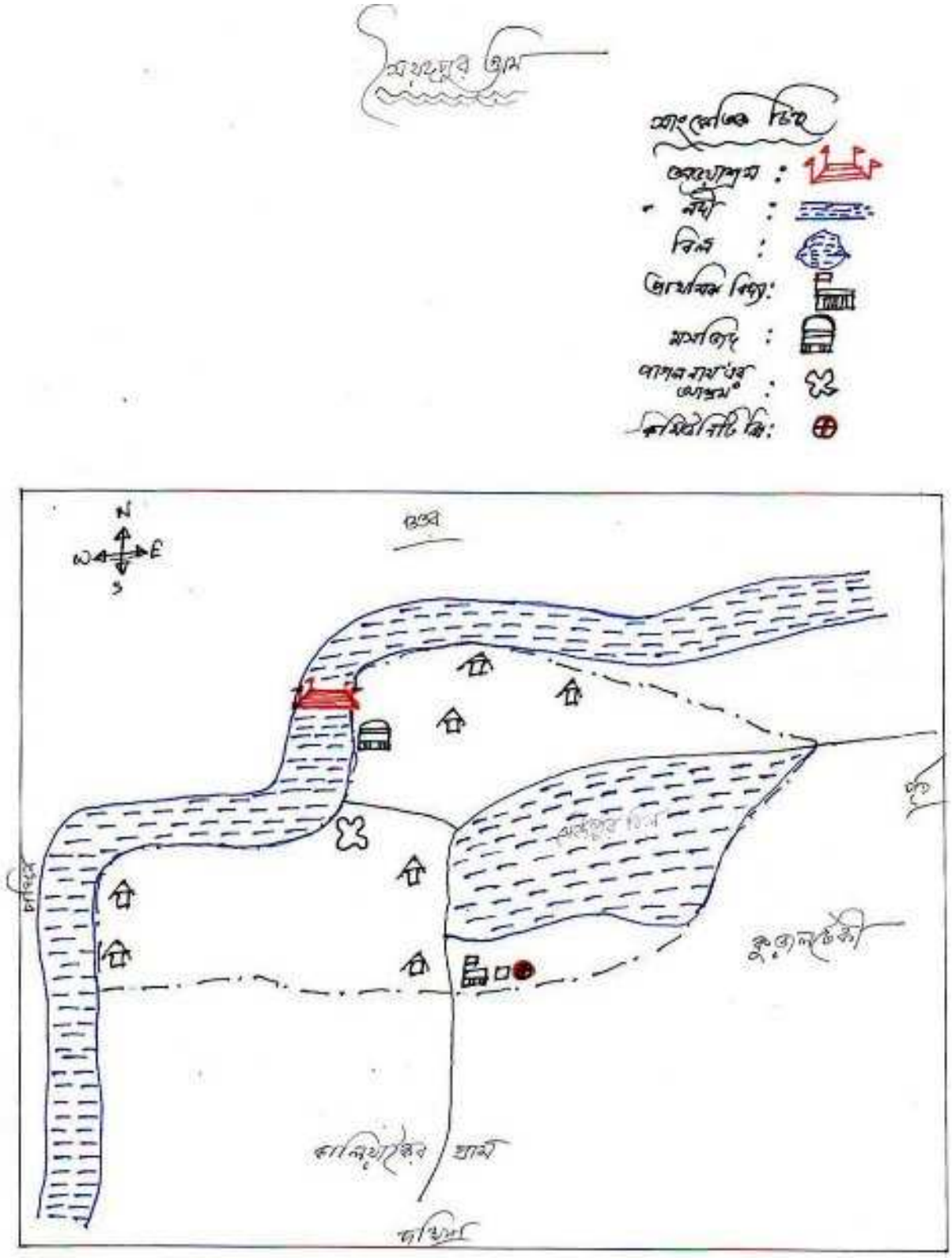


Fig. 18: Social map of Sutrapur (a village of Sutrapur Union Parishad)

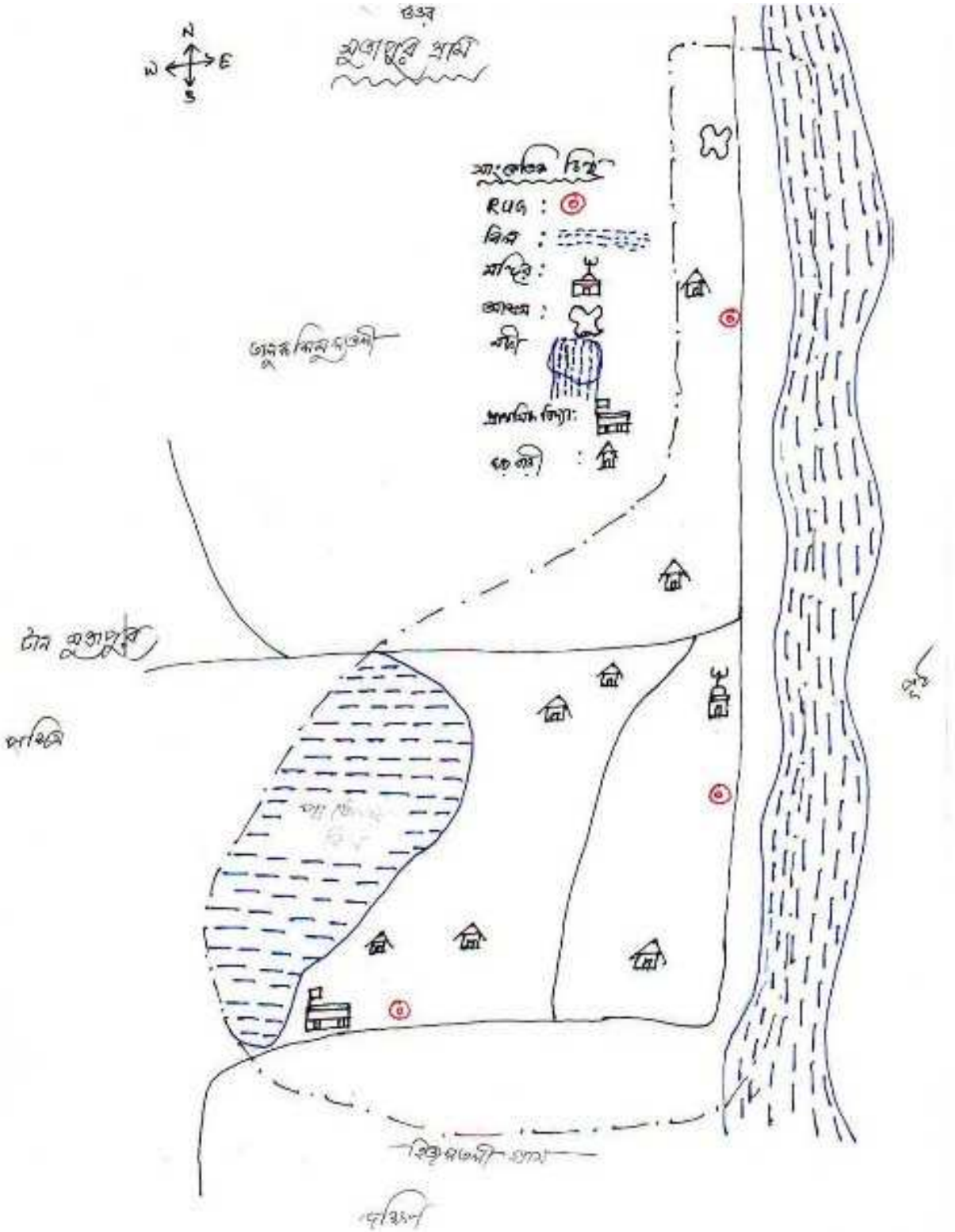


Fig. 19: Social map of Haturiachala (a village of Maddyapara Union Parishad)

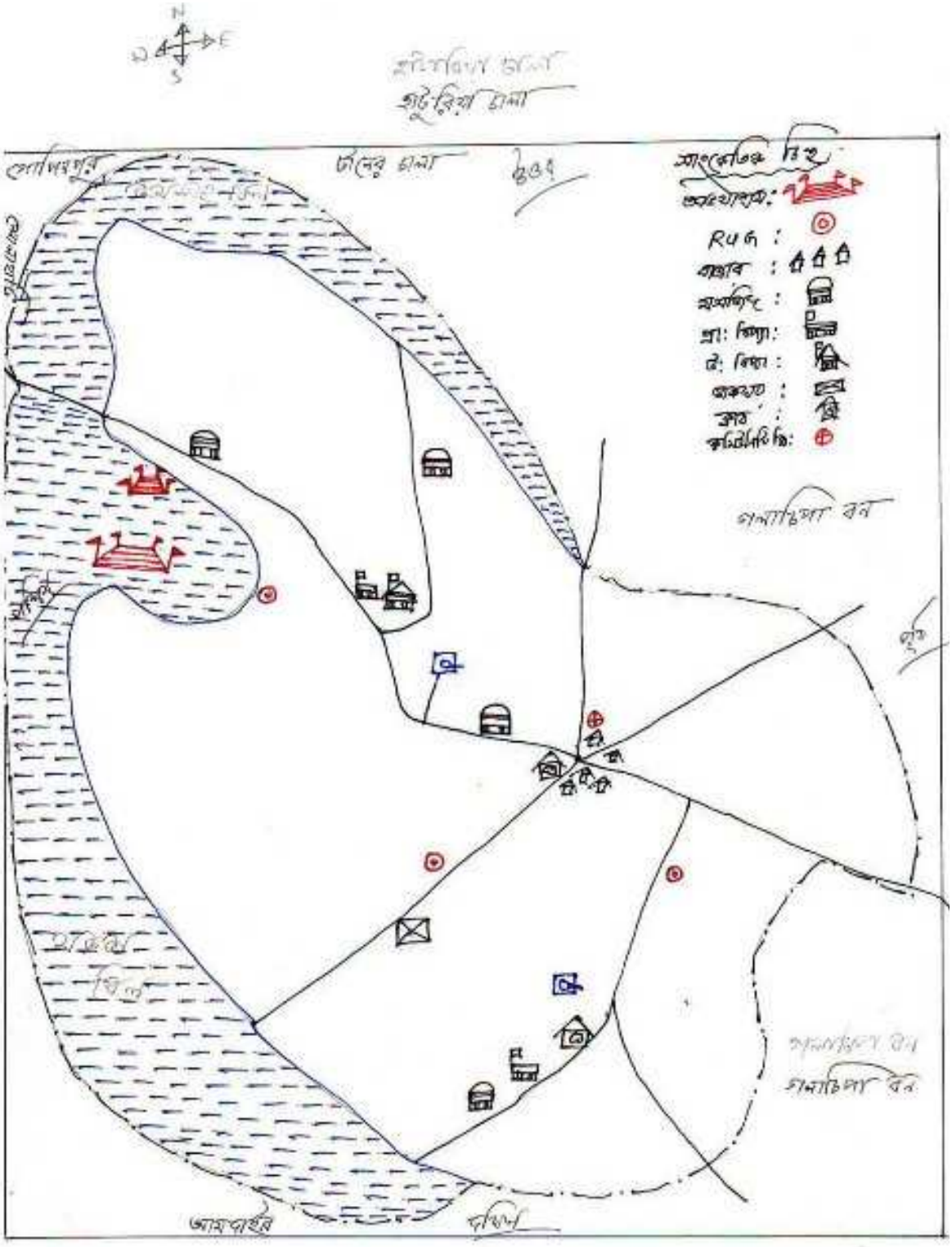
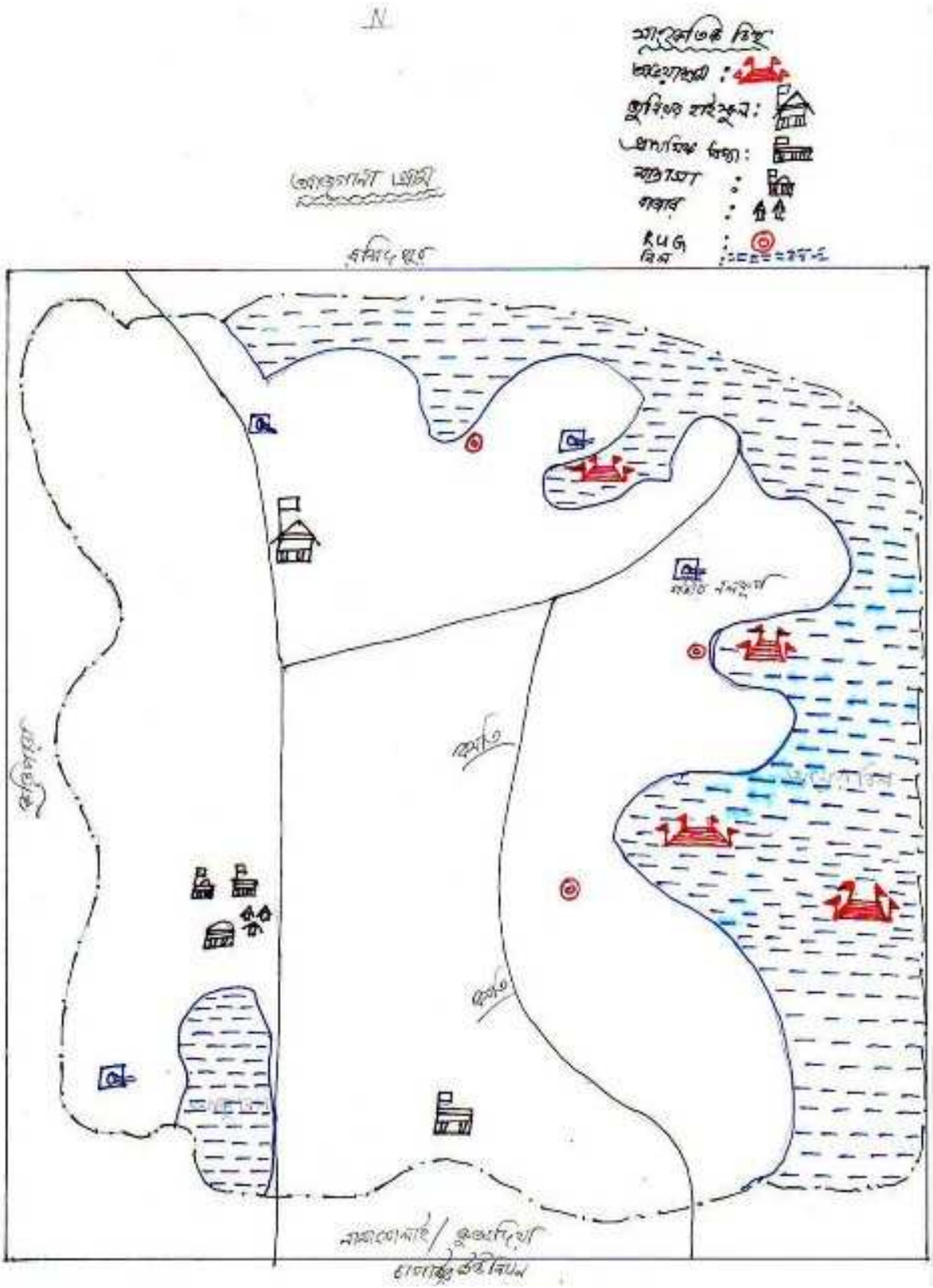


Fig. 20: Social map of Azgana (a village of Azgana Union Parishad)



4. Findings

4. 1 Settlements in and Around IPAC Turag-Bangshi Site and its Level of Stakes with the wetland and forest resources

4.1.1 Settlements

A total of 250 villages having varied degree of stakes with the project area have been identified. These villages spread over 133 Moujas. The villages belong to 8 Unions namely; Fulbaria, Chapair, Boali, Mouchak, Sreefaltali, Sutrapur, Maddyapara, and Azgona of the project area (Table 7).

Table 7. List of the name of Districts, Upazillas and Unions of the IPAC Turag-Bangshi Site

District	Upazilla	Union	Number of Mouja	Number of Village
Gazipur	Kaliakoir	Fulbaria	10	42
		Chapair	17	17
		Boali	13	32
		Mouchak	28	54
		Sreefaltali	23	23
		Sutrapur	18	18
		Maddyapara	09	40
Tangail	Mirzapur	Azgona	15	24
		Total	**133**	**250**

Source: Census 2001, local Statistical Bureau Office, Kaliakoir and Mirzapur Upazilla

4.1.2 Demography

A number of 08 Unions having varied degree of stakes with the project have been identified including 133 Moujas (Table 7). Total project area is 341.06 Sq. Km. Total Household of 8 unions is 58,099 Nos. with population of 281,879 including 146,825 male and 135,054 female (Table 8)

Table 8. Area of the Project and union-wise number of Household, Population (male and female)

Name of the Union	Area of the Union in Sq. Km	House-hold	Popula-tion (Male)	Popula-tion (Female)	Total
Fulbaria	76.41 Sq. Km	10,122	25,321	23,289	48,610
Chapair	34.96 Sq. Km	5,388	11,606	11,649	23,255
Boali	35.65 Sq. Km	3,640	10,535	10,512	21,047
Mouchak	55.69 Sq. Km	16,452	39,740	34,074	73,814
Sreefaltali	33.0 Sq, Km	4,155	11,955	12,525	24,480
Sutrapur	15.54 Sq. Km	3,975	13,986	11,762	25,748
Maddyapara	34.81 Sq. Km	6,500	11,982	11,243	23,225
Azgona	55.00 Sq. Km	7,867	21700	20,000	41,700
Total	**341.06 Sq. Km**	**58,099**	**146,825**	**135,054**	**281,879**

Source: Census 2001, local Statistical Bureau Office, Kaliakoir and Mirzapur Upazilla

4.1.3 Level and role of stake

Table 9 Provides information of the Unions total population, level and role of stake with the forest. There are three types of stakes depends on their roles. The major type of level of stake, live in Chapair UP, Boali UP, Sreefaltali UP, Sutrapur UP, and Maddyapara UP; medium type of stake live in Azgona UP; and Minor type of stake live in Fulbaria UP.

Table 9. Information on Unions Having Stakes with IPAC Turga-Bangshi Project Area

Name of the Union	Total Population	Level of stake	Role of stake
Fulbaria	48,610	Minor	There are only a few fishermen lives in this union, this union comprises with uplands which is covered by patches of forest. Local people collect NTFP from these forests.
Chapair	23,255	Major	There are many fishermen villages, this comprises with many Beels and floodplain area, Turag River lies on this union proportionally more than other unions, etc.
Boali	21,047	Major	There are three fishermen villages, most lands are lowland, fishing scopes are comparatively better than other area, etc.
Mouchak	73,814	Medium-Minor	Most of area are industrial area, people depends on services of different industries. There are few wetlands in this union.
Sreefaltali	24,480	Major	There are some fishermen villages both sides of the river, most lands are lowland (Beels), fishing scopes are comparatively better than other area, etc.
Sutrapur	25,748	Major	Many Beels are in this union, most of the area comprises with flood plain area, many fishermen lives in this union.
Maddyapara	23,225	Major	There are many fishermen villages, this comprises with many Beels and floodplain area, river lies on this union, etc.
Azgona	41,700	Medium	Most of the villagers depend on farming, comparatively less people depends on fishing. This union comprises with a few wetlands.
Total	281,879		

4.1.4 Road network of Project Area

The roads within the project area form a frame of network. Easier accessibility by using these access roads is one of the main causes of wetland and forest resource degradation. The illegal resource collector can easily move within and around the forest comfortably.

4.1.5 Educational institutions

In the project area, there are 35 Non-Government High and Junior High Schools, 75 Government Primary Schools, 23 Registered Primary Schools, 43 Madrashas, more than 352 Moktabs, and 05 colleges (Table 10). Out of these educational institutes, there are many

kindergartens in all unions. There number is more than double of the number of Primary Schools.

Table 10. Union-wise number of High School, Primary School, Registered Primary School, Madrasa and Moktab

Union	Non-Government High and Junior High School	Govt. Primary School	Registered Primary School	Madrasha (Dhakil, Ebdadia, etc.)	Moktab	College
Fulbaria	07	10	05	09	70	01
Chapair	04	09	01	01	72	02
Boali	03	09	05	03	23	00
Mouchak	05	13	00	03	50	01
Sreefaltali	04	06	00	18	27	01
Sutrapur	02	08	00	03	21	00
Maddyapara	05	09	06	03	40	00
Azgona	05	11	06	03	49	00
Total	**35**	**75**	**23**	**43**	**352**	**05**

4.1.6 Religious institutions

Inhabitance of the project area consist different types of ethnic and religious groups, where the Muslims are the majority. The religious institutions within the project area are: Mosque 352 Nos., Temple 75 Nos. and Church 04 Nos. (Table 11).

Table 11. Union-wise Religious Institution (Mosque, Temple, Church) of the project area

Name of the Union	Mosque	Temple	Church
Fulbaria	70	05	03
Chapair	72	09	00
Boali	23	05	01
Mouchak	50	05	00
Sreefaltali	27	22	00
Sutrapur	21	07	00
Maddyapara	40	13	00
Azgona	49	09	00
Total	**352**	**75**	**04**

4.1.7 Community facilities

The community facilities within the project area are average comparing to the other part of the Bangladesh. There are 03 Hospitals, more than 23 Community Clinics, --- Sanitary Latrines, --- Tube Wells, 185 Deep Tube Wells, and 43 Hats / Bazars (Table 12).

Ta**ble 12. Union-wise Community Clinic, Tube well, Deep Tube well, Hat / Bazar**

Name of the Union	Hospital	Community Clinic	Sanitary Latrine	Tube well	Deep Tube well	Hat / Bazar
Fulbaria	01	05	-	205	26	06
Chapair	00	-	5,388	-	15	05
Boali	00	-	-	-	26	06
Mouchak	01	-	-	-	24	09
Sreefaltali	00	06	-	845	18	02
Sutrapur	00	01	-	-	17	02
Maddyapara	00	02	-	-	05	06
Azgona	01	09	-	-	54	07
Total	**03**				**185**	**43**

4.1.8 Credit

Several NGOs, and banks provide micro-credit to local people. About 21 NGOs involved in the project area. Bank loans are mainly given for poverty reduction and integrated rural development through creating opportunity of IGA and also as seed money for agriculture and handicraft. NGOs provide credit mainly for IGA. NGO's IGA programs concentrate on small business, fish culture, poultry, livestock rearing etc (Table 13). Women's are mainly focused on NGO credit programs. It was seen that local people also take credit locally from neighbors, relatives and sometimes from Mohajons (Money Lender) etc.

Table 13. List of NGO and their union-wise activities at project area

Sl. No.	Name of NGO	Activities	Location of Union
01	ASA	Micro credit for agriculture, small business, poultry and livestock	All unions
02	Grmeen Bank	Micro credit	All unions
03	Buro Tangil (Buro Bangladesh)	Micro credit	All unions
04	BRAC	Micro credit, education, health, awareness, poultry & livestock development	All unions
05	CARITAS	Micro credit, education, health, handicraft, spinning, poultry & livestock, legal support, etc.	All unions
06	PROSHIKA	Micro credit, Livelihood	All unions
07	SSS	Micro credit	All union
08	TMSS	Micro credit	All unions
09	SS	Micro credit	Sutrapur UP and Sreefaltali UP
10	Polly Daridra Bimochan	Micro credit and training	All unions
11	BASA	Micro credit and training	Sutrapur UP , Azgon UP and Sreefaltali UP
12	CNRS	Natural Resource Management	Project area
13	BCAS	Pollution related research work	Project area
14	VOST	Micro credit	All unions
15	Grameen Shakti	Soala pannel	Fulbaria Up
16	Dishari	Health	All unions
17	Pratibandi Manab Unnayan Shasta	Disable people	All unions
18	Polly Mongol	Micro credit	All unions
19	Pridim	Livestock	Fulbaria UP
20	ASPADA	Environment	Fulbaria UP
21	SRVE	Health and education	All unions

4.2 Special phenomenon

4.2.1 River Dolphin (*Platanista gangitica*)

These *kums* are not only providing habitat for fish, but also provide habitat for river dolphins (*Platanista gangitica*). During field visit, IPAC field staff found dolphins in some of the scour holes. In dry season, when there is insufficient water in the river, dolphins take shelter in *kums*. During fishing in *kums* some dolphins are caught and killed by the fishers. It is reported that the fishermen catch the dolphin from *kum*s in the night for selling the oil extracted from them. The oil of dolphin is a costly item, 1 liter oil fetched about Tk. 1000. Therefore, the fishermen are very keen to catch dolphins. However, they know that catching dolphin is illegal. That is why they catch them in the night. The oil of dolphin is used by the quacks (*kabiraj*) for various diseases particularly for rheumatic fever. River dolphin is one of the endangered species and the project can take up awareness program to save the dolphins in the river.

4.2.2 Brush Piles

100 - 130 *kathas* (brush piles) were observed in Bangsai and Turag rivers during the fieldwork. The professional fishers usually fixed most of the *kathas* in the river. However, some non-fishers and landowners living beside the river and have land at the river side (claim de facto ownership) also fix *kathas*. The *khatas* are fished in the dry season. In most of the *kathas* branches of *hijol* trees (swamp tree species) are used. The fishers mentioned that if they use the branch of *hijol* tree they get more fish. They mentioned that the fish prefer hijol branches. The catch from *kathas* include boal, (*Wallago attu*) are (*Mystus aor)*, chital (*Notopterus chitla*) of big fish and several species of small fish. According to fishers opinion they get less fish than in the past. In the *katha,* which are owned by the non-fishers, are fished by the fishers on contact basis. As per the contract with the owners, the fisheries get (20-30% of the total catch). This percentage of ratio varies depending on contract arrangement between katha owner and fishers. Ber Jal and Jhaki Jals are used in *katha* fishing.

4.3 Fishing

4.3.1 Access to fishing

It was observed that the Beels and rivers are open for the fishers and local people. It is reported that fishers community who lives very closed to the water bodies (Beel and river) do more fishing in their adjacent water bodies than that of the fishers from the distant villages. Fishers from the distant villages are also allowed to catch fish in rivers, Beels and floodplains. However, fishing in Kathas is not open, only the owners of katha can fish there.

4.3.2 Fish Markets

Fish catch for from the water bodies are sold in the local markets. Normally traditional fishermen sale their fish in the Kaliakair market which is the biggest one of that area. The names of fish markets in the area in given Table 14.

Table 14: List of prominent markets in the project area

SL. No	Name of market	Locations
1	Boali	Boali Union, Kaliakair, Gazipur
2	Laskarchala	Maddyapara Union Kaliakair, Gazipur
3	Medi ashulai	Chapair Union, Kaliakair, Gazipur
4	Khaitar hat	Chapair Union, Kaliakair, Gazipur
5	Barai bari	Chapair Union, Kaliakair, Gazipur
6	Kaliakair	Srifalltoli Union, Kaliakair, Gazipur
7	Simultoli	Mouchak Union, Kaliakair, Gazipur
8	Majukhan	Mouchak Union, Kaliakair, Gazipur
9	Sinabahor	Mouchak Union, Kaliakair, Gazipur
10	Safipur	Mouchak Union, Kaliakair, Gazipur
11	Mouchak	Mouchak Union, Kaliakair, Gazipur
12	Board ghar	Sutrapur Union, Kaliakair, Gazipur
13	Mirzapur	Mirzapur, Tangail

4.3.3 Fishers Community

Normally the fishers (traditional fishers) community lives close to the availability of fishing opportunities. The fisher community in the area in general found to be very poor and most of them are illiterate. They are involved in fishing from over generations. During the field visit, the team tried to identify the fisher village in the project area. Around 20 fishers, villages are identified which are dispersed in the area. The list of fisher community villages mentioned in

this report (Table 17) regularly fish in the water-bodies within the project area. It is also learned that the fishers from distant villages like Basail, Delduar and Bhuanpur also come to this area for fishing. Notable fisher villages in the area are Nama Sutrapur, Chapair, Saturia-Sailhati, Banghata, Fatepur and Trimohani.

4.3.4 Fish price in the project area

The team collected the fish price in the area during their field visits. Table 15 shows that the price is varied between whole and retail sale markets. This is also varied among the species.

Table 15: Fish price in the local market of the project area

[SL. No	Name of fish species	Fish price (take/kg) at retail market	Fish price (take / kg) in whole sale market
1	Carfu	100-120	80-100
2	Koi	200-250	180-220
3	Shing	250-300	225-275
4	Silver carp	70-90	50-60
5	Nura/ Rui	80-100	60-80
6	Faka/ Catla	110-120	80-100
7	Thai Sarputi	70-90	70
8	Mirka	70-100	75
9	Shoal	120-140	100-120
10	Taki	80-100	70-90
11	Boal	100-140	80-120
12	Ayre	90-130	75-100
13	Prawn	200-250	180-200
14	Small fish	80-120	100

4.3.5 Fishing Gears

There were various types of fishing gears were observed in the area. Table 16 Shows that there was seasonal variation in using fishing gears. It also shows that only *beer jal* and *jhaki jal* were found to be used through out the year. The list of the mostly common fishing gears presented in Table 16.

Table 16: Fish Gears used by Months at project area

	Month											
Gears / Traps	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Berjal	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Current jal	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔
Uthal jal	-	-	-	-	-	-	-	✔	✔	✔	✔	✔
Jhaki jal	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Suti jal	-	-	-	-		✔	✔	✔	-	-	-	-
Vashal / Khora		-	-	-	-	✔	✔	✔	✔	✔	✔	✔
Thella jal	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔
Barsi	-	-	-	-	-	✔	✔	✔	✔	✔	✔	✔
Kathi jal	-	-	-	-	-	✔	✔	✔	✔	✔	✔	✔
Dharma jal	-	-	-	-	-	✔	✔	✔	✔	✔	✔	✔
Chai	-	-	-	-	-	✔	✔	✔	✔	✔	-	-
Ghuni	-	-	-	-	-	✔	✔	✔	✔	✔	-	-
Koach	-	-	-	-	-	✔	✔	✔	✔	✔	-	-
Dolla	-	-	-	-	-	✔	✔	✔	✔	✔	✔	✔
Moi jal	-	-	-	-	-	✔	✔	✔	✔	✔	✔	✔
Sachi jal	✔	✔	✔	-	-	-	-	-	-	-	-	✔
Polo	-	-	-	-	-	-	-	-	-	✔	✔	✔

4.3.6 Fishermen Community

As per a census report of 2001, there are 6,919 households (HHs) in whole projet area are involved directly fishing within project area at different location (Table 17).

Table 17. List of village having Fishermen Families at project area

SL. No	Name of the village	Name of the Mouza	Name Union / Thana / Dist	No of HH	Fishing sites
1.	Gupinpur	Saturia Soulhati	Maddyapara, Kaliakair, Gazipur	230	Mokash bbeel and Turag river
2.	Sholhati	Sholhat	Maddyapara, Kaliakair,	110	Mokash bbeel and Turag river
3.	Majukhan	Majukhan	Maddyapara, Kaliakair,	422	Mokash bbeel and Turag river
4.	Sinabohar	Inabohar	Mouchak, Kaliakair	325	Mokash beel and Turag river
5.	Rangamati	Rangamati	Mouchak, Kaliakair	75	Mokash bbeel and Turag rivr
6.	Vangar Jangal	Vangar Jangal	Mouchak, Kaliakair	116	Mokash beel and Turag river
7.	Taltali	Taltali	Mouchak, Kaliakair	151	Mokash beel and Turag river
8.	Bagamber	Bagamber	Mouchak, Kaliakair	140	Mokash beel and Turag river
9	Kalidaha	Tela Satulia	Mouchak, Kaliakair	80	Mokash beel and Turag river
10	Barai bari	Baraibari	Chapair, Kaliakair, Gazipur	528	Ujan beel and Turag river
11	Boali	Boalia	Boali, Kaliakair, Gazipur	330	Boali beel and Turag river
12	Sutrapur	Strapur	Sutrapur Union,Ka;liakair, Gazipur	380	Bangsai river
13	Chapair	Chair	Chapair union, Kaliakair,Gazipur	600	Turag ,Bangshi river, Aola, Ukan mari beel
14	Ashuria bari	Ashuria bari	Chapair union, Kaliakair,Gazipur	172	Chanpatra beel and Turag river
15	Medi ashulai	Medi ashulai	Chapair, Kaliakair, Gazipur	803	Aola beel, Turag river
16	Nama ashulai	Nama ashulai	Chapair, Kaliakair, Gazipur	273	Aola beel, Turag river
17	Kuri para	Kuripara	Chapair, Kaliakair, Gazipur	190	Ukan mari beel, Turag river
18	Hijaltali	North hijaltali	Sutrapur Union, Kaliakair,	240	Bansai River
19	Hajaltali	South Hijaltali	Sutrapur Union, Kaliakair,	90	Bansai River
20	Kucharosh	Kucharosh	Mouchak, Kaliakair	48	Mokash beel and Turag river
21	Karolsurichala	Karolsurichala		259	
22	BashTali	BashTali	Chapair	326	
23	Amdoir	Amdoir	Mouchak	240	
24	Kouchakuri	Kouchakuri		82	
25	Jhengichala	N-Loshkarchala		230	
26	Haturichala	Haturichala		390	
27	Borochala	N-Loshkarchala		89	
			Total	**6,919**	

4.3.7 Fish Availability (Common, Rear and Extinct Species)

The local people and fishers that some of species of fish are common and some are rare in the area. The total number of fish species of the project area is 43 (Table 18). The list of common and rare fish species are mentioned in Table 19 and 20. The local people mentioned that in the past all these species were available.

Table 18. List of fish species observed in IPAC Turag-Bangshi Site

Sl. No.	Name of fish	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
01	Jat Puti	✔	✔	✔	✔	✔	✔		
02	Kanchan Puti					✔			
03	Tit Puti			✔	✔	✔	✔		
04	Chola Puti					✔			
05	Mola	✔	✔	✔	✔	✔	✔		
06	Dhela					✔			
07	Chela				✔	✔	✔		
08	Ranga Chanda		✔	✔	✔	✔	✔		
09	Lamba Chanda	✔		✔	✔	✔	✔		
10	Col Chanda				✔	✔	✔		
11	Chapila	✔		✔		✔			
12	Lhakisa			✔	✔	✔	✔	✔	✔
13	Lal Khalisha			✔	✔	✔			
14	Chuna Khalisha		✔	✔	✔		✔	✔	✔
15	Danbkina			✔	✔	✔	✔		
16	Koi							✔	
17	Kali/Napti Koi			✔	✔	✔	✔		
18	Bele	✔	✔	✔		✔	✔	✔	✔
19	Rani						✔	✔	
20	Kachki		✔		✔				
21	Gutum	✔		✔		✔	✔		
22	Khalla / Kharshulla				✔		✔		
23	Boro Baim			✔		✔	✔		
24	Guchi Baim	✔	✔	✔		✔			
25	Tara Baim	✔	✔	✔	✔	✔			

26	Taki					✔			✔
27	Shol		✔		✔	✔		✔	
28	Cheng							✔	
29	Tatkini					✔	✔		
30	Goisa					✔	✔		
31	Tenors	✔	✔	✔		✔			
32	Bashioata / Kaili								✔
33	Shing	✔				✔			
34	Hilsha				✔				
35	Rui			✔					
36	Mrigel			✔	✔				
37	Gura Echa	✔	✔	✔	✔	✔	✔	✔	✔
38	Ghaura	✔							
39	Buth Koi Baki Chata					✔			
40	Dimua/ Kathakia Echa			✔					
41	Koral / Vetki					✔			
42	Gura Gutum					✔			
43	Guri Bila					✔	✔		
Total: 43 Species		**12**	**12**	**21**	**19**	**31**	**21**	**7**	**6**

Note:- Site-1: Mokash Beel (South); Site-2: Mokash Beel (North); Site-3: Kalidaha Beel; Site-4: Mokash Khal / Solhati Khal (Canal); Site-5: Turag River (River Sec. 2 km); Site-6: Aowla Khal (Canal); Site-7: Aowla Beel; Site-8: Bangsai River (River Sec. 2 km)

Table 19. List of locally extinct fish species

SL. No	Name of extinct fish species	Scientific name
1.	Mane	*Nadus nandus*
2.	Kalibaus	*Labeo calbasu*
3.	Silon	*Silonia silonia*
4.	Ghaira	*Clupisoma garua*
5.	Fasa	*Setipinna phasa*
6.	Nandina	*Nandina nandina*
7.	Kaunia	*??*
8.	Bata	*Labeo bata*
9.	Golda chingri	*Macrobrachium rossenbergi*
10	Along	*??*

Table 20. List of locally rare fish species

SL. No	Name of rare fish species	Scientific Name
1.	Rita	*Rita rita*
2.	Sarputi (Local)	*Puntius sarana*
3.	Chital	*Notopterus chitala*
4.	Foli	*Notopterus notopterus*
5.	Ayre kata`	*Aorichthys seengala*
6.	Raik/ Tatkini	*Cirrhinus reba*
7.	Bagha ayre	*Bagarius bagarius*
8.	Gazer	*Channa marulius*
9.	Chapila	*Gudusia chapra*
10.	Pabda	*Ompak pabda*
11.	Pangas	*Pangasius pangasius*
12.	Jeol	*Heteropneustes fossilis*
13.	Buguri	*Mystus tengra*
14.	Batashi	*Pseudeutropius atherinoides*
15.	Mola	*Amblypharyngodon mola*
16.	Chella	*Salmostoma bacaila*
17.	Boal	*Wallago attu*
18.	Kakila	*Xenentodon cancila*

4.3.8 Problem and issues for fisher community

The local people and fishers reported that the fish production and species diversity in the rivers has declined to very low level. They mentioned that in the dry season low water flow and over fishing are the main causes for reducing fish in the river. While RRA was conducting fish species found in the rivers were puti, tengra, baila, gharua, baim, chingri, boal, ayre, chital, rui, catla and other small fishes. The fishers reported that there is no restriction in fishing in the river all over the year. They also mentioned that sometimes, local influential people create problem during fishing in order to get fish from them free of cost or with low price compare to the prevailing market rates.

As reported by the local people that in the past there were numbers were trees along the riverbanks. At present, no trees were found. Wildlife habitat also lost. Local people also mentioned that riverbank erosion is comparatively more than that of the past.

4.4 (1) Pollution

The project site is closed to semi-industrial area along Dhaka -Tangail road. Some industries are present in the project area in Kaliakair area. The Industrial effluents are continuously polluting the Beels and river water. In the dry season situation aggravates. The list of the industries from which directly effluents are coming to Beels and rivers is given in Table 21.

Water of the Mohesh Beel is polluted by the industrial wastage. It is now great concerned of the community. In this regard, local people have already made appeal to the union council with copy to the concerned agencies including Prime Minister Secretariat.

Turag-Bangshi River Basin in Gazipur / Tangail Districts is a river with adjacent Beels connected via khals to the river channel, representing deeply flooding Jamuna-wetland ecotypes. Wet season water area is approximately 8000 -10,000 ha while the dry season water area is less than 1000 ha. The floodplain is typical of other shallow vegetation rich haors.

By the end of the 1999 dry season portions of the Turag / Bangshi River had completely dried into a series of pools. Out of 26 Beels only one (Kalidaho) maintained minimal amounts of water. Fishers reported lower catch and fewer species compared to past years. Data on fish catch collected by MACH showed only 37 species of fish present in the catch, and only one of which was reverine. The catch-to-date includes primarily Beel resident generalist species.

At the Turag site, industrial pollution was identified by local residents as the most serious problem facing their community. Other major environmental problems that have contributed to the declining fish catch include:

• *Lack of dry season water*. The Turag-Bangshi River has become merely a series of disconnected pools in the dry season. Instead of year-round and none of the old permanent Beels retain water. Water shortages in the dry season are mainly a result of a combination of factors including deforestation in the upstream forests and riparian zones, excessive water for '*boro*' rice irrigation and the existence of the Farraka Dam.

• *Pollution* . An additional problem at this site is industrial pollution from industries on die Dhaka-Tangail Highway. This includes raw wastes from tanneries and from garments-related industries. The residents of the Mokash Beel area have identified pollution as their most pressing environmental problem. Other problems reported were reduced rice yields, dying fish, bad smells, inability to use die khals and Beel for stock watering, etc.

• *Sedimentation:* Many permanent Beels, khals and riverine scour holes have been lost or are in the process of disappearing due to rapid sedimentation of the river, Becls and khals. This is mainly due to deforestation of upland areas, loss of riparian cover, simplification of stream channels through stream canalization and flood control embankments.

• *Over-fishing and destructive practices:* A major problem is late dry season fishing in the deep scour holes of the Turag River. These scour holes are the only permanent water in the Turag Basin and remaining fish and other aquatic animals (including the endangered Gangeatic dolphins) seek refuge in these pools. The Turog/Bangshi is the main sources of broodstock and aquatic biodiversity in this region.

- *Lack of permanent water*: Lack of permanent water is the most critical factor in rehabilitating the aquatic environments of the Turag-Bangshi Basin. The immediate MACH focus will be with the community, to re-establish sources of permanent dry season water within the beels possibly through re-excavation and sanctuaries. Additionally, MACH will work with the local community to encourage the establishment of seasonal scour holes sanctuaries in the Turag River.

The pollution issue is being addressed through a combination of field studies to establish the nature of the pollution and plans to offer the polluting industries some technical ways to solve the problem. If these fail, legal recourse will be sought through the Department of Environment.

Table 21: List of the name of major industries and the name of directly effected Beels then River

SL. No	List of Industries	Location	Effected beels/Rivers
1	Rahim Textile	Safipur, Kaliakair Union Gazipur	Mokash Beel / Turag river
2	Appex Weaving	Purbachandra, Mouchak Union, Kaliakair, Gazipur	Mokash Beel / Turag river
3	Fareast Industries (garments)	Chandra , Mouchak Union, Gazipur	Mokash Beel / Turag river
4	Appex Weaving	Chandra , Mouchak Union, Gazipur	Mokash Beel / Turag river
5	Appex Tannery/Foot ware	Chandler, Mouchak Union, Gazipur	Mokash Beel / Turag river
6	Devine Textile/garments	Chandra , Mouchak Union, Kaliakair, Gazipur	Mokash Beel / Turag river
7	Aimon Textile	Chandra , Mouchak Union, Kaliakair, Gazipur	Mokash Beel / Turag river
8	Purbani Fabrics	Noor bug ,Mouchak Union, Kaliakair, Gazipur	Surface flow / Turaga River
9	Daeyu Bangladesh (garments)	Vannara, Mouchak Union, Kaliakair, Gazipur	Surface flow / Turaga River
10	Newtex Mill Limited	Gorai Union, Mirzapur, Tangail	Baro beel / Bangsai river
11	Uttra Textile	Gorai Union, Mirzapur, Tangail	Baro beel / Bangsai river

While conducting the RRA one of the major problems identified at the Mokesh Beel site of Kaliakair is the high pollution load entering into the Beel system from around a dozen industries located along the Dhaka Tangail high ways. This is causing serious problems for local people and is affecting both fish as well as crops in the Mokesh Beel.

4.4 (2) Industrial pollution mitigation

Bangladesh has maintained an ipressive rate of economic growth in recent years, areraging 5% per anum growth in GDP over the last five years, with growth in the ready made garments (RMG) manufacture being particularyly good. Much of this growth has been generated by small and medium-scale enterprise (SMEs) and it is likely that the future development path of Bangladesh will remain closely linked to the performance of these industries. Most of them are found near the banks of natural streams or rivers in an industrial belt around the rapidly growing urban centers. However, this economic growth has brought with a range of problems, particulary extensive water and air pollution. The principal polluting industries are textile (dyeing and printing), tanneries and paper and pulp, the former two being principally export oreinted industries. The polllution can be broadly categorized into biodegradable organic compounds, non-biodegradable or persistent organic compounds and heavy metals. All of these effuents need treatment before disposal, although the vast proportion of waste is discharged without treatment.

One of the biggest industrial clusters in Bangladesh is located in Kaliakoir Upazila north of Dhaka, where there are many textile and dyeing factories. During participatory planning the communities which MACH has been working with in the Turag River floodplains reported that these industries use the surrounding wetlands, particularly Mokesh Beel and Ratanpur Khal, which flows through the beel, as a disposal groudn for untreated waste, which they reported resulted in poor catches of bad smelling fish. Effluent from industries downstream in the Turag catchment also appears to be entering the rever and is carried upstream during low river flows by tidal effect. As a result, water quality has deteriorated to a level which is unsuitable for certain types of aquatic life.

Since 1999 MACH Project has addressed industrial pollution issues of Kaliakoir, where more than 274 industries are located. Most of these industries are socially compliant but not environmentally compliant. It is estimated that these industries are discharging 30 billion litres of waste water in surrounding water bodies, particularly Mokesh Beel and Ratanpur Khal. In addition, effluent from industries downstream in the Tugar catchment also appears to be entering the rever and is carried upstream by late season tides. Large areas of surface water have a dark black appearnace and foul smell due to high sulfide levels and low or no oxygen in dry season. There are also reports of poor catches and large fish kills in the araa during dry season.

Regular monitoring results indicated that water ing the beel and khal has biological and chemical oxygen demands respectively more than double and more than four times higher than the national acceptable standard, high chemical oxygen demand, seasonall high pH levels of between 9-11 and sulfide concentrations tha averaged 50% above the national acceptable standard but peaked at five times that level (Table 22 and 23). High concetrations of heavy metals such as chromium were also fournd in surface water close to the industries, although aquatic plants were found to absorb some of this pollution such that sediments wesre within European permissible levels, the possible effects of animal and human consumption of these plants is not known. The problems were traced to local textile related industries which were found to be inefficient – producing more waste water with higher biological oxygen demand than both Bangladesh and World Bank standards. Focus group discussion and in-depth interviews with community members and health practitioneres revealed that the preception of the community is that health problems are increasing as a result of industrial pollution of the wetlands that they traditionally use as a source of water to irregate crops, for bathing and for fishing.

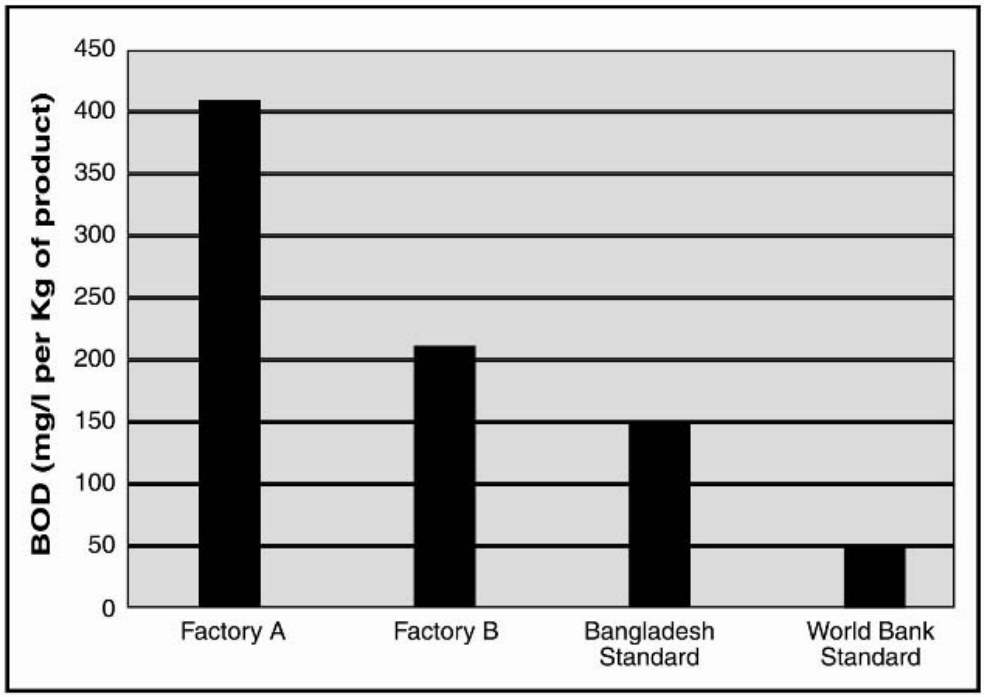


Fig. 21. BOD levels of factory effluent in Kaliakoir

Table 22. Median values of different parametes in water in seven locations of Mokesh Beel ecosystem in 2001

Parameter	Bangladesh Standard (mg/l)	Median value (mg/l)	Range (mg/l)
BOD	150	407	380-500
COD	200.0	960	350-1600
DO	4.5-8.0	1	0.6-1.2
TSS	100.0	195	115-10.2
Sulfide	2.0	3.1	1.6-10.2
Oil and grease	10.0	27	17-45

Table 23. Results of 24-hour composite effluent samples from five textile factoris

Identification number	pH	COD (mg/l)	BOD5 (mg/l)	Sulfate (mg/l)	TDS (mg/l)	TSS (mg/l)
Factory	9.7	161	41	85	1354	108
Factory	8.9	748	210	215	1284	33
Factory	11.2	522	144	90	1280	171
Factory	9.4	174	87	520	1266	43
Factory	9.4	654	198	20	2998	27
Maximum permissible in textile effluent	9.0	200*	150	-	2100	100

*Refers to surface water as no limit is given for textile effuent

To support the RMOs so that they would be able to show evidence of water quality trends in the area, and considering reports that in the dry season poor water quality in the Turag River was affectin the overall fishery, MACH trained and equiped local volunteer

college students to become monitors for regular DO sampling in the beel and river. This program will continue long term through the UFC providing funds for the costs of monitoring from its endowment income. This monitoring has revealed that along most of the Turag River within the area managed by RMOs and downstream, there is little or no detectable DO in the dry season. (Fig. 21)

Research in the industries themselves identified potential alternatives production options which can increase dye fixation by up to 70% and consequently save an average factory about US$ 67,000 a year and significantly reduce repeat dying and effluent dicharge. Some of the industries are now showing an interest in adopting these technologies. The studies also highlighted the need for more efflluent treatment facilities and better management of those that already exist. Effluent Treatment Plants are a legal requirement for factories approved after 1995, but in 2000 only two factories in the area had such plants and they were functioning below optimum. The project has worked with industries to advise on setting up treatment plants and one new one has been established and four more are under construction. However, the number of textile related factorirs in the area increased from 20 to 80 in late 2005, so the pollution problem overall is worsening. This means that there is an immediate need to increase the rate of implementation of proposed pollution mitigation options if ther is to be any reduction in pollution. Wilthout this the efforts of the communicaties and MACH that have seen fish yields in the grater Turag-Bangshi area restored from about 60 Kg/ha to 300 kg/ha by 2004 are likely to be irreplaceable lost.

To support the industries to clean up, web-based networks for dye managers and ETP managers (http://www.sei.se/asia/dyenetwork/, http://www.sei.se/asia/etp) have been estableished; six booklets ans four briefing notes have been published and distributed to BGMEA members, BTMA members, factories in the Kaliakoir area and international buyers, and workshops have been held with the major buyers and through them with their suppliers. However, while most industries within the project area seem to be convinced of the need for cleaner production and to comply with laws regarding effluent, adoption by the industries has been very slow. This has frustrated the RMOs which have lobbied locallly through their own production of posters and holding meetings and rallies.

4.4. (3) Possible Intervention

In the discussions, it was felt that local people wanted to improve the resources and manage it in sustainable manner. For this purpose, the local people (fishers, Farmers and others elite) proposed the following intervention in the project site as per listed (Table 24).

Table 24. List of major issues and suggestion for possible intervention to prevent pollution

Major Issues	Suggestions for possible Intervention
Water pollution in Mokash Beel	Awareness development; Enforcement of Government rules; Lobbing with the concerned agencies
Siltation of canals	Planning with community people. Involve the community in implementing the re-excavation works.
Lack of Kum/Duar management	Some kums should be declared as sanctuary. Community management unit should be organized to protect the kums.
Lack of Beel sanctuary	Establish Beel sanctuary in consultation with the local people.
Use of harmful gears for fishing	Awareness program to be conducted at the community level. Fishers and other local people should participate. Community will decide what types of gears should be band
Lack of River dolphin conservation program	Awareness and sanctuary
Deforestation of Tree along the river and canal sides	Flood tolerance trees including Hijal tree plantation program would be suitable
Lack of River Development program	In the places where siltation is high, river re-excavation would be suitable option for make the river active during the dry season
Fishing through de-watering of water bodies Beels	Fishing through de-watering should be stop to keep the parent stock.
Over fishing	Alternate income earning scope should be created through skill training
Lack of environmental knowledge	Organized environmental awareness programs
Mono crop cultivation (HYV)	Demonstration program for crop diversity.

4.5 Beels, Khals and Kums

Major Beels, Khals and *Kum*s of the project area are mentioned in Table 25 and 26 with other relevant information.

Table 25. List of Beels and Connected khals of the project area

Name and Location of Beel	Connected canals	Physical Status	Area of Beel (acre)		Types of Beel	Locations
			Wet	Dry		
Dubail beel	Dubail Khal	Active	200	-	Seasonal	Maddyapara UP, Kaliakoir
2. Khunai Beel	Golachipa Khal	Silted partially	125	-	Seasonal	Maddyapara UP, Kaliakoir
3. Ukai Beel	Ukai Khal	Silted	25	10	Perennial	Maddyapara UP, Kaliakoir
4. Kamlai Beel	Kamlai beelar khal	Silted partially	50	8	Perennial	Maddyapara UP, Kaliakoir
5. Mokas Beel	Saturia Solhati Khal	Silted partially	800	20	Perennial	Mouchak UP. Kaliakoir
6. Kalidaha Beel	Saturia Solhati Khal	Silted partially	50	10	Perennial	Mouchak UP. Kaliakoir
7. Ujan Beel	Boali/Narandra/ Dakurail	Mostly Silted	150	50	Perennial	Boalia UP, Kaliakoir
8. Chanpatra Beel	Nikna khal	Active	140	-	Seasonal	Chapair UP, Kaliakoir
9. Aola Beel	Nikna / Kuripara / Talinar / Umad ali	Mostly silted	1000	-	Perennial	Chapair / Asgana UP,Kaliakoir / Mirzapur
10, Ukanmari Beel	Ukanmari Khal	Mostly Silted	10	5	Perennial	Chapair UP, Kaliakoir
11. Ziddhara Beel	Varpara khal	Mostly Silted	100	-	Seasonal	Asgana UP, Mirzapur
12. Sayardoka beel	Surface flow to Kumid purar khal	-	7	2.5	Perennial	Sutrapur UP, Kaliakoir
13. Khar beel	Surface flow to Kumid purar khal	-	5	2	Perennial	Sutrapur UP, Kaliakoir
14. Baker beel	Surface flow to Kumid purar khal	-	5	1.5	Perennial	Sutrapur UP, Kaliakoir
15. Banpair beel	-	-	8	1.5	Perennial	Sutrapur UP, Kaliakoir
16. Fakir beel	Surface flow to Kumid purar khal through pipe	-	5	-	Seasonal	Sutrapur Union, Kaliakoir
17. Boro Beel	Kumidpurar khal	Mostly silted	35	7	Perennial	Sutrapur Union , Kaliakoir
18. Jogar hari Beel	-	-	225	50	Perennial	Asgana, Mirzapur,
19. Pora Beel	-	-	30	3	Perennial	Fatehpur, Mirzapur,
20. Tangra Beel		-	20	2	Perennial	Fatehpur, Mirzapur
21. Sobulla Beel	Sobullar canal	-	125	-	Perennial	Fatehpur, Mirzapur
22. Doika beel	Kumidpur khal through small khal to Bangsai river	Mostly silted	2	.25	Perennial	Sutrapur UP, Mouza Uttar Doriarpur, Kaliakair
23. Puber beel	Kumidpur khal through doika beel to Bangsai River	Mostly silted	5	2	Perennial	Sutrapur union, Mouza Uttar Doriarpur, Kaliakair

Table 26. List of *kum*s Observed in April 1999 (Kaliakair bazar to Mirzapur bazar)

Locations	Mouza no	Depth (Ft)	Remarks
Kaliakair, Srifaltoli Union, Kaliakair, Gazipur	348	10	
Chapair, Chapair Union, Kaliakair, Gazipur	340	30	
Chapair, Chapair Union, Kaliakair, Gazipur	340	15	
Chapair, Chapair Union, Kaliakair, Gazipur	340	10	
Kuratoli , Ajgana Union, Mirzapur, Tangail	197	15	
Kuratoli, Ajgana Union, Mirzapur, Tangail	197	60	
Palashtoli, Ajgana Union, Mirzapur, Tangail	196	18	
Palashtoli, Ajgana Union, Mirzapur, Tangai	196	15	
Palashtoli, Ajgana Union, Mirzapur, Tangail	196	18	
Palashtoli, Ajgana Union, Mirzapur, Tangail	196	45	
Palashtoli, Ajgana Union, Mirzapur, Tangail	196	50	
Palashtoli, Ajgana Union, Mirzapur, Tangail	196	50	Susuk is there
Chetassorai, Ajgana Union, Mirzapur, Tangail	200	30	
Chetassorai, Ajgana Union, Mirzapur, Tangail	200	60	Susuk is there
Chetassorai, Ajgana Union, Mirzapur, Tangail	200	50	
Chetassorai, Ajgana Union, Mirzapur, Tangail	200	60	
Beltoil, Ajgana Union, Mirzapur, Tangail	195	25	
Gorai, Gorai Union, Mirzapur, Tangail	161	75/ 80	Susuk is there
Rahimpur, Gorai Union, Mirzapur, Tangail	160	40	
Salimnagar, Ajgana Union, Mirzapur, Tangail	165	15	
Salimnagar, Ajgana Union, Mirzapur, Tangail	165	45	
Salimnagar(3), Ajgana Union, Mirzapur, Tangail	165	45	
Salimnagar, Ajgana Union, Mirzapur, Tangail	165	70	
Baoba Kumarjani, MirzapurUnion, Mirzapur,Tangail	167	40	
Garail , MirzapurUnion, Mirzapur, Tangail	168	40	

4.6 Hydrology of the Turag-Bangshi floodplain

The hydrology of Turag-Bangshi has been highly affected by the lower flow in the Ganges since the early 1970's. it is also always defined by the two dominant seasons in Bangladesh. In the monsoon season, (July to December), rainfall is around 70-80% of the local annual rainfall. The drainage network is filled along the major rivers by a wide overland flow, and rivers are no more then preferential high velocity channels within the floodplain. Drought conditions follow the monsoon (December - June). While the main rivers continue to be naturally fed, the local dry season irrigation practices deplete the smaller rivers, which have no active catchments.

4.6.1 Rainfall

Rainfall during the December to March period equals to 2 to 3% of the annual. In the pre-monsoon period from March-May, 20-25% o the annual total occurs. Also during this period temperature rises to a maximum of over 40 °C. The south-west monsoon begins in June and lasts until October and the rainfall during this period is convective. During this season, heavy rainfall occurs over the whole region, and relative humidity remains very high. The total annual rainfall shows a minimum value at 1400mm around Tangail. The rainfall over the region varies spatially and temporally.

The Bangladesh Water Development Board (BWDB) has a rain gauge station at Mirzapur which has been monitoring daily rainfall since 1957. Figures 22 show a graph of the monthly wet and dry season rainfall of Mirzapur. Rainfall increase is recorded for May with the peak recorded in August.

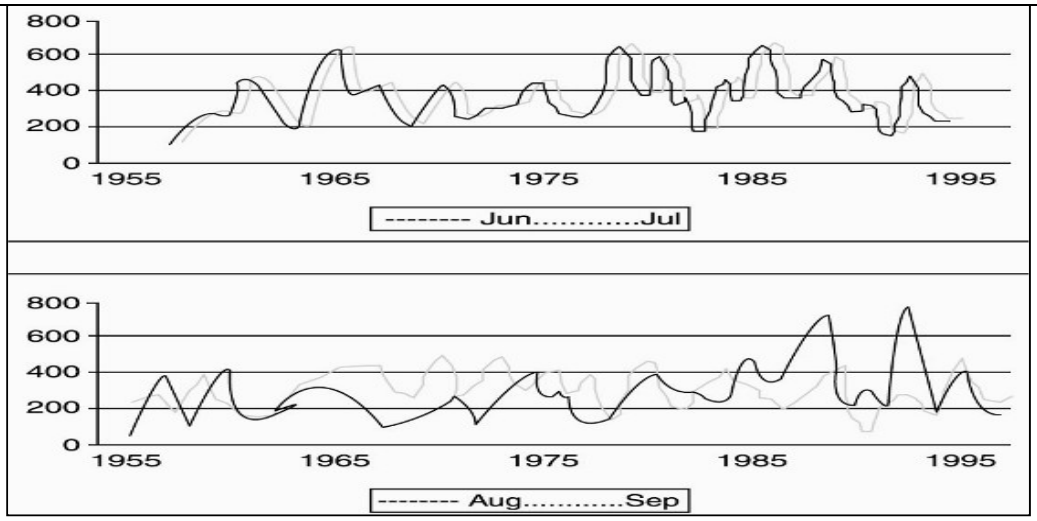


Fig. 22. Historical monthly rainfall in Mirzapur during the Wet season.

4.6.2 Rivers

Historical Water Level of Bangshi River

The Bangladesh Water Development Board (BWDB) has been monitoring the water level at Kaliakhair and Mirzapur on the Turag-Bangshi River. Average daily water level has been monitored since 1950 without considering the tidal effect in the river. However, according to residents the Turag at Kaliakhair Town has been experiencing greater tidal influences for the last two decades, particularly in the dry season. BWDB has tidal gauge stations on Tongi Khal and Buriganga River, downstream of the Turag River 2, which monitors daily maximum and minimum water levels

Figure 23 shows the historical wet season and dry season water level of the Bangshi River at Kaliakhair Town. Before 1970, dry season and wet season water levels show a normal trend. However, after that year the lowest water level recorded continued to decline while the levels at high flow moved up. The reasons behind these are the Farakka Dam, deforestation, Boro-rice irrigation, etc. The Farakka barrage has had a significant impact on the major and minor rivers of the region since the barrage began operating after 1970.

Withdrawal of water from the Ganges River by the Farakka Barrage during the dry season has reduced the flow not only in the Ganges but also in the other rivers that make up the Ganges-Brahmaputra-Meghna system. As the dry season Ganges flow decreased due to the influence of Farakka, other rivers in the catchment began down cutting to meet these lower flows. This has resulted in lowered channel flows and water tables throughout the region. Turag-Bangshi is not fed by the Ganges, but it is indirectly fed by the Jamuna / Brahmaputra River, and the decrease of dry-season flow of the Ganges as well as ground water losses causes the decrease of water level of Jamuna, which drains into the Ganges at Bahadurabad.

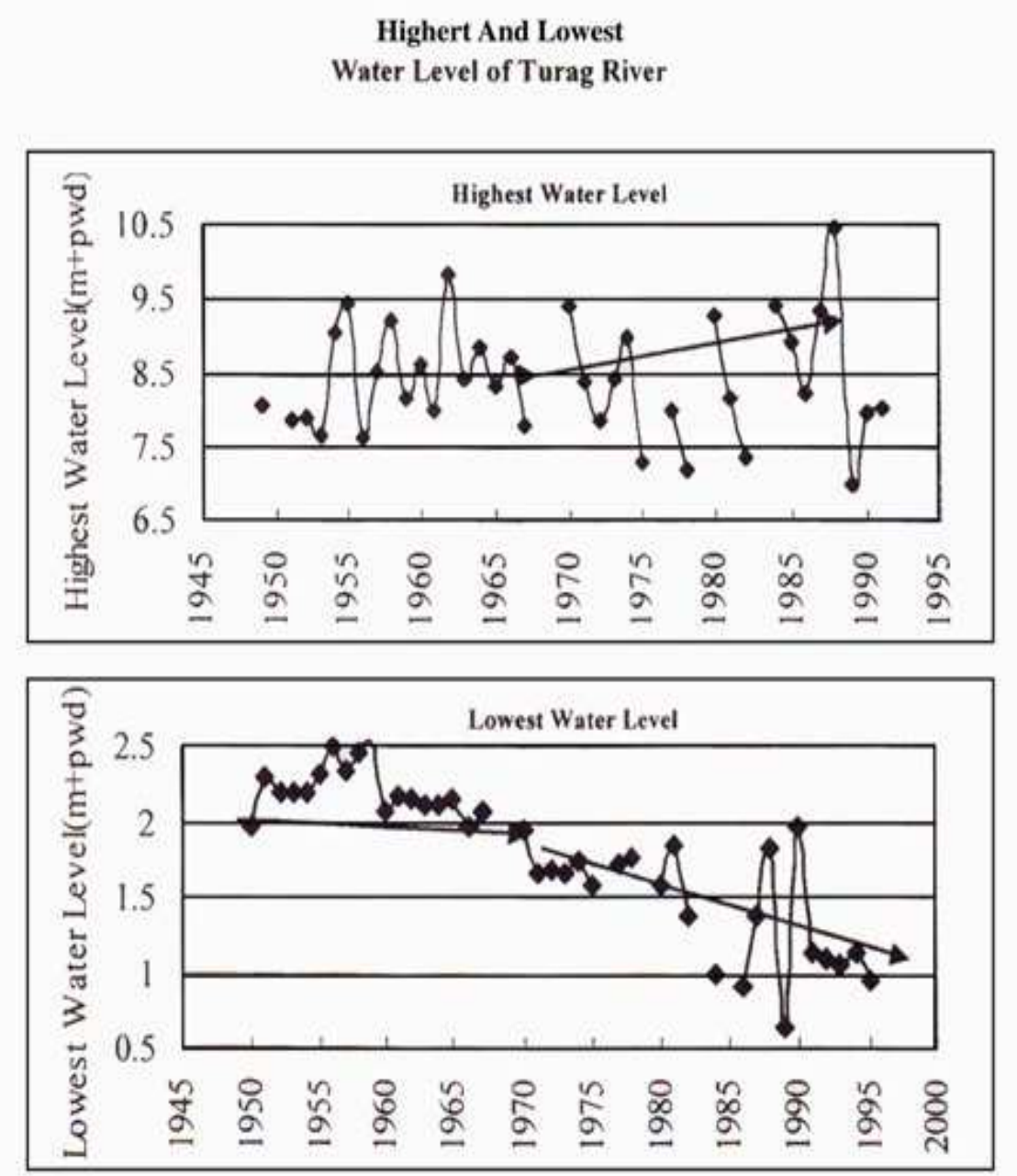


Fig. 23 : Historical maximum and minimum water level of Turag river at Kaliakoir

4.6.3 Tidal effects in the Turag River

The Turag River has been more heavily influenced by the tide during the last two decades particularly during the dry season. This is due to the lowering of flow in the river during the dry season. Turag is connected with Mcghna River through Tongi Khal and the Lakhya River and also with Padma/Gangcs through Buriganga. The river system is shown in Fig. 23.

BWDB data of water levels of Tongi khal and the Buriganga River has been analyzed. DaiK maximum and minimum water levels of Tongi khal and the Buriganga arc shown in Fig. 23Tongi khal has an upward trend for its maximum water level after 1970 whereas Buriganga shows a stable trend. During the last 30 years, the tidal level of Tongi khal in the dry season has increased approximately 40cm. The tidal effect in the Turag is mainly caused by the Lakhya River, which 15 connected with Turag through the Tongi Khal.

;

Beel and Khals

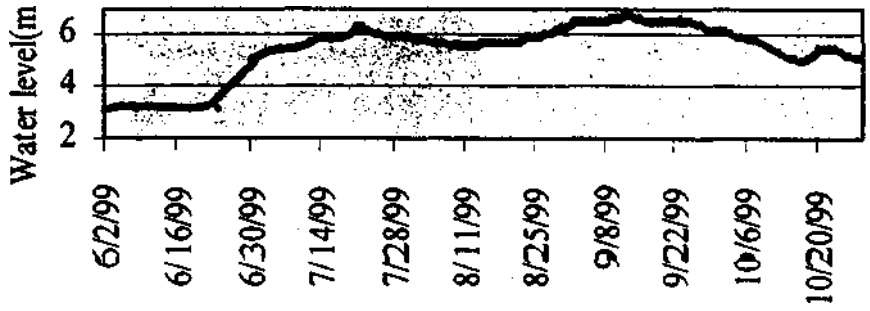
Water Level variation in the Beels

Water levels were monitored in the two major Beels of the project, Aoia Beel and the Mokesh Beel. Two manual gauges were installed in the beets in the month of May 1999. Two potential readers have been taking daily water level records since the installation. Since the two Beels lose connection with the Turag in the dry season, no tidal fluctuation is visible in the Beel during this time.

Figure 24 shows the water level variation in Mokesh and Aoia Beel. The water level of Mokesh Beel increased sharply from die end of June and began to decrease from September. Nodiing can be immediately concluded from this small volume of data. The project needs to continue to monitor the water level.

Water Level of Mokas Beel

(from arbitrary datum)



Water Level of Aoia Beel

(from arbitrary datum)

Fig. 24. Water level variation in Mokash and Aoia Beel

4.6.4 Flow pattern in the Beels.

The Aola and the Mokash Beels are fed by the Turag River and rainfall runoff. Both becls drain to the Turag River by a connecting channel. Their flow pattern varies with season. Their seasonal fluctuation in flow patterns is described below.

a. Pre-monsoon:
During the pre-monsoon period (March to May), the rains account for 20 to 35% of the annual total rainfall. The water level of the Turag remains low at this time. Since the Aola beel catchment area has a higher elevation, as well as a larger area, significant volume of surface runoff from the pre-monsoon rainfall drains to the Turag. The opposite holds true for the Mokash Beel whose catchment area is at a lower elevation. Here, the surface runoff gets stored in the deepest part of the Beel, along with some additional flow from connecting channels. See Fig. 24 for the flow patterns of the beels in the pre-monsoon season.

b. **Monsoon:**
During the monsoon period (June-September), the water level of the Turag rises sharply and water from Turag enters the Aola and the Mokash Beel by the connecting channels. This flow continues till the water level of the Turag reaches its peak. The flow direction during this period is shown in Figure 24

c. Post-Monsoon:
The post-monsoon period is from October-February. During this time, water level of Turag begins to drop and the stored water of both of the beels begins to drain to the Turag. Since the elevation of the connecting channels is raised due to the siltation, at a certain stage, both beels loose their connection with the Turag. The flow direction during this period is shown in Figure 24.

4.6.5 Water problems / Conclusion

Turag-Bangshi River

By the end of the 1999 dry season, portions of the Turag / Bangshi River had dried to a series of pools. Water no longer flowed in this formerly perennial river. Out of 26 beels in the area, only Kalidaha retained some water. Water shortage in the dry season is the result of a combination of factors including deforestation in the upstream forests and riparian zones, excessive water extraction for 'Boro' rice irrigation and the Ganges upstream barrage at Farakka.

People along the river use river water extensively for Boro rice cultivation. During the 1999 dry season, a survey was conducted on water extraction from the river. It was found that around 80 pumps with capacities varying from 6 HP to 12 HP were in operation to extract water from the river.

A. Mokesh Beel
Mokesh beel lacks dry season water. Mokesh is fed by rainwater from its catchment and the Turag River during the monsoon. A large portion of the Beel drains to the Turag at the end of Monsoon. Only a small portion remains in the Beel. The farmers of the surrounding area extract water from the Beel for their Boro field irrigation. An additional problem at this site is industrial pollution from industries on the Dhaka-Tangail Highway. This includes raw wastes from tanneries and garments.

B. **Aola beel**
Aola Beel also exhibits dry season water deficits. Farmers surrounding the Beel use shallow pumps to extract water for their Boro rice field irrigation, virtually draining the Beel in the dry season. Average water depth in the deepest part of the Beel is around 5m in the wet season and retains only a few centimeters in the dry season. It has been a general practice for some years to construct earthen dam on the connecting canal to store monsoon water. However, this has become a social dispute among the people living up and downstream of the dam. The latter are deprived of the stored water.

A submergible sluice gate is under construction near the Medi-Asilia Bridge, some hundred meters up from the disputed site, by the initiative of local UP Chairman

In addition to these problems, many permanent beels, khals and riverine scour holes have been lost or are in the process of disappearing due to rapid sedimentation of the river, beels and khals. This is mainly due to deforestation of upland areas, loss of riparian cover, simplification of stream channels through stream canalization and flood control embankments.

4.7 Water pollution in Turag - Bangshi Site

Industrial pollution has been identified as one of the major factors responsible for environmental degradation mainly affecting this aquatic and ultimately becoming a threat to human life in Bangladesh. The MACH project site in Turag-Bangshi, particularly in the Mokcsh bed area, has a serious environmental caused by heavy discharges of pollutants from several industries. Water pollution in the area has affected the fishes and other aquatic lives of Mokesh beel. In community meetings, the local stakeholders have raised this issue of industrial pollution..

MACH carries out preliminary water quality investigations and meets with concerned industrialists to discuss steps to solve pollution issues at the site. The results of chemical analyses and the outcome of meetings with the local community and industrialists are discussed and steps to mitigate industrial pollution are outlined.

The primary source of water in this area is the Bangshi-Turag Rivers. The original source of the Bangshi, the Old Brahmaputra, is now closed. The river flows south down the western edge of the Madhupur Tract whose ground water provides much of the dry season flow. It divides near Mirzapur town with a portion continuing south and the other portion turning southeast upon reaching the end of the Madhupur Tract. At Kaliakhair town, the river becomes the Turag. The Turag River is connected with Mokesh and Aowlai Beel through Mokesh and Aowlai Khal, respectively. This river divides north of Dhaka and flows into the Shitilaka and Buriganga Rivers, respectively.

The area forms the northern edge of the Dhaka-Tongi-Savar industrial belt and is home to several industries including a major tannery, several textile and textile dying plants, metal anodizing and over 200 poultry farms.

4.8 Pollution Problems

Within the Turag-Bangshi area in Kaliakhair, the Mokesh beel ecosystem is heavily impacted by industrial effluents, which effect biodiversity, soils, water and possibly human health. MACH has documented problems caused primarily by effluents from local industries. Chemical analysis of wastewater and sediments near the discharge points of some local industries show evidence of toxic heavy metals, sulfides and other chemicals in contravention of national and international standards.

Heavy metals found in worrying concentrations include cadmium, chromium, lead, arsenic and Zinc. Other problems include high levels of petroleum distillates, high levels of dyes, sulfites, as well as high COD, BOD and p^H.

The main chemicals used in tanneries arc common salt, sodium sulfide, chromium sulfatc, fad liqueur, formic acid, ammonium chloride, dyes, glazing agents, etc. In textile dyeing and printing units, the main chemicals being used arc caustic soda, hydrogen peroxide, liqueur ammonia, urea, DAP (Di-ammonium Phosphate), binding agents, emulsion paints, pigments and dyes (both heavy metal-based). Dyes include acid reds, acid yellow, direct black, direct violet, etc. These industries also use a vat dying process, which includes sulfur dyes.

The metal anodizing industries use electroplating processes that require the use of HC1, HNO_3 Our tests, taken from the vicinity of the industries, showed that the untreated effluents from these plants are highly acidic. The Zinc content of local sediments was found to be high.

The project is aware that over 200 poultry farms are found in the area. Untreated wastes from the farms are reportedly placed directly into the local streams or khals. The other major pollutants will be the organic wastes, which will have a direct bearing on the BOD values of the water bodies around the areas.

All of these industries are located in or near Ratanpur Khal, which flows into Mokesh Beel, and then into the Turag River, which in turn flows into the Buriganga and Shitiylaka Rivers. Some of the local industries that could potentially cause pollution include •

1. Apex tannery
2. Aymon Textile
3. Rahim Textile
4. Gumti Textile
5. Bangladesh Thai Aluminium
6. Devine Textile
7. Newtex Mill Ltd.
8. Ultra Textile
9. Apex weaving
10. Purbani Fabrics

Physical examination reveals that Ratanpur Khal and Mokesh Beel in Kaliakhair and its surrounding canals and rivers are seriously affected (Fig. 21) by the pollutants discharged by the above mentioned industries. The water is noisome and colored, water birds are rarely found fish production is either not present or decreasing and those fish remaining are reported to smell of kerosene and having a bitter taste. The main Ratanpur khal is biologically dead and the toxicity is expanding to downstream areas. In the dry season Mokesh Beel is badly effected by these pollutants.

Some of the studied trace elements including chromium, zinc, arsenic, cadmium, lead and other parameters which are toxic to fish, human and other organisms are shown. The tables 27 and 28 below show the median values of analyses carried out for sediments and waters at different locations of the area.

Table 27. Median values of heavy metals in sediments in different locations of Mokesh Beel Ecosystem.

Parameter	Median values (ppm)	Range values (ppm)
Arsenic (n=6)	12.5	(4.15- 16.3)
Cadmium (n=6)	1.35	(0.6 - 4.2)
Chromium (n=6)	44	(21.5-5640)
Lead (n=6)	77.25	(46.5 -189.5)
Zinc (n=6)	450	(90 - 882)

Table 28. Median values of different parameters in water in different locations of Mokesh Beel Ecosystem.

Parameter	Median value ppm)	Range value ppm)	Bangladesh Standard ppm)
COD (n = 7)	960	(350 - 1600)	200.0
DO (n = 7)	1	(0.6-1.2)	4.5 - 8.0
TSS (n = 7)	195	(115-427)	100.0
Sulfidc (n = 7)	3.1	(1.6-10.2)	1.0
Oil & Grease (n = 7)	27	(17-45)	10.0

The discussion of test results are as follows:

a) Chromium

Chromium sticks strongly to soil particles when it enters the environment. Most chromium in water sticks to din panicles that fall to the bottom; only a small amount dissolves. Small amounts move from soil to groundwater.

Preliminary studied results showed that total chromium concentration in sediments and waste waters near the discharged points of local tannery and textile industrial area of Kaliakhair MACH project is very high. It is established that chromium is more toxic to fish, human and other aquatic and terrestrial organisms. In surface waters, the most stable forms of chromium are the oxidation states (HI) and (VI). Of these two forms, chromium (HI) is poorly soluble and is readily absorbed onto surfaces, so that the much more soluble chromium (VI) is the most common form in fresh water. For this reason, though chromium (HI) is more toxic to fish and other aquatic organisms. Maximum admissible concentrations for chromium are generally based on toxicity data for the hexavalent form. For example, for the LCso data obtained for different fish species, chromium (HI) compounds are among those substances with a high toxicity to fish (LC_{50}s of 2.0 to 7.5 mg per litre) whereas chromium (VI) compounds are among those substances of medium toxicity (LC_{50}s of 35 to 75 mg per litre). The preliminary test results of MACH project showed two to five times higher than LC_{50} of chromium (VI).

With acute poisoning by chromium compounds, the body surface of the fish is covered with mucus, the respiratory epithelium of the gills is damaged, and the fish die with symptoms of suffocation. Fish suffering from chronic chromium intoxication accumulate an orange yellow liquid in their body cavity.

Chromium is a carcinogen. All forms of chromium can be toxic at high levels, but chromium (VI) is more toxic to humans than chromium (III). Ingesting very large amounts of chromium can caus. stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. Skin contac: with liquids or solids which contain chromium (VI) may lead to skin ulcers. Some people ha\ ^ allergic reactions including severe redness and swelling.

The Environmental Protection Agency (EPA) of USA sets a maximum level of chromium (HI) an: chromium (VI) in drinking water of 100 micrograms of chromium per liter of water (100 ug/1), The National Research Council (NRC) of USA recommends a dietary intake of chromium (III) of 50 200 ug/day. The Occupational Safety and Health Administration (OSHA) of USA sets limits: for an 8-hour workday, 40-hour workweek of 500 ug Cr/m^3 for water-soluble chromium salt Chromium (VI) in workplace air should not be higher than 100 ug/m^3 for any period of time.

b) Cadmium

Cadmium enters water and soil from waste disposal and spills or leaks at hazardous waste sites binds strongly to soil particles. Some cadmium dissolves in water. It does not break down in r environment, but can change forms. Fish, plants and animals take up cadmium from v environment. It stays in the body a very long time and can build up from many years of exposure low levels.

A very low concentration of cadmium may affect fish and other aquatic organisms. General cadmium in surface waters is found together with zinc but at much lower concentrations. The cadmium present in surface waters may be either dissolved or insoluble. Of the dissolved font those which may be poisonous to fish include the simple ion and various inorganic and organic complex ions. Apart from an acute toxic action which is similar to that of other toxic metals (damage to the central nervous system concentrations of and parenchymatours organs), very small cadmium may produce specific effects after a long exposure period. An adverse influence of long exposure to cadmium upon the maturation, hatchability and development of larvae in some species of fish was recorded at concentrations as low as 0.002 mg per litre. The maximum admissible cadmium concentration in water is 0.001 mg per litre for Cyprinids. The preliminary results in MACH project area showed higher value than the maximum admissible cadmium concentration in water. The acute lethal concentration of cadmium for different species of fish is from 2 to 20 mg per litre.

Eating food or drinking water with very high levels of cadmium severely irritates the stomach, leading to vomiting or diarrhea.

Long term exposure to lower levels of cadmium in air, food or water leads to a build-up of cadmium in the kidneys and possible kidney disease. Other potential long-term effects are lung damage and fragile bones.

The Department of Health and Human Services (DHHS) of USA has determined that cadmium and cadmium compounds may reasonably be anticipated to be carcinogens. The Environmental Protection Agency (EPA) of USA allows 5 parts of cadmium per billion parts of drinking water (5 ppb). The Food and Drug Administration (PDA) of USA limits the amount of cadmium in food colors to 15 parts of cadmium per million parts of food color (15 ppb).

c) **Arsenic**

The preliminary studied results showed that the main sources of arsenic pollution in IPAC Kaliakoir Project area are industrial effluents e.g. from tanneries and arsenic-based dye in local textiles. Arsenic is able to accumulate in large quantities in the sediments on the bed of water courses and reservoirs, and in aquatic organisms. Arsenic is toxic to aquatic organisms, including fish. The lethal concentrations in different species of fish during 48 hours exposures ranged from 3 to 30 mg/1.

Arsenic is a powerful poison. High levels of inorganic arsenic in food or in water can be fatal Arsenic damages many tissues including nerves, stomach and intestine, and skin.

Lower levels of exposure to inorganic arsenic may cause nausea, vomiting and diarrhea, and decreased production of red and white blood cells.

Long term exposure to inorganic arsenic may lead to a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles and torso.

Arsenic is a carcinogen. Ingesting inorganic arsenic increases the risk of cancer and tumors of the bladder, kidney, liver, and lung.

EPA has set a limit of parts per million (ppm) for arsenic in drinking water. WHO's maximum allowable limit is 0.01 ppm for arsenic in drinking water.

d) Zinc poisoning offish is most frequently encountered in aquatic organisms and some species of fish such ppm as Cyprinids, especially their fry. The lethal concentrations ranged from 0.01 to 0.1 mg per litre in some species of fish especially for Cyprinids. The concentration of zinc in MACH project area is higher than the lethal range. The clinical symptoms and patho-anatomic picture of zinc poisoning include laboured breathing and, in Cyprinids, gasping for air at the water surface.

The typical patho-anatomic appearance includes a large amount of mucus on body surface, under the gill covers and in the gills.

e) Lead

Lead pollution occurs in the IPAC Kaliakoir Project area. Source of pollution is not only the effluents of lead-based dye in textile industries. In surface water, lead largely accumulates in bottom sediments at concentrations ranged 2 to 3 orders of magnitude greater than in the water.

Acute lead toxicity is characterized initially by damage to the gill epithelium; the affected fish are killed by suffocation. The chemical studied results are two to three times higher than the maximum admissible lead concentration in water is of 0.07 mg per litre for Cyprinids. The acute toxic concentrations in different types of water are in the range of 10 to 100 mg per litre for Cyprinids.

Lead concentration of 80 ug/100 g of blood is the maximum concentration tolerated by adults without apparent ill effects. Children are considerably more susceptible, some youngsters having shown symptoms of poisoning even though the lead concentration was only 60 ug. Above the SO Hg level in adults, the blood, kidneys, and nervous tissue are adversely affected. Brain tissue may be irreversibly damaged. Ordinarily the brain is protected from the toxic materials in the blood, but heavy metals such as lead appear to be an exception. Some of the early symptoms of lead toxicity include headache, weakness, loss of appetite and fatigue, as well as mental depression, apathy, and lack of ambition. Lead poisoning can interfere with the normal process of reproduction. It can injure both sperm and egg cells. Exposure of a pregnant mother to high levels of lead may result in damage to the fetus.

0 Sulfide

Sulfide is also present in local industrial effluents in IPAC-Kaliakoir project area including those from tanneries and dyeing textiles. Sodium sulfide from tanneries and sulfide dyeis from tixtile dyes finishing units are the main sources. The lethal concentrations for different fish species range iron: 0.4 to 4 mg/1 (e.g. carps). According to the preliminary results, it is stated that sulfide concentrations in IPAC Kaliakoir Project are 3 to 10 times higher than the lethal concentrations.

g) Oils and refined products

In the IPAC Turag-Bangshi Project Site, concentrations of oils and refined products in water are much higher than the maximum admissible concentrations (0.003 to 0.025 mg /I for fish). The source of oils and refined products in IPAC Turag-Bangshi Project Site are local textiles and tannery industries.

The sources of oil and grease are mainly from the kerosene used in the textile dyeing units an: waste lubricant and waste oil from captive power generative units. Even very small discharges ca. produce a large area of "sheen" in which the thickness of the oil is about 1 micron.

There are also large differences between oil and its different products as to their toxicity to fish most of them have 48 hours LC so values within the range of 0.5 to 200 mg per litre. The toxic is varies according to the chemical composition of the different products, with the water solubility : the different petroleum hydrocarbons, and with the degree of emulsification of insolub components in the water. It is generally agreed that the lighter oil tractions (including kerosene petrol, benzene, toluene and zytene) are much more toxic to fish than the heavy fractions (hea paraffins and tars). There are also differences in the sensitivity to oils and refined products betv.cc different fish species. The fry of predatory fishes show the greatest sensitivity to refined products

In general, oils and most of the refined products have a narcotic effect on fish; acute symptoms are effects on the nervous system and respiratory activity. The main clinical symptoms include an initial increased activity and respiratory rate followed by a loss of balance, toss of response to stimuli, reduced activity, shallow respiratory movements, and ultimately dead).

The scales of the dead fish are dull in color and are covered with mucus; the skin shows local congestion, the epidermis fractures and peels off, and surface wounds may occur in some cases. Damage to the cornea of the eyes may lead to blindness. The gills show severe dystrophic effects and

necrosis and there may be a proliferation of the respiratory epithelial cells and hypertrophy of the mucus cells. Prolonged exposure to oils at low concentrations can cause severe degenerative necrobiotic effects in the kidneys of the fish and in their eggs. The dead fish have an oily odour and flavour. This has been observed in the MACH project area.

Therefore, toxicity is not the only harmful consequence associated with oil pollution; the aquatic ecosystem in general, and fish farming in particular, can be badly affected by the oil smell and taint of the water and of the organisms living there. For this reason, a sensory assessment is preferred to lexicological analyses in determining the highest admissible amounts of oil and oil products that can be present in water. On this basis, the highest admissible concentrations are in the range of 0.003 to 0.025 mg /I.

h) Dyes

Chemical dyestuffs have been attracting the attention of lexicologists in recent years. These can be present in the effluents from textile productions in the MACH project area. Although these colored effluents are, like oils, very conspicuous even at very great dilutions, they seldom cause severe damage to the fish and other aquatic organisms.

The mechanism of toxic action of effluents containing dyestuffs on fish is not direct in the majority of cases. If the water is heavily polluted with colored organic waste, the increase in the organic content alone can lead to an oxygen deficit. Other dyes may increase or decrease the water pH. Some, e.g. aniline, can act as methaemoglobin poisons and as carcinogenic substances.

The clinical symptoms of fish poisoning by different dyes are not specific. The patho-anatomic changes that indicate such poisoning may include a change in body color due to the particular dyestuff, and the organs inside the fish body may also take on an intensive color, e.g. as with malachite green which group of dyes are very toxic to fish.

i) Chemical Oxygen Demand (COD)

The preliminary results of COD in MACH project area are very high (Annex 2). It is higher by a one-to-two order of magnitude than for the optimal range for Cyprinids in water (20-30 mg O2 per litre). If industrial pollution is continuing at the present rate, then the aquatic organisms in the MACH project area may be endangered very soon.

j) Disclosed Oxygen (DO)

Different aquatic organisms have different requirements for the concentration of oxygen dissolved in water. Some species of fish have the more demanding requirements for oxygen in water, for example, optimum concentration of oxygen for Cyprinids is 6-8 mg /I; and if the level declines below 1.5 to 2.0 mg/1. mg/1 they begin to show signs of suffocation. The preliminary results of the sample areas in MACH project showed two to four times lower values than the optimum concentration of oxygen for Cyprinids (6-8 mg/1).

The oxygen requirements of fish also depend on a number of other factors, including the temperature, pH, and CO2 level of the water, and the metabolic rate offish.

Besides these, preliminary results of the total dissolved solids (range: 500 to 1800 mg/1) and total suspended solids (range: 160 to 600 mg/1) are higher than the Bangladesh standard of 50 and 150 respectively. All of the studied results showed higher values considering all of these studied results, it is concluded that MACH project area is heavily polluted.

4.9 MACH achivements at Turag-Bangshi Site

During MACH Project period a number of development activities implemented successfully. 49 RUG formed and their group saving is Tk. 2106,012. A total of 253 trainings conducted where 4,494 community members participated. These trainings programs include group management, leadership development, resource awareness, accounts keeping, and skill development training of different AIG trades. Under different types of awareness raising program 425 events conducted where nearly 43,000 people participated from different stakeholders' level. MACH also worked in sanitation, health care and other social activities. Under these activities 75 tube wells, 396 pit latrines, 932 pieces warm cloths distributed among the beneficiaries. Total 35 adult literacy courses conducted for the beneficiaries. Several agricultural and fisheries demonstration activities like pond fish culture, vegetable cultivation, plant nursery, maize cultivation etc. implemented that benefited poor stakeholders significantly. Under resource management activities a note worthy development achieved through RMOs formed. A total of 12 threatened fish species stocked in different water bodies. The total number of fingerling stocked is 213,700. 151,310 saplings planted in different areas of project site. 23 number of fish sanctuary established with tetra-pod, hexapod and RCC pipe. Out of 23; 7 are in river and 16 are in different Beels. These sanctuaries are well maintained by concerned RMOs. Detalis of avobe things have mentioned in details in following tabular formts.

4.9.1 Working village covered: 61 (Boali 08, Chapair 16, Fulbari 09, Madhyapara 10, Mouchak 14, Sreefaltali 02, Sutrapur 01 and Azgona 01)

4.9.2 Wetland resource management:

Resource Management		Achievement
• Area under improved wetlands / floodplains resource managements		5,440 ha (Alua-2,450, Turag-155, Mokosh-1,675 & Goalia-1,160)
• Environmental events		769 events with more than 80,000 participants
• Formation of resource management organizations	Beel River Section / daha Committee	2 2 20
• Establishment of sanctuaries		23
• Habitat restoration Re-excavation of wetlands:	Beel Canal	124.38 ha 9.5 KM
• Riparian trees planted		72,893 nos
• Swamp trees planted		44,053 nos
• Roadside and institution trees planted		34,364 nos
• Permanent sanctuary		23 (2 of beel & 3 of rivers are Govt. declared)
• Threatened Fish Stocking		213,700 (12 species)

Special Study	Achievement
• Industrial pollution	Pilot study done and observation continued. New activity and DFID funding started.
• Poultry waste management	demonstration and technical support
• Education program	Primary Schools

Survey and Monitoring	Achievement
Baseline	
• CPUA (Catch per Unit Area)	57.80 kg/ha
• Fish Consumption	27.32 gm / person / day
• Species diversity in catch	82
Impact (6^{th} year impact)	
• CPUA (Catch per Unit Area)	321.00 kg / ha
• Fish Consumption	42.29 gm / person / day
• Species diversity in catch	94

4.9.3 Community Development and Income Generation Activities

Resource Users Group (RUG)	
No of RUGs	49 (Male-28, Female-21) (up to April 2009)
Group savings	Tk.2106012 (Up to April 2009)
Credit Disbursement	Tk.1,85,93,800.00
• RUG members under credit service	889 (up to April 2009)
• Realized amount	Tk.1,51,05,495.00

Training		
Group Development Training	**Sessions**	**Participants**
• Group Managements	61	1,163
• Leadership	22	428
• Resource Awareness	66	1,257
• Accounts Keeping	17	330
Skill Development training		
• Cow rearing and fattening	10	144
• Poultry & Duck rearing	14	177
• Tailoring	7	84
• Driving	3	12
• Traditional Birth Assistance	1	6
• Pond Fish Culture	6	78
• Cage Culture	2	20
• Plant Nursery	7	87
• Vegetable Cultivation	8	157
• Wheat Cultivation	7	196
• Potato Cultivation	1	9
• Vocational Training	2	15
• Adult Literacy Teacher Training	3	16
• Micro Enterpreneurship	6	119
• Development allies training	4	35
• Primary Health Care	15	302
Total:	**253**	**4494**

Awareness Program	Sessions	Participants
• annual Rally	5	3,785
• UP Level	5	2,242
• Village level/ Drama	65	29,541
• Para level	350	7,126
Total	**425**	**42,694**

Sanitation, Health and Others	
Tube Well Distribution	75
Pit Latrines	396
Adult Literacy Course	35
Warm Cloth Distribution	932

Demonstration Activities	Area Decimal	Farmers	Yield kg/dec
• Pond Fish Culture	281	18	13.05
• Wheat Cultivation	901	72	9.03
• Vegetable cultivation	576	138	29.72
• Granular Urea appl.	468	21	28.57
• Road Side Plantation	15 Km	19,348 saplings	
• Plant Nursery	147,143 saplings	10	
• Homestead/ institutional plantation	3,877 saplings	828	
• Potato Cultivation	72	20	80
• Cage Culture	42 Cage	5	
• Elephant foot	51	14	118.5
• Maize Cultivation	155	8	30
• vegetable Gardening	1,538	1,438	77.3

4.9.4 Wetland Resource Management Organizations (RMO's)

Name of organization		Name of water body under management	Unions	No. of Members
	Committee			
Mokesh	Mokesh RMO	Mokesh & Kaliadaha	Mouchak,Madhyapara	133
	Naler Daha Committee	Naler Daha	Mouchak	21
	Moise Daha Committee	Moiser Daha	Mouchak	29
	Burir Daha Committee	Burir Daha, Nepal, Master & Moulavir Ghuni	Madhyapara	31
	Nawkholaq+Dholi Daha Committee	Nawkhola+Dholi Daha	Madhyapara	33
	Tamali Daha Committee	Tamali Daha	Mouchak	19
Turag	Turag RMO	Turag River & associate floodplain	Chapair, Mouchak, Boali, Madhyapara, Sreefaltoli	105
	Section-1 Committee	Golachipa Kum	Madhyapara, Boali	35
	Section-2 Committee	Lalkhar Kum	Chapair, madhyapara	35
	Section-3 Committee	Gabtoli Sayedpur Kum	Sreefaltoli, chapair	35
Alua	Alua RMO	Alua Beel	Chapair, Azgana	182
	Bamoner Ghuni Committee	Bamoner Ghuni	Chapair	35
	Bhangi Danga Daha Committee	Bhangi Danga Daha	Chapair	25
	Doika Daha Committee	Doika Daha	Chapair	19
	Boro Daha Committee	Boro Daha	Chapair	23
	Folimara Daha Committee	Folimara Daha	Chapair	21
	Dilarhari Daha Committee	Dilarhari Daha	Azgona	21
	Gurerhari Daha Committee	Gurerhari Daha	Azgona	19
	Krishneer Hari Daha	Krishneer Hari	Azgona	17
Goalia	Goalia RMO	Goalia River	Fulbaria, Boali	92
	Section-1 Committee	Goalia river	Boali	31
	Section-2 Committee	Goalia river	Boali	17
	Section-3 Committee	Goalia river	Fulbaria	17
	Section-4 Committee	Goalia river	Fulbaria	27

4.9.5 Summary Profile of RUGs (Union wise)

Sl. No.	Name of RUG	Group	Village	Union Council	RUG Members
1	Azgana Dalia Mahila Samity	Female	Azgana	Azgana	18
2	Azgana Chingri Purush Samity	Male	Ajgana	Ajgana	19
3	Azgana Foli Purush Samity	Male	Azgana	Azgana	17
4	Boali Paschimpara Golap Samity*	Female	Boali	Boali	21
5	Boali Purbapara Mohila Samity*	Female	Boali	Boali	28
6	Boali Ganeer Alo Mohila Samity	Female	Boali	Boali	23
7	Habuar Chala Sabuj Purush Samity*	Male	Habuarchala	Boali	23
8	Kundaghata Banalata Mohila Samity*	Female	Kundaghata	Boali	19
9	Madankhali Shapla Purush Samity*	Male	Madankhali	Boali	19
10	Raghunathpur Chanda Purush Samity	Male	Raghunathpur	Boali	20
11	Sreepur Asar Alo Purush Samity*	Male	Sreepur	Boali	17
12	Sreepur Madhapara Mohila Samity	Female	Sreepur	Boali	17
13	Sreepur Rupchada Matsajibi Purush Samity	Male	Sreepur	Boali	19
14	Boroibari Sheulimala Mohila Samity	Female	Boroibari	Chapair	21
15	Kanchanpur Palash Mohila Samity*	Female	Kanchanpur	Chapair	24
16	Medi Ashulai Doyel Mohila Samity	Female	Medi Ashulai	Chapair	20
17	Nama Ashulai Hijol Mohila Samity	Female	Nama Ashulai	Chapair	23
18	Ashariabari Ilish Purush Samity	Male	Ashariabari	Chapair	16
19	Baniarchala Talla Purush Samity*	Male	Rasidpur	Chapair	18
20	Betara Carp Purush Samity	Male	Betara	Chapair	20
21	Boroibari Matshajibi Purush Samity	Male	Boroibari	Chapair	19
22	Derchala Jhinuk Purush Samity	Male	Derchala	Chapair	25
23	Medi Ashulai Mola Purush Samity	Male	Medi Ashulai	Chapair	17
24	Nama Ashulai New Turag Purush Samity	Male	Nama Ashulai	Chapair	21
25	Rasidpur Kadam Purush Samity	Male	Rasidpur	Chapair	20
26	Aliar Chala Patabahar Mohila Samity	Female	Aliar Chala	Maddhapara	20
27	Amdair Rajanigondha Mohila Samity*	Female	Amdair	Maddhapara	22
28	Haturia Chala Jagironi Mohila Samity	Female	Haturiachala	Maddhapara	18
29	Chatal Solahati Golapful Mohila Samity	Female	Solahati	Maddhapara	20
30	Solahati Udayan Mohila Samity	Female	Solahati	Maddhapara	18
31	Aliar Chala Surjamukhi Purush Samity	Male	Aliarchala	Maddhapara	15
32	Amdair Golap Mohila Samity*	Female	Amdair	Maddhapara	27
33	Gopinpur Rui Purush Samity*	Male	Gopinpur	Maddhapara	18
34	Haturia Chala Pangas Puruish Samity	Male	Haturiachala	Maddhapara	24
35	Haturia Chala Singh Purush Samity	Male	Haturiachala	Maddhapara	20
36	Haturia Chala Tekpara Niknai Samity	Male	Haturiachala	Maddhapara	20
37	Solohati Chitol Purush Samity	Male	Solohati	Maddhapara	20
38	Kaliadaha Shaluk Mohila Samity	Female	Kaliadaha	Mouchack	24
39	Majut Banshtoli Mahila Samity	Female	Majut Banshtoli	Mouchack	15
40	Sinabaha Ekata Mohila Samity	Female	Sinabaha	Mouchack	25
41	Taltoli Shapla Mohila Samity*	Female	Taltoli	Mouchack	20
42	Bagambar Sramajibi Matshajibi Purush Samity*	Male	Bagambar	Mouchack	19
43	Banstoli Matshajibi Purush Samity*	Male	Bastoli	Mouchack	21
44	Kouchakuri Kajoli Somobai Samity*	Male	Kouchakori	Mouchack	18
45	Majukhan Ekata Matshajibi Purush Samity*	Male	Majukhan	Mouchack	28
46	Vangajangal Krishak Samity*	Male	Vangarjangal	Mouchack	23
47	Sutrapur Bangshi Mohila Samity	Female	Sutrapur	Sutrapur	18
48	Sutrapur Machranga Matshajibi Purush Samity*	Male	Sutrapur	Sutrapur	15
49	Sutrapur Sarputi Purush Samity	Male	Sutrapur	Sutrapur	19
				Total:	**1,011**
*Which are colored those are fishermen group					

4.9.6 RMO wise members

RMO	Total	Male	Female	RUG	Fisherman
Mokosh	**133**	97	36	85	59
Turag	**105**	78	27	51	51
Alua	**182**	138	44	107	111
Goalia	**88**	82	6		28

4.9.7 Fingerilings release (2001-2005)

RMO	2001	2002	2003	2004	2005	Total
Mokosh	96	18,747	72,704	2,580	1,900	**96,027**
Alua		12,882	61,138	3,457	21,330	**98,807**
Goalia				3,870	7,141	**11,011**
Turag	40			3,715	4,100	**7,855**
Total	**136**	**31,629**	**133,842**	**13,622**	**34,471**	**213,700**

4.9.8 Plantation (1999-2006)

RMO	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2005-2006	Total
Mokosh		400	1,225		15,705		**25,393**
Alua				3,120	11,745	1,260	**22,875**
Goalia						4,000	**25,996**
Turag		3,100	10,100	6,976	14,604		**36,430**
Institute	3,286	6,422	4,213		7,431		**21,352**
Road side	4,200	4,725	2,287		1,800		**13,012**
Homestead		1,332	4,920				**6,252**
Total	**7,486**	**15,979**	**22,745**	**10,096**	**51,285**	**5,260**	**151,310**

4.9.9 Sanctuary protection (2002-2005)

	2002			2003			2004			2005			Total		
	T	H	P	T	H	P	T	H	P	T	H	P	T	H	P
Mokosh	-	-	-	-	-	-	-	-	-	-	270	153	-	270	153
Alua	180	-	40	1569	-	654	-	920	920	-	150	42	1749	1070	1656
Goalia	-	-	-	-	-	-	-	-	-	-	20	5	-	20	5
Total	180	-	40	1569	-	654	-	920	920	-	440	200	1749	1360	1814

Note : T- TETRA POD, H- HEXAPOD, P- RCC PIPE

4.9.10 Working area of IPAC Turag-Bangshi Site (village, Union and RMO-wise)

I.no.	Village Name	Union	RMO
1	Azgana	**Aazgana**	**Alua**
2	Baniarchala	**Chapair**	
3	Barachala		
4	Betara		
5	Bilbaria		
6	Derchala		
7	Gobindapur		
8	Kanchanpur		
9	Medisulai		
10	Rashidpur		
1	Aamdair	**Madhyapara**	**Mokesh**
2	Chatal Sholahati		
3	Haturiachala		
4	Jhenjichala		
5	Sholahati		
6	Gopinpur		
7	Bagambar	**Mouchak**	
8	Bashtoli		
9	Bhangar Jangal		
10	Bhulua		
11	Kaliadaha		
12	Kancharosh		
13	Karol Surichala		
14	Kouchakuri		
15	Majhukhan		
16	Matikata		
17	Rangamati		
18	Sinabaha		
19	Taltoli		

Sl.no.	Village Name	Union	RMO
1	Kundaghata	**Boali**	**Turag**
2	Namashulai	**Chapair**	
3	Ashariabari		
4	Baraibari		
5	Chapair		
6	Gabtoli		
7	Kutamoni		
8	Kutubdia		
9	Aliar Chala	**Madhyapara**	
10	Madhyapara		
11	Golachipa		
12	Gopinpur		
13	Shailakhali		
14	Garjankhali	**Mouchak**	
15	Majut Bashtoli		
16	Sayeedpur	**Sreefaltoli**	
17	Tan Kaliakoir		
18	Sutrapur	**Sutrapur**	
1	Boali	**Boali**	**Goalia**
2	Cha Bagan		
3	Gachhbari		
4	Nabirbahar		
5	Nalua		
6	Raghunathpur		
7	Sreepur		
8	Baghair	**Fulbaria**	
9	Baheratoli		
10	Bashakoir		
11	Berachala		
12	Fulbaria		
13	Gabchala		
14	Janpara		
15	Khalishajani		
16	Nandichala		
17	Pagalnathchala		

4. 10 Stakeholder assessment

At least 3 categories of stakeholder could be recognized in IPAC Turag-Bangshi Site, such as

- Primary stakeholder- involved with direct extraction of resources from the wetland or their activities directly affect the wetland
- Secondary stakeholders – indirectly linked with the wetland, involved with trading or exert influences on the wetland
- Institutional stakeholder- involved with developmental activities and administration of the adjoining areas

4.10.1 Primary Stakeholders (PSH)

Table 29 provides information on stakeholder type & category, stakeholder description, their activities, dependency, relative level of stakes with the wetland and their impact on the wetland resources. About 5 different primary stakeholder types, who directly extract different resources from the wetland, have been identified. Of them; fishermen, arotder, lease holder, boatman (round the year), subsidence user, sand collector are recognized as primary stakeholder.

4.10.2 Secondary Stakeholders (SSH)

Out of 15 different stake holders; piker, boatman (only rainy season) musclemen, industrialist, local elite person, land encroacher as secondary stakeholder.

4.10.3 Institutional Stakeholders (ISH)

Out of 15 different stake holders; RMOs & FRUGs, relevant government institutions, NGO as institutional stakeholder

Table 29. Stakeholders Information of IPAC Turag-Bongshi Site

Sl. No.	SH name	SH type	SH description	Role / Description of Activities of SH	Dependency	Level of stake	Remarks
01	Fisherman	Direct / primary	Poor and living Beel sourrounding area	Fishing practices legal and illegal	Livelihood full depend	Major	They directly destro fish biodiversity
02	Piker (fish collector from fisherman)	Secondary	Medium to higher, in and out side of the wetland	Pruchase fish from local fishermen	Livelihood depend	Medium	They patronize the fishermen to over fishing practices
03	Arotder / Mohajon (money investor)	Direct / primary	Rich, in and out side of the wetland	Purchase fish from local fishermen	Livelihood depend	Medium	They patronize the fishermen to over fishing practices
04	Lease holder (by RMO)	Primary	RMO of the project area	They play positive role for wetland management	Indirect	Minor	They conserve the biodiversity of the wetland
05	Boatman (round the year)	Primary	Poor and living Beel sourrounding area	They service to the local people to shift one side to other side of the river	Livelihood full depend	Major	Some times the pollute the water by boat engine's extruction
06	Boatman (only rainy season)	Secondary	Poor and living Beel sourrounding area	They service to the local people to shift one side to other side of the river and Beel	Livelihood depend	Medium	Some times the pollute the water by boat engine's extruction
07	Subsidence user	Direct / primary	Poor to medium	They play negative role to wetland management	Direct	Major	They destroy biodiversity in various ways
08	Sand collector	Primary	In and out side of the project area, they employ local poor people for sand collection	They play negative and positive role	Direct	Major	They hampered ecological balance
09	Muscleman	Indirect / Secondary	Individural / Group	Having a good link with illegal collection of	Direct	Major	They destroy biodiversity in various

Sl. No.	SH name	SH type	SH description	Role / Description of Activities of SH	Dependency	Level of stake	Remarks
				fishermen			ways
10	Industrialist	Indirect / Secondary	Individural / Group	They play very negative role	Negligible	Minor	They polluted the wetland ecosystem and encroaches the wetland
11	Local elite person	Secondary	Individural / Group	They play positive role	Negligible	Minor	They aware the local people to conserve the biodiversity
12	Land encroacher	Secondary	Individural / Group	They play negative role	Direct	Major	They encroach Khash land and so fish habitat decreasing
13	RMO and FRUG	Institutional	Group	They play strong positive role	Indirect	Major	They protect and improvement wetland ecosystem and having more scopes
14	Relevant Governent Institution	Institutional	Group	They play positive role	Indirect	Major	They protect and improvement wetland ecosystem and having more scopes
15	NGO	Institutional	Group	They play positive role	Indirect	Major	They protect and improvement wetland ecosystem and having more scopes

4.11 Problems, Causes, Effect, Solutions for the declined wetland resources

4.11.1 Problems of wetland resources

Summaries of problems of project areas of wetland's resources can be mentioned as follows which:

- Fish abundance
- Fish disease
- Use of destructive Fishing Gears and catching fish fries
- Lack of any Fish Sanctuary
- Decreased in Aquatic natural resources in the Beels
- Diminished natural resources (Aquatic Weed reed) like, Shapla, Shalook, Bhet, Kalmi, Pawta, Singra etc. in Beels
- Decreased in the abundance of migratory Birds
- Fuel scarcity, No trees at the side by the Beels
- Siltation of Beel, Flood damages crops, Beel become dry-up, Beels coming silted up due to the erosion of MANDAs dykes
- Link Canals silted Connected Khal,
- Lack of employment opportunities
- Lack of Bullocks for plough, lack of cattleheads and Poultry, lack fishing gears, lack Shellow Machine, lack of cash capital, lack of land, lack credit facilities and lack of daily laborage scope.
- Common Fishers loosing access in the Beel due to the private MANDA's occupying major part of Beels, etc.

4.11.2 Causes of wetland resources

Summarizes causes of project areas wetland resources can be mentioned as follows:

- Catching fish fry
- Unemployment situation prevails during Jaistya to Kartik
- Non availability of brood fish
- Deadly diseases of Fish
- Siltation of Khal and Beels and dries up once in dry season
- Lack of Aquatic Weeds and natural fodders
- Beel water lifting for irrigation
- De-watering of MANDAs
- Catch of Brood-fish
- Frequent use of Current-Jal and Mashery-Jal (Fine mesh)
- Use of chemical fertilizer and pesticide in rice field
- Pollution of water
- Diminishing water depth level / inadequate water depth level
- Lost connectedness of water bodies
- Use of Mashery-jal (Fine mesh) and Current-jal.
- Harvest of Aquatic Weed Reeds as fodder
- Dries up of Beel / Khal in the dry season
- Degradation of birds habitat
- Birds hunting / trapping
- Fishing by de-watering of Beels
- Over harvesting of resources/over Fishing increased population
- Collecting of Shapla, Shalook as food substitute
- Collection of Weed, Reeds as house making materials
- Unplanned rural infrastructure set up
- Deposition of sediment coming with run offs
- Beel bed raising by dumping of earth cut by farmers for leveling the Beel adjacent land for expansion of rice field
- Soil erosion of MANDAs Dykes
- Soil erosion of its banks

- Sedimentation by run off
- Decreases in the abundance of Fish
- Beels being silted up
- Landless ness / selling out of resources
- Decreases of abundance of Plants, trees and other natural resources
- Lack of scope of employment
- Less opportunity of alternative income generation
- Illegally occupies Khash land and make MANDAs
- Fisher and poor people have no land in the Beel, etc.

4.11.3 Effect due to causes of wetland resources

Effects due to causes of wetland resources can be summaries as follows:

- Catches of small fries much in number but less in weight
- Fish crisis in the market
- Lack protein intake
- Raises Fish price
- Decreased in daily income and savings of Fisher
- Decreased in Fish export
- Problem in carrying social entertainment cost
- Decreases in the abundance of natural Fish food
- Decreases in the abundance of natural cattle fodder
- Increases in human food shortage
- Increases in the pest attack on crops
- Breaks out Fish diseases
- Diminishing income of laborers
- Decreases in Fish production
- Hinders Poultry raising activities
- Decreasing in the resting places / shelters for those are working in the field both of rice and Fishing
- Hampers the natural balance
- Fish not available there round the year
- Damage of Aquatic Plants
- Less farm production/lack of irrigation water
- Decreasing in the cattle fodder
- Decrease in the Fish production
- Increase in the human food shortages
- Beel becomes dries up
- Navigation been interrupted
- Hampers water movement
- Causing water congestion
- Water becomes polluted
- Dearth of sufficient irrigation water
- Catching Fish excessively
- Decreased in income/daily laborage
- People suffers from food deficiency
- Farm land remain untilled sometimes due to lack of Bullocks
- Faces difficulties in carrying cost for treatment
- Faces difficulties in carrying social/festival / marital cost
- Faces difficulties in carrying social/festival / marital cost
- Faces difficulties in carrying educational expenses for children
- Faces difficulties in carrying the households / house maintenance cost.
- Increased the pressure on catching Brood-fish and fries

- Don’t have Fish for consumption
- Common people/subsistence are compelled to buy Fish in the market
- Decreased in the amount of catch by Fisher
- Brood-fish and fries can’t survive.

For among reasons ultimate groups of local people are farmers, fishers, day laborers, women, landless poorer and service holders, businessmen, etc.

4.11.4 Solution of the causes of wetland resources

Solutions of mentioned causes of wetland resources can be summaries as follows:

- Use big mesh/wider mesh net (Jal)
- Stop small fry catch
- Enforce Fish conservation act/regulations appropriately
- Enhance/raise community awareness
- Re-excavate Kewta and Durungi Beels (Khash land is there)
- Stop use of Mashery (Fine mesh) Jal and Current-jal
- Re-introduce of some species like, Daishya, Shol, Gazer, Foli
- Establish Fish Sanctuary
- Take water treatment measures, use Potusium, Lime and other water purifying substance.
- Stop Fishing participatory in Baishakh
- Reduce use of Chemo fertilizer and pesticide
- Limit Fishing pressure

4.12 Local Community, Power Structure and Local Governance

4.12.1 Local decision makers and influential people

Various types of influential persons have been identified in the locality and many of them have control over the local people, their activities and even over local administration. Some of them have linkages with the illegal fishing.

4.12.2 Local governance

Local Union Parishad is the lower level local government entity and look after local welfare and development. It has also emerged as the main center for conflict resolution.The UP members, who are elected from different areas of the Union, look after their respective areas. The local public representatives are consulted whenever there is a local issue. There is also a new local organization. Police administration at Upazila level is the local law enforcing agency and are involved with maintaining local law and order situation.

4.12.3 Local conflict, conflict resolution, social adhesion and cohesion

4.12.3.1 Sources of conflict

The main sources of conflict among local people are, fishing, land dispute, children affairs, livestock grazing, marriage related affairs, family affairs, money lending, local politics, local elections etc.

4.12.3.2 Conflict resolution

Conflicts are resolved by arbitration by local elites & public representatives (MP, UP chairman, members), RMO and FRUG. If the local efforts are not fruitful it may lead to filing cases with Thana-police and ending up in courts.

4.12.4. Social cohesion and adhesion

There are many social activities that maintain social adhesion and cohesion among the villagers. Some of them are Eid ul Azha, Eid ul Fitre, marriage ceremony, religious functions, collective action through local community organizations, etc.

4.13 Local Socio-economic Context through education

It may be mentioned that extrapolation of data was made based on limited data collected through RRA exercises. Now-a-day's 85-90% children go to primary school, only 70% go to High School and only 30-35% study in the colleges. Among the adult, about 45-50% are literate (above 30 years of age).

4.14 Livelihood analysis

4.14.1Occupation

The major primary occupation of project area is agriculture (approx.40-50%), principally paddy cultivation, followed by day labour including (20-25%), fishermen (25-30%), small business (2-3%), service (30 - 35%), and overseas employment (5%).

4.14.2 Richness-poverty level

The PRA / RRA team members have gotten a idea about richness and poverty level of the project area whic are; about 7-10% people of the area are rich, 20-25% are middle class and 40-50% is poor and 10-15% is very poor.

4.14.3 Unemployment

Unemployment is another severe problem that puts pressure on over exploitation of wetland resources. In the project area, on an average, about 10-15% people are unemployed. Among the villagers, about 5-7% people are unemployed. In average, about 15% local surrounding people are unemployed. However, there is a strong seasonal trend in unemployment level in the area.

Unemployment is a major concern/problem in the area. According to the local people, the number of unemployed people increases during the dry season.

4.14.4 Income and expenditure profile

FGD revealed that the major sources of income in order of magnitudes are laborer, followed by agriculture, fuel wood collection, timber poaching, small business, etc. On the other hand, the expenditure profile shows that people spend major part of their income for purchasing food, followed by meeting, cultivation expenses, clothing purpose, less for educational purpose.

4.14.5 Skill & skill development opportunities

Overall in the area, the number of skilled person seems to be very inadequate to undertake alternate generation activities. Skill development training provided by the NGOs are very limited and confined to some traditional areas of income generation. Local people have got some skills, like bamboo basket and mat making, etc. There are areas such as bamboo and cane handicrafts preparation, cattle fattening, poultry, dairy, pond aquaculture etc. Potential training and credit support in these areas could play a vital role in income generation of some of the local people and lessen their dependency on wetland and at the same time very soft loan would help in undertaking these activities.

4.15 Social dynamics (Trend in changes in socioeconomics)

4.15.1 General Dynamics

Table 30 shows the changes in some key socio-economic factors and local activities. Compared to 1970, there has been an increasing population; the expenditure of local people has increased with corresponding decline in solvency. Income of local people in terms of taka has increased, but at the same time livelihood expenditures have increased. Although, literacy rate has increased, unemployment rates have also increased. During this time, use of the wetland for both as HH needs and income has increased. However, local food scarcity has reduced while opportunities for alternate income have increased.

Table 30.Trend in Changes in Some Socio-Economic Matrices of the Local People

Issue	Pre-1971	15 years ago	Present	Causes for change
Population	00	000	00000	Population growth,
Solvency	00000	0000	000	Livelihood expenditure increased, lack of added income and unemployment
Pollution	00	0000	000000	Quick industrialization
Livelihood expenditure	00	000	00000	Increased price of goods, use of increased commodity
Literacy	0	000	00000	Awareness raising, educational opportunity increased
Unemployment	0	00	00000	Less cultivated land than pre- 1971, population growth, resource depletion
Use of wetland for income	00	000	00000	Poverty, unemployment
Use of wetland for HH needs	00	000	00000	Poverty, Population growth, easy access and no alternate source
Transportation and mobility	00	000	00000	Development of communication and transport road
Homestead plantation	0	00	0000	For income generation, consumption, awareness HHs
Food scarcity	00000	000	00	Increased opportunity development and employment agricultural

Credit and IGA	-	-	00	Increased GO, NGOs credit and IGA programs
Occupation	0	00	00000	Increment of IGA and business

4.15.2 Seasonal changes in socio-economics of the local people

While there appears to be no direct link between seasonal unemployment and dependence on the wetland resources, this is thought to be a causal factor in dependence. In flash flood most of fishermen are engaged to their general phenomenon, but in the dry season most of them become unemployment. Specially, at that time, they need AIG support to save the wetland resources in various ways.

4.16 Local Problems

Problem ranking exercise (Table 31) was performed to identify and understand the local level problems and its causal factors. The major problems, according to the magnitude, are pollution, poverty, unemployment, road communication, electricity, drinking water, etc.

Table 31: Local problem and their causes and possible solutions

Name of Problems	Reason	Solutions
Pollution	Day by day, the area going beyond living of standard due to pollution, mainly industrial pollution. Imapact of industrial pollution most of wetlands's ecosystem have destroyed.	ETP should be establishing in all factories and other environmental factors should be considered.
Poverty	Over population, unemployment, lack of capital to initiate IGA, lack of alternative income generating activities, lack of skills.	Creation of opportunities for new IGA and providing of credit without interest, skill dev. training, more NGO activities
Unemployment	Lack o f sufficient work, population pressure, Lack of education,	Creation of opportunities for new IGA and providing of credit without interest, skill dev. training, more NGO activities
Education	There is no sufficient educational institution	Establishment of new technical & NFE schools, awareness, and financial support
Road communication	Road communication is not well in some area, most of the case, become difficult during rainy season	Local government and other concern agencies should give proper attention
Drinking water	Lack of deep tube well and fresh water	Need Government and NGO efforts to provide tub well and technology for safe water.
Electricity	Limited & interrupted electricity supply that hampers public life.	Electricity supply should be smooth and introduce solar energy system.

A collation of problem rankings carried out during the PRA showed that poverty is cause for the use of wetland (Table 32).

Table 32. Pair wise Ranking of Some Local Problems

Identified problems	Pollution	Poverty	Unemplo-yment	Food security	Income needs	Fuelwood scarcity	Scarcity of house build. mat
Pollution	.....	Unhealthy environment		Lack of farming land			
Poverty		------	Poverty	Poverty	Poverty	Poverty	Poverty
Unemployment		Poverty	---	unemploy ment	Income needs	Unemploy ment	Unemploym ent t
Food security		poverty	unemployment	------	Income need	Food security	Food security
Income needs		poverty	Income needs	Income needs	-------	Income needs	Income needs
Scarcity of. H. build mat.		poverty	unemployment	House building materials	Income needs	House building mat.	----------
Total	10	08	03	02	06		01
Rank	**1**	**2**	**4**	**6**	**3**	**7**	**5**

4.17 Gender Issue

4.17.1 HH decision making

In generally, most of the families, husband takes the major HH decisions, while female opinion ignored due to lack of empowerment.

4.17.2 Outdoor mobility and access to credit and IGA

The women of the area have moderate mobility. Participation to social events by women is comparatively less than males. But in the cases of IGA & credit, the women have much higher access than the man. The cause behind this is that the credit providing organizations or NGOs prefers female than to male for providing credit. Women are moderately discriminated in case of employment in jobs, business etc.

4.17.3 Workload of Local Male & Female

Generally, the in the community, men have more work during Jaistha to Bhadra and again during the winter months. The females have more work during the dry months and the periods that correspond to the local agricultural activities. In general, women in the locality have a lower workload than the men.

4.17.4 Daily work load

The females are typically involved with the household work and also help in the and outdoor work. The males mainly do the outdoor works related to income generation.

4.17.5. Education

The overall literacy rates of male and females are near to close. In recent years, the umber of school going girls is higher than the boys. However, in case of higher studies girls are behind the boys. Overall, females are less educated than the males. Overall, higher education is very less in the area, and the females are far behind in this respect.

4.18 Local Level Awareness and Behavior

Local people know about some of the rules of Fisheries Acts, but most of them do not know the significance of these acts. They have a positive attitude towards conservation. Initial response of the local people and DoF staff towards the project is very positive and villagers are willing to cooperate.

4.19 Resource regeneration through plantation practices

Al ready there are some Social Forestry have developed on the road side and Beel & Cannel's embankment. The Social Forestry is mainly maintained by the administration of Local Government, Co-management Committee with the collaboration of RMO. The species of Social Forestry are Mehogoni, Akasmoni, Arjun, Hisol, Karach, etc.

5. Threats, Issues, Opportunities and Challenges for the IPAC Turag-Bangshi Site

5.1 Threats to the IPAC Turag-Bangshi Site and its Biodiversity

5.1.1. Siltation of Beels

The geographical location of Turag-Bangshi Site is as such where run off water come with huge silt, especially at the commencement of monsoon. Flood water in these areas comes from the Old Bramhaputra. Old Bramhaputra get water from Garo / Meghalaya Hills through a number of hilly streams and eventually drains out through the Turag and Bangshi. Thus huge silts settle in Beel basin and adjacent canals. It damages crops. Indirect effect of siltation Beels becomes dried up. Beels becoming silted due to erosion of *DOHA*s / dyke also. Such like things happens in case of river and its *KUM*s Local people also mentioned that river bank erosion is comparatively more than that of the past.

5.1.2 Link Canal silted

Due to siltation process most of canals have silted up. Silting process blocked the current of water flow and in course of time criss-crossed canals loses connectivity. According to the local community there has been massive change over last 20 years with and almost complete deforestation of the wetland areas followed by a rapid loss of connectivity due to embankments and increased sedimentation.

5.1.3 Pollution

At present, pollution of water and air are the main threats for the IPAC Turag-Bangshi Site. One of the biggest industrial clusters in Bangladesh is located in Kaliakoir Upazila north of Dhaka, where there are many textile & dyeing, medicine factories and poultry industry. Beside the project area, there are many brickfields polluting the environment in various ways. During participatory planning the communities which MACH has been working with in the Turag River floodplains reported that these industries use the surrounding wetlands, particularly Mokesh Beel and Ratanpur Khal, which flows through the Beel, as a disposal ground for untreated waste, which they reported resulted in poor catches of bad smelling fish. Effluent from industries downstream in the Turag and Bangshi catchment's also appears to be entering the river and is carried upstream during low river flows by tidal effect. As a result, water quality has deteriorated to a level which is unsuitable for certain types of aquatic life.

5.1.4 Industrialization

At present, quick industrialization is one of the major threats for the IPAC Turag-Bangshi Site. Since 1999 MACH Project has addressed industrial pollution issues of Kaliakoir, where more than 274 industries are located. Most of these industries are socially compliant but not environmentally compliant. It is estimated that these industries are discharging 30 billion litres of waste water in surrounding water bodies, particularly Mokesh Beel and Ratanpur Khal. In addition, effluent from industries downstream in the Tugar catchment also appears to be entering the river and is carried upstream by late season tides. Large areas of surface water have a dark black appearance and foul smell due to high sulfide levels and low or no oxygen in dry season. There are also reports of poor catches and large fish kills in the area during dry season

5.1.5 Using Insecticides in agricultural field

Similar common practices of other part of, Bangladesh huge amount of insecticides used in project area, especially during Amon and Boro season, which is very harmful for flora and fauna of wetland biodiversity.

5.1.6 Irrigation

During dry season, irrigation is common practice in project area. Most of time, people dried up the *DOHA*s. Therefore this poses a threat to the wetland biodiversity within the project area as their population is now reduced.

5.1.7 Use of destructive fishing gears

Most of the local people are not aware of using fishing gears as per Fish Act. Most common gears are current jal (Gill net under4.5 cm), mosquito net, Seine net with fine mesh size, khora jal (lifting gear), etc. Implementation of fish act is very seldom.

5.1.8 Extensive fishing pressure

Finding no other alternative options for livelihood the poor fishers and ultra poor section of the community are compelled to over fishing. Day by day, per unit fishing effort is increasing due to meet the demand of increasing population. Both unemployment and population are increasing parallel and so illiterate employment persons of the project area do not find alternative income source rather than traditional income. So, fish habitat decreasing but fishing effort increasing.

5.1.9 Lose of habitat

Effect of above threats causes most of the Perennial Beels to become seasonal Beels and Seasonal Beels have disappeared. Finally it becomes paddy or other crop's field. Due to loss of habitat, 12 indigenous fish species already are now in Critically Endangered Condition (Table 20). The local people mentioned that in the past all those species were abundantly available. Another example of habitat of loss is that no winter birds now a day are seen since last few couple of years.

5.2 Issues of Concern

The following are the major problems that need to be addressed in order to sustainable management of the IPAC Turag-Bangshi Site:

5.2.1 Conserving aquatic biodiversity: Mainly caused due to over and indiscriminate fishing, habitat lost, etc. Conservation and enhancement of aquatic biodiversity would have to be a priority work for IPAC.

5.2.2 Unsustainable resource exploitation: Mainly include harvesting at each stage of life cycle of fish from fingerling to adult fish and all aquatic flora and fauna of wildlife etc. Thus causing depletion of biodiversity. IPAC needs to address this issue.

5.2.3 Local dependence on wetland resources: Almost all HHs (mainly fishermen community) and many HHs from nearby settlements depend on fishing; Collection of other aquatic animals like snails, freshwater bivalves also too high. Using water for irrigation is also too much intensive. Excessive dependency on wetland by local people causing harm to biodiversity. Thus this emerges as an issue of concern for the project.

5.2.4 Poor wetland management by the DoF, DoE and lack of specific Management Action Plan: As became apparent from the appraisal process that the wetland is poorly managed by the DoF and DoE, primarily due to lack of adequate and skilled man power for wetland management, lack of logistics and incentives. But some Beel of Turag-Bangshi Site are under better management with the collaboration of DoF, and RMOs of MACH project. Most importantly, there area variety of scope to improve management action plans for the Turag-Bangshi Site and therefore these are important issues for consideration.

5.2.5 Local poverty and unemployment: Local poverty and unemployment have been identified as the driving forces for the illegal wetland use by the local people. Unless the problem is reduced it is unlikely to achieve success in the implementation of the project and therefore draws particular attention for addressing the issue.

5.2.6 Lack of awareness among local people about biodiversity conservation: There is serious lack in understanding about benefit of biodiversity conservation and need for sustainable management of wetland resources among the local people. It seems that enhance local level awareness would help in the successful implementation the project interventions.

5.2.7 Poor law enforcement for wetland conservation: Wetland patrol is inadequate to check illegal fishing. Help from the other local law enforcing agencies is not adequate; rather the activity of local police is not conducive to wetland protection and encourages the illegal capturing.

5.2.8 Changes in the landscape: Land erosion, land leaser, different types of cultivation practice, siltation, sedimentation, etc. brought a change in the original landscapes and its associated elements.

5.3 Challenges for the Project

The possible challenges for the project are:

- **Reducing use of destructive fishing gears, using chemical, fertilizer & insecticides:** People are not aware about the negative impact on using destructive fishing gears, unplanned use of chemicals and insecticides in the crop fields. They even don't know how these practices causing fatal effect on aquatic biodiversity and fish production. IPAC would have to take the challenge to aware local community on these issues.

- **Reducing pollution:** At present local people /community are very much aware about the negative impact of all types of pollution in their area. The MACH Project, several times, with the support of the local community, has successfully held dialogues with some of the owners of the polluting establishments. In addition a meeting between the RMOs and the concerned Advisor of the caretaker government helped result in the government setting nationally an urgent timetable for industries to comply with existing legislation and set up ETPs in 2007. Another result has been a meeting locally between the GoB and industries agree to the time frame and to ensure compliance. Actually, reducing the pollution of this area is very difficult. But at present practice, IPAC can address this issue with more emphasis through local community as well as concern authority of the government by the help of RMOs and FRUGs. Combindly, IPAC can raise a shout in national forum against pollution by the assistance of all stakeholder of the local area.

- **Reducing local poverty and unemployment:** Unless this issue not addressed the illegal use of wetland resources will continue. However, though it may be a difficult job even than project should address this issue with great importance.

- **Establishing co-management regimes for biodiversity conservation:** Approach for resource management by involving stakeholders at different tiers is new in the country. It will be a huge task for the project to bring the parties, particularly the local community on board and facilitate them to be organized.

5.4 Opportunities

- **Positive responsiveness of the local people:** The general people showed interest to the project. This positive attitude of local people can be utilized to ensure their participation in the project and thus will help in establishing co-management.

- **Ecotourism development:** A large number of people visit the picnic spot of Shohag Polly, Shafipur Anser Academy, Jumbury Field of Mouchak (large scale scout gathering place), some patches of forest, etc that lies spread over the project area. Here the scope of establishing facilities for Eco-Tourism is very feasible. IPAC can come forward to introduce Eco-Tourism practice within these localities.

- **Plantations:** There are plenty of opportunities for plantation like on road side, embankment of canals and Beels, etc. Another scope for plantation within Beels to reintroducing Hijol, Karach, etc. By this type of plantation the wetland habitat will automatically be restored.

- **Scope for alternate income generation activities:** There are good scopes to undertake various AIG activities, such as basket making, handicraft making, cultivation, nursery, poultry, cattle fattening, weaving, fish culture etc. The raw materials for such AIGA are easily available within the locality. This will help to reduce dependency on wetland uses.

- **Habitat restoration and rehabilitation:** By excavation / re-excavation of degraded Beels and canals, stocking indigenous endangered species, fish sanctuary, proper plantation and Fish Act implementation within project area the habitat can be restored.

6. Recommendations and Suggestions

Administrative

6.1 Poor wetland management by the DoF, DoE and Land Ministry has been identified as one of the major reasons for wetland degradation. Strengthening and capacity building of local concern authorities' engaged in wetland management would have to be a prior area that IPAC can address. Following supports and activities would be required to achieve this target

- Adequate staffs for the local DoF and DoE offices. As at this moment there is no chance to set revenue staffs from GoB side, therefore, field worker can be provided from project side. At the same time this issue can be highlighted in PA strategy with importance and advocacy can be given to the concern ministry and departments to increase staffs;
- Capacity building training in wetland management and community development required for the local GoB staffs;
- Can raise a shout in national forum against pollution by the assistance of all stakeholder of the local area;
- Logistic support for the local concern offices like motor cycle; mechanized/country boats and other necessary equipments can be provided from project;
- Developing and strengthening linkage among RMO / FRUGs and local government;
- Enforcing fish acts and rules;
- Provision for providing incentives to local staff to make the job lucrative
- Steps for improving the morale of local staff and make them dedicated to biodiversity conservation
- Provision for strong monitoring and supervision of local activities by a central cell and the cell will take any necessary participatory decision by the consulting of scientific and technical point of view

Technical Management

6.2 An appropriate, site specific and technically sound management Action Plan should be developed with consultation of local people. The action plan, among others, should have the following provisions:

- a plan of action for re-introduction and rehabilitation of endangered biotic species
- a plan of action for habitat restoration and rehabilitation
- a plan of action for protection and sustainable use of wetland resources and biodiversity
- a long-term biodiversity monitoring plan aiming at changes in the biodiversity in the wetland; not only targeting to measure the changes impacted due to project activities but also to identify post project situations.

Some specific suggestions:

i. Catching fish from sanctuaries and respective buffer zone must be prohibited;
ii. Introduction of endangered indigenous fish species;
iii. Short-rotational plantations with exotic trees should gradually be replaced with indigenous species for social forestry.
iv. Considering local dependence on the wetland resources, mainly, sustainable use of some resources local people should be allowed without destructive gears some spot for fishing which are out of restricted area.
v. Subsistence collection should be stopped on a short term basis, but this may not be a success as long as there is a scarcity of its supplies in the area. However, once the stock is recovered it may be possible to exploit the resources on the basis of principle of sustainable use.

vi. Promotion of fuel efficient stoves in the locality for improves the environment.
vii. Promotion of homestead plantations for improving the environment.
viii. Arranging alternative livelihood sources for local poor resource users.

Project activities targeted to local stakeholders

6.3 Poor resource users, particularly those who are dependent on the wetland for their livelihood, should be identified and brought under AIG programs with provision that they give up the unsustainable use of wetlands/forest resources. The possible AIG opportunities include, homestead gardening, dairy and fish culture, poultry, several types of pickle production, etc.

6.4 Attempts should be made to bring the local elites on board with the concept of wetland protection. In particular, the project needs to consult local public representatives, including local Chairmen and Members of Upazila / Union parisad and MP, and involve them, at least in advisory role. The project should also work with existing local community organizations identified under the appraisals.

6.5 Awareness raising activities should be carried out on a priority basis in the area to make the people understand how they could benefit from this project

6.6 Planned eco-tourism may be promoted in and around the wetland with provision for generating local funds for wetland management and welfare of the local people.

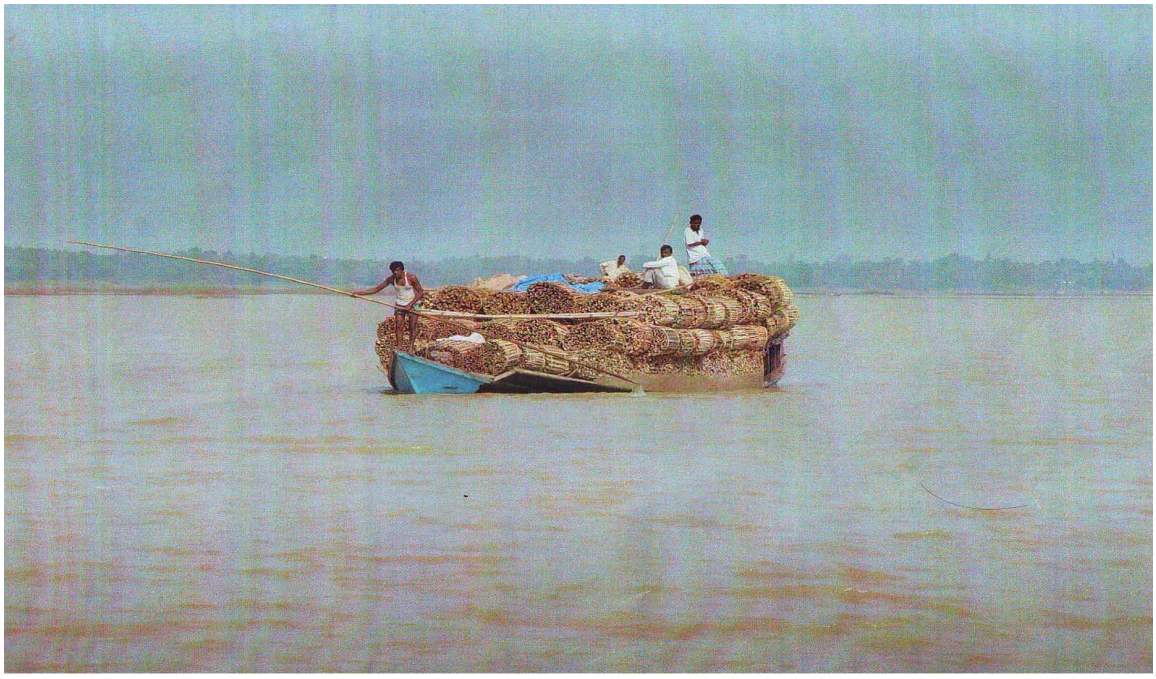
6.7 The project should make an effort to negotiate with local development partners/agencies to extend their social welfare services to the area.

6.8 The project should also make provisions for generating a scientific and social knowledge base about the wetland resources.

6.9 Immediately a comprehensive faunal and floral inventory should be made. Investigations into the threatened categories of flora and fauna should be made on a priority basis and a management scheme for their protection and rehabilitation should be developed.

6.10 Awareness campaign groups at local level can be developed by involving Boys Scouts, BNCC, School/College students who will conduct street drama; pot songs on sustainable use of wetland/forest resources.

Annexure-1
Pictorial Presentation

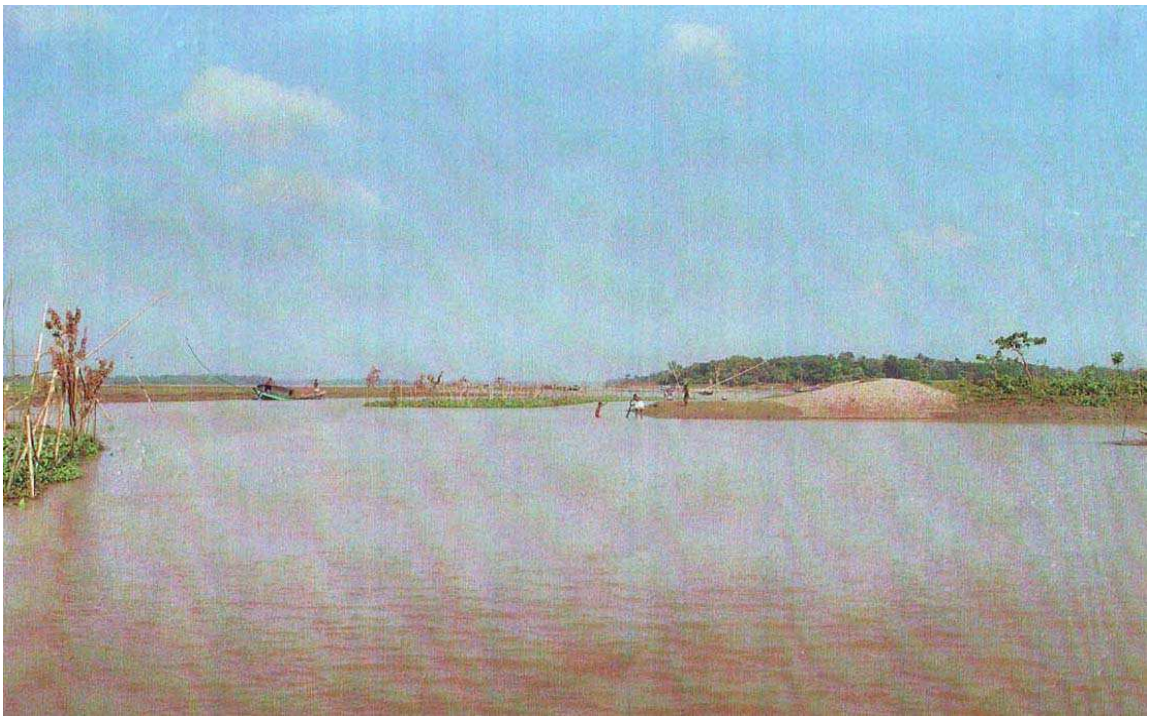


Firewood carrying through the Turag River that collected from adjacent forest

Dry Season Scenerio of a *Beel* inside project area

Fishing activity in Turag River at early rainy season

Releasing fisngerlings at Fish culture practice in Ujan *Beel*



Scenario of connectivity with a beel to Turag River in rainy season

Fishing activity in Turag River at early rainy season

Local people making social map of Boroibari at Turag RMO Office of Chapair Union

Industrial pollutants falling in to beel

Scenerio of Kaliardaha *Beel* of project area at dry season

Plenty of birds and cattle grazing at Mokesh *Beel* of project area at dry season

Scenerio of Mokesh *Beel* of project area at dry season

Scenerio of a patch of forest within project area at rainy season

A signboard of project area posted by Turag RMO that indicating their working area

Farmers harvesting paddy from *Beel*s of the project area

Annexure-2

Checklist of questions of RRA for FGD, KI and HHs interview

a. Checklist of questions for FGD

I. Stakeholder Assessment

1. People come from where to collect wetland resources? Please indicate its location on the map.
2. What are the different categories of people who collect different resources from the wetland?
3. At what extent the local people depend on the resources they collect from the wetland for their livelihood, please specify for each category of resource users group?
4. What are the local organizations/institutions which are involved with the development /management of the wetland or its control or its resource exploitation/ and or degradation? What are the activities of these institutions/ organizations?
5. Please indicate how the different resource users and other stakeholder groups interact with each other or inter-linked with each other.

II. Resources and resource status

6. Which plants and animals have disappeared from the wetland ecosystem in the recent past?
7. Which plants and animals in the wetland have been declining very rapidly?
8. What are the causes for the decline of these animals and plants? -Ven diagramming
9. What are the major shifts in the abundance of various resources over time? Compare between pre-liberation and present status? ---Trend analysis

III. Power structure and local conflict

10. What are the sources of conflict among local people?---Ven diagramming
11. Whom do the local people go for conflict resolution?
12. How the local conflicts are resolved?
13. What are the events that bring the local people together?----Ven diagramming

IV. Resource exploitation

14. What are the various resources that are collected from the wetland and who collect what? Please indicate on the format. ---use format
15. Exploitation of which resources is posing threat to its future availability?
16. Please indicate how exploitation of different resources varies with different seasons? ---------- Seasonal analysis
17. Which animals and plants are collected more and which are collected less?
18. When there is scarcity of fuel wood in the locality and indicate how it varies with season? –Seasonal calendar
19. Do the local people collect medicinal plants from the wetland? Are they available now a day?

V. Demographic profile

20. What are major occupations of the people of the locality? Please rank them.
21. Are there many illiterate people in the locality? Do many people go to High school, college, and universities? Please rank them and indicate on the format
22. Do you think that the occupations of people in the locality have changed over past (30-50 years)? Please indicate the shift in occupation local people over time? Format, in which occupation the shifting have occurred (Trend analysis).

VI. Socio-economic activities/livelihood strategies

23. What are the major activities for earning of the local people and rank them according to their importance?
24. Are there many people who have no land?
25. Are there many people in the locality who have no work to do?
26. Please indicate how the availability of work changes with seasons?
27. What the local people do when there is less or no work for them to do
28. Do many people in the locality take loan from, bank NGO or other organizations and please mention the reasons for taking loans?
29. Do the local people get income generation training from various organizations?

VII. Gender issues

30. How do the roles of men and women differ in this community?
31. What are the different thing men and women do concerning wetland products?
    a. Does the male and female are equally educated in the locality?
    b. Who take the decision for HH purchase, undertaking income generation activities etc. - male or female?
    c. Do the females have access to loan and IGA as the male have?
    d. Is the female are associated with forest management?
    e. Please indicate on the format, what daily works are done by the male and what daily works are done by the female?----- Chart

IX. Others

32. What are major the NGOs operating in the locality? Please indicate their activities on the format.
33. What are major challenges for the conservation of wetland resources?

b. Checklist of questions for Key Informant (KI) interview

Stakeholders Assessment

1. What are the organizations/institutions, which carry out any type, work in the wetland?
2. What are the villages from where people come to wetland for collecting resources? Please tell which villages are more involved and which are less involved?
3. What are the different categories/groups of people who go and collect various resources from the wetland?
4. Who are the other people who do not use wetland resources but have linkages with resource exploitation and development of the wetland?
5. Are there any people who can be important for the conservation of the wetland and its resources?

Power structure and local conflict

6. Who are the more influential people in your locality? Tell who more and who are less influential among them
7. What are the sources of conflict among local people?
8. Whom do the local people go for conflict resolution?
9. How the local conflicts are resolved?
10. What are the events that bring the local people together?
11. Have the local people any conflicts with DoF & DoE? If yes, what are those?

Resources and resource status

12. Which plants and animals have disappeared from the wetland in the recent past?
13. Which plants and animals in the wetland have been declining very rapidly?
14. What are the causes for the decline of various animals and plants?

Resource exploitation and dependency on wetland

15. What are the various resources that are collected from the wetland? Which are collected more and which is less?
16. What are the reasons for collection of these resources?
17. Which category/group of resource users are dependent on the collection of these resources?
18. What proportion of HHs benefit from the wetland?
19. Collection of which resources likely to pose a threat to those resources/ availability in the future?
20. Do people collect and use medicinal plant from the wetland?

Demographic profile

21. How many households are living in this community/thana? How many adults?
22. What are the major occupations of the local people?
23. What proportion of local people are illiterate and what proportion of people have read up to school, colleges and above?
24. How the occupations of people have in the locality have changed over past (30-50 years)?

Socio-economic activities/livelihood strategies

25. What are the major activities for earning of the local people?

26. What proportions of local people are very poor (have food shortage), poor, middle class and rich?
27. Are there many unemployed in the locality? What proportion?
28. In which season(s) there is scarcity of work in the locality?
29. From which source the local people take credit?
30. What are the different organizations, which operate credit in the locality?
31. Do many people in the locality take loan from , bank NGO or other organizations
32. Have the local people skills that can be utilized for undertaking alternate income generation?
33. Is there any work/economic opportunity that requires special skill that the local people don't have?

Legal aspects

34. Can anybody can go to the wetland and collect any thing?
35. Is there illegal fishing? Is it at large scale?
36. What are the main reasons for wetland resource collection?
37. Is there any issue of wetland encroachment? What are problem with recovery of these land?

Gender issues

38. Does the male and female are equally educated in the locality?
39. Who take the decision for HH purchase, undertaking income generation activities etc. - male or female?
40. Do the females have access to loan and alternate income generating activities as the male do have?

Others:

41. What are the major threats to the wetland habitat and its resources?
42. What would be major challenges for the conservation of biodiversity and restoration of its habitat?

C. Checklist of questions for HH interview

1. Govt. has plans to preserve the wetland biodiversity and to improve the socioeconomic condition of the people ---- what do you think (Actually team will gave a statement on the purpose of their visit and on the project)
2. Do you know that the wetland is a fish sanctuary?
3. Do you know what are allowed and not allowed to do in the sanctuary?
4. Do you think that the wetland resources should be preserved/ conserved?

Stakeholders

5. What are the villages from where people come to wetland for collecting resources? Please tell which villages more involved and which are less involved?
6. What are the various groups of people who collect different types of resources from the wetland?
7. Who are the people who do not use wetland resources but are involved with the wetland or has control over the wetland?
8. What are the organizations/institutions which carry out any type of work in the Wetland?

Resources and resource status

9. Which plants and animals have disappeared from the wetland in the recent past?
10. Which plants and animals in the wetland have been declining very rapidly?
11. What are the causes for the decline of these animals and plants?

Resource exploitation and dependency on forest

12. What sorts of things do you use from this wetland?
13. Does your household collect it/them, or do you obtain from someone else?
14. If yes, do you collect those for selling or for consumption?
15. Of those things you get from the wetland, which ones won't be available in 5 or 10 years?
16. Do you use medicinal plants from the wetland?

Power structure and local conflict

17. Who are the more influential people in your locality?
    Tell who are more and who are less influential among them
18. What are the sources of conflict among local people?
19. Whom do you go for conflict resolution?
20. How the local conflicts are resolved?
21. Have you or your neighbors any conflict with forest department? If yes, what are those?

Demographic profile

22. What is your primary and secondary occupation?
23. How many people in your HH are educated up to School, how many in the colleges and above and how many are illiterate?

Socio-economic activities/livelihood strategies

24. What is your HH primary and secondary source of income?
25. Do you have land of your own (home stead/agricultural)?
26. Is your HH income adequate to meet your family expenditure or you having surplus?
27. Have many people in the locality no work?
28. Have you work to do in all seasons? In which season/seasons people of the locality have little/no work?
29. What do you do when you have no work opportunities locally?
30. Have you taken loan from, bank NGO or other organizations? Was it easy to get the loan?
31. What are the different organizations, which operate credit in the locality?
32. Have you any skill to do a particular work but you don't do? Why don't you do it?

Resource regeneration practices

33. Are there many plant nurseries in the locality?

Legal aspects

34. Can anybody can go to the wetland and collect any thing?
35. Do you know that there is tree poaching in the wetland? If yes, from where they come (villages)?
36. Do you think that the Department of Fisheries and Department of Environment people are protecting the wetland resources?

Annexure-3 PRA issues

PRA will build upon the RRA findings and is intended for collecting in depth information on the identified issues.

Understanding the wetland make up and dynamics

Transect map: Necessary for understanding the present wetland physiography and topography. A few transects across the wetland will give an idea on overall make up of the wetland. This exercise will also provide the opportunity for learning about the historical trend in changes in the forest make up in different areas of the wetland. It will also provide the opportunity to learn many thing about the wetland while walk with a key informant.

The transect map should indicate

- land elevation (high/low)
- land cover/use pattern (trees / bush / grassland / agricultural land/marshy land etc.).
- a similar transect map should be drawn based on the condition of the wetland 30-40 years back.
- should carry GPS to track the transect walk / take coordinate reading at intervals
- should be accompanied by a key informant and learn about the changes over time in the wetland

Trend analysis in wetland dynamics: changes with time of the following: wetland areas, abundance of wetland resources, population

Resource maps (wetland): Helps in the understanding the distribution, concentration of different major resources of the wetland, resource exploitation and regeneration areas. Also will show

- internal walkways, footpath trails, access roads
- encroached land areas
- rural area
- areas for plantation, agricultural and other resource regeneration
- areas for major resource exploitation
- distribution of various resources

Understanding local governance system and community structure and functions

- decision makers--- influential people
- hierarchy set up
- local community organizations and institutions and their linkages
- local conflict and conflict resolution
- social cohesion and adhesion (which brings them together)
- collective action

Notes