Introduction to Community Based Haor and Floodplain Resource Management

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

UNDP

IUCN
The World Conservation Union

Introduction to Community Based *Haor* and Floodplain Resource Management

IUCN- The World Conservation Union
Bangladesh Country Office
November 2004

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Published by: IUCN Bangladesh Country Office

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Citation: IUCN - Bangladesh. 2004. Introduction to Community Based *Haor* and Floodplain Resource Management. IUCN Bangladesh Country Office, Dhaka, Bangladesh, vi+42 pp.

ISBN: 984-8574-02-6

Design & Layout: Sheikh Asaduzzaman and Arif M. Faisal

Printed by: Computer Graphics

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TABLE OF CONTENTS

Foreword v
Acknowledgements vi

1. Introduction 01
2. Background 02
3. Project Objectives 03
4. Project Sites 04
4.1 *Haor* Sites 04
4.1.1 Pagnar and Sanuar-Dakuar *Haors* 06
4.1.2 Hakaluki *Haor* 06
4.2 Floodplain Sites 07
4.2.1 The Jamuna-Padma Floodplain 08
4.2.2 The Madhumati Floodplain 08
4.2.3 The Brahmaputra Floodplain 09
5. Approach and Methodology 10
Development and conservation 10
Gender consideration 11
Methods considered and deployed 11
Tools for project implementation 12
6. Activities 13
6.1 Baseline Information and Mapping 13
6.2 Awareness Campaign 14
6.3 Organizing Community People and Raising 16
Community Organizations
6.4 Skill Development 19
6.5 Ecosystem Restoration and Rehabilitation 19
6.6 Erosion Proofing 21
6.7 Biodiversity Conservation 21
6.8 Promoting Eco-tourism 23
6.9 Promoting Medicinal Plants 24
7. Renewable Energy Options 25
7.1 Fuel Saving Oven 25
7.2 Biogas Plant 26
7.3 Solar Electrification 27
8. Environment Fund 28
9. Monitoring and Evaluation 29
10. Towards Sustainability 29
References 32

FOREWORD

Haor and floodplain are common but vitally important fresh water wetlands in Bangladesh. A haor is a back swamp or bowl shaped depression, between the natural levees of a river. Floodplains, on the other hand, are lowlying plains contiguous to rivers, formed mainly of river sediment and subject to flooding which consists of baors, beels, jheels and other swamps. The main difference between a haor and a floodplain consists in their period of water retention which is 7-8 months for the haors and 4-5 months for the floodplain. These wetlands of Bangladesh have been subjected to rapid degradation due to population pressure, massive withdrawal of water for irrigation, destruction of swamp forest and a number of other anthropogenic and natural causes. Largescale habitat conversions, unsustainable harvesting practices and lack of appropriate wetland policies and poor enforcement of the existent regulations have led to the destruction of valuable wetlands. Thus, there is genuine and urgent need of undertaking efficient and sustainable management of wetland resources of the country.

In its endeavour to assist communities in appreciating and conserving nature and natural resources, IUCN-The World Conservation Union, Bangladesh Country Office has undertaken the responsibility of initiating a positive reversion of the lately perceived trends of degradation choking the wetlands of Bangladesh, with support from the Ministry of Environment and Forest and the UNDP. In association with Center for Natural Resources Studies (CNRS), Bangladesh Centre for Advanced Studies (BCAS) and Nature Conservation Management (NACOM), IUCNB has been implementing Comminuty Based Haor and Floodplain Resource Management projects under the national intervention Sustainable Environment Management Programme (SEMP) in two select haors of Sunamganj, another *haor* site in Hakaluki and three floodplains faced with abject degradation, with a view to demonstrating the implementation of replicable sustainable wetland management system for Bangladesh.

IUCN Bangladesh has been implementing the SEMP programme interventions through adopting a genuinely participatory approach since inception. Potential activities suggested by the involved communities that might, in all probabilities, be helpful in accomplishing the programme goal of sustainable environmental management were incorporated and tested from time to time during the project. The present report delineates the approach, activities and some case studies to show the impact of the activities fielded so far.

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Dhaka
November 2004

ACKNOWLEDGEMENTS

IUCN-The World Conservation Union, Bangladesh has been implementing the Community Based Haor and the Floodplain Resource Management projects in association with three partner organizations since October 1998. The unique feature of the project is embodied in its essential nature, which manifests itself not only in advocating the grassroots' cause, but by ensuring the closest participation of the concerned communities all through the project processes. That is, during the implementation of the project, community people and other stakeholders actively participated and regularly suggested ways of rendering the project successful, functional and sustainable. In this connection, IUCN Bangladesh acknowledges the useful roles of the representatives of relevant organisations, officials from various government departments and especially the local government bodies viz. the Union Councils of different project sites in haor and floodplain areas. The signs of forthcoming success of these interventions have been quite encouraging and inspiring for all those who are involved in the project and we all feel that it has all been possible because of the wholehearted participation and sincerest support of the local communities and the organisations provided in terms of time, knowledge and physical presence.

IUCN Bangladesh also expresses its heartfelt gratitude to Mr. Naymul K. Chowdhury, Mr. Yahia Sazzad, Mr. Mohidur Rahman, Mr. Shital Kumar Nath, Mr. Abu Sayed and to all those staff members and consultants who served the mission with their expertise and unfailing cooperation. Mr. Asaduzzaman of IUCN Bangladesh worked hard in helping us publish the document, working most devoutly through the process, which is acknowledged cordially.

Finally, IUCN Bangladesh gratefully acknowledges the financial support received from the Ministry of Environment and Forests, Government of the People's Republic of Bangladesh and United Nations Development Program (UNDP) for implementing the Community Based *Haor* and Floodplain Management Projects.

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1. Introduction

Bangladesh is located in the delta of the world's major river systems. The largest river system flowing through Bangladesh are the Ganges, the Brahmaputra and the Meghna. Besides these three river systems hundreds of rivers and canals crisscrossed the 147,500 sq km land mass of the country. The network of the rivers and canals and the seasonal intrusion of water into low lying lands make country as a land of water and wetlands. More than two-thirds of the country's landmass may be classified as wetlands according to the definition enunciated in the Ramsar Convention. Diverse dynamic ecosystems such as mangrove forests, fresh water marshes, natural lakes, man-made reservoirs, oxbow lakes, fresh water depressions, fishponds and tanks characterise the wetlands of Bangladesh.

The wetlands of Bangladesh have been subjected to rapid degradation due to population pressure, massive withdrawal of water for irrigation, destruction of swamp forest and a number of other anthropogenic and natural causes. Large scale habitat conversion, unsustainable harvesting practices, lack of wetland policies and ecological considerations have led to the destruction of valuable wetlands. Thus, there is genuine and urgent need of undertaking efficient and sustainable management of wetland resources of the country. To reverse the degradation trend of the most worthy aquatic resource bases, government of Bangladesh has formulated National Environment Management Action Plan (NEMAP). Besides this Government of Bangladesh has signed the Ramsar convention to conserve the valuable wetlands. Tanguar *haor* and the Sundarbans have been declared as the Ramsar sites of the country. Furthermore, Ministry of Environment and Forests of the country declared 8 wetlands as the Ecologically Critical Area (ECA) among which most of them are wetlands. Thus it is realized that the need to conserve wetlands and its resources is crucial for national development of country.

Table-1: Areas under different types of inland openwaters in Bangladesh (Source: Ali 1991)

Type	Area (ha)
Permanent rivers and streams	479735A
Estuaries and mangrove swamps	551828A
Beel and haors	114161C
Inundable floodplains	5486609B
Kaptai Lake	68800C

Source: aMPO (1986). bMPO (1987). cDOF (1986)

Village woman at work

Date palm friuits

2. Background

Sustainable Environment Management Programme consists of five major sub-programmes: a] Policy and Institution; b] Participatory Ecosystem Management; c] Community Based Environmental Sanitation; d] Awareness and Advocacy; and Training and Education emerged from the niche of NEMAP. It is also expected that SEMP will have close linkages with other development projects of NEMAP. The NEMAP process had been unique in its approach in involving people's participation through grassroots consultations held with different stakeholders in a bid to identify the appropriate local concerns and options to address them. The major breakthrough of the NEMAP process consisted in the identification of the priority areas of environmental concern where immediate action is required. Based on needs, SEMP, a programme consisting of 26 components under the five aforesaid major themes was designed to address priority environmental concern of Bangladesh, be eventually implemented by 22 selected Government, NGOs and international organizations.

The Community Based Haor and the Floodplain Resource Management Projects under the broad theme of participatory ecosystem management, officially comprising SEMP Components 2.2.1/A and 2.2.1/B, have been implemented by IUCN-The World Conservation Union, Bangladesh Country Office since October 1998 with support from the Ministry of Environment and Forests and United Nations Development Programme (UNDP). Three national NGOs as well as member of IUCN namely- Bangladesh Centre for Advanced Studies (BCAS), Center for Natural Resource Studies (CNRS) and Nature Conservation Management (NACOM) have been associated for implementing projects in five degraded haor and floodplain areas of the country. Under the arrangement of partnership, Center for Natural Resource Studies (CNRS) working in the haor region; Nature Conservation Management (NACOM) in the Padma-Jamuna, Brahmaputra and Shitalakha floodplains; and the Bangladesh Centre for Advanced Studies (BCAS) in the Madhumati floodplain.

Post-harvest fuel gathering

Recognising the fact that the local communities are the key stakeholders for effective management of the wetland resources, their participation has been considered essential for sustainable management of the wetland resources. Hence community participation has been made mandatory in all stages of planning as well as implementation of the components. This profile aims at providing a brief delineation of the guidelines formulated and actions tested and successfully fielded with regard to wetland resource management.

3. Project Objectives

The overall objective of the project is to contribute to the improvement of the quality of life in general, coupled with attaining sustainable development, poverty alleviation and capacity building of the local communities for effective wetland resource management by involving the communities to a maximum extent.

Targeting the objectives of the project, several outputs have been identified through exercises. At the end of the project, the outputs should be in place that may lead to reach the goal of the project. The outputs targeted are as follows-

1. Participatory resource management tools developed and practiced
2. Ecosystem improved/ restored/ rehabilitated
3. Local institutions for sustainable development established and made functional
4. Capacity, skills and awareness levels enhanced

Specific project objectives

- Prevention and reversing the trends of wetland degradation
- Sustainable use of wetland resources
- Promoting sustainable development
- Ensuring people's participation in formulation and implementation of sustainable management plans
- Improving the quality of life with special focus on women

A wetland grass: *Kash*

Variety of freash water small fishes

4. Project Sites

The project sites were carefully chosen from the *haor* and floodplain areas of Bangladesh. A *haor* is a back swamp or bowl shaped depression, between the natural levees of a river. Haors are flooded annually during the rains and they remain under water for several months of the year. When they drain out during the post-monsoon months, some permanent water bodies, or *beels* remain in the deepest parts of the *haors*. Floodplains, on the other hand, are low laying plains contiguous to rivers, formed mainly of river sediment and subject to flooding. The main difference between a *haor* and a floodplain consists in their period of water retention, which, for the *haor* is 7-8 months and 4-5 months for the floodplain.

A wetland plant

The site selection criteria for the Community Based Haor and Floodplain Resource Management projects were developed basing on the benchmarks mentioned in the SEMP Project Support Document (PSD). For site selection, it was mandatory for the project staff (multidiscipinary) to visit an earmarked area and hold discussions with the community leaders, fishermen, and local government officials to obtain their views of the proposed project implementation. The specific sites were selected by considering their physical, hydrological, social, biological and management/ general criteria.

4.1 Haor sites

In the biodiversity-rich *haor* region, many threatened species of plants and animals need immediate attention for conservation and sustainable management. Historically, much of the region used to be covered with inundation resistant tree species and bushes, of which, hijal (*Barringtonia acutangula*) and karoch (*Pongamia pinnata*) are the two dominant species. In addition to wetland trees, several water resistant herbs and grasses occurs in the region such as *nol, khagra, chailla, binna, echor, ban tulshi, guijja kanta* etc. A total of

Dry season fishing in a *beel*

eight plant communities have been recorded in the haor areas so far, which may be grouped as follows:

- Submerged plants (20 nos)
- Free floating plants (15 nos)
- Rooted floating plants (15 nos)
- Sedge and meadows (35 nos)
- Reeds swamp (7 nos)
- Fresh water swamp forest (7 nos)
- Crop field vegetation (60 nos)
- Homestead vegetation (63 nos)

The plant composition varies from one *beel* to another within a particular *haor* ecosystem, depending on the water depths and the chemical composition of the water bodies. Most species prefer depths of 0.2 to 2 metres, though some require deeper (>2m) water. The reed communities thrive typically on the ridges (*kandas*) in the haors. Apart from plants, there remain very few species of animals now after extinction of large mammal species like the Leopard (*Panthera pardus*), Tiger (*Panthera tigris*) the Rhinos, Wild Buffalo etc., Marsh Crocodile and Rock Python have also disappeared from the *haor* region. The Bengal Fox, Small Indian Civet, Jungle Cat, Fishing Cat are facing pressure of extinction by the rapid aggression into their habitats. The waterfowl status both resident and migratory is significantly high in this region. Million of migratory birds use to visit the region during winter, which make the haor area globally significant (FAP-6, 1993).

Wildlife is an important component of the wetland ecosystems. The birds which depend ecologically on wetlands would include the two fish eagles, the osprey, several kingfishers, and a number of marsh passerines. There are 125 species of waterfowls, which are recorded in the haors of the country. Altogether, 284 species were recorded in the region. The migratory birds use the wetlands of *haors* for resting and breeding during the winter. In a survey conducted in 1992 by the Flood Action Plan Component 6, a total of 108,000 waterfowls of 77 species were counted.

Considering the trend of degradation of the wetland ecosystems, parts of Pagnar and Sanuar-Dakuar *haors* in Sunamganj district and Hakaluki of Sylhet and Moulvibazar districts were selected for management of the resources.

The white Bengal Rose

4.1.1 Pagnar and 'Sanuar-Dakuar' haors

Selected segments of Pagnar and Sanuar-Dakuar haors of Jamalganj uazilla in Sunamganj district were selected for implementing a component of Community Based *Haor* Resource Management.

Date palm juice collection

Pagnar houses 22 villages with a population size of about 12,000, while Sanuar-Dakuar *haor* has 20 villages inhabited by 16,000 people. Both sites have diverse wetland habitat characteristics viz. small and medium-sized beels and canals, secondary rivers and huge seasonally inundated lands where people do fishing in the wet season and cultivate rice in the dry season. In addition, there are patches of degraded swamp forests in the *khas* lands and the raised *kandas* of beels. Some of these areas have been used for swamp forest restoration and other wetlands resource management activities under the current project. Pagnar *haor* site is a deeper flooded area compared to *Sanuar-Dakuar*. Most of the villages in the Pagnar are exposed to wave action in the monsoon, which causes widespread and drastic homestead erosion.

4.1.2 Hakaluki haor

Comparatively worse degraded segments of Hakaluki *haor* have been included in the SEMP *haor* sub-component under the overarching familiar label of wetlands as an additional work site since July 2001. This Hakaluki is a complex ecosystem of more than 80 inter-connecting freshwater *beels* in a shallow basin bastioned by the Patharia and Madhab hills in the east and the Batera hills in the west. The important *beels* here are *Chatala, Pinglarkona, Haorkhal Footi, Paula* etc. For implementation of the activities, comparatively smaller, manageable and representative segments of the floodplain ecosystem were selected. The project mostly concentrated in parts of Hakaluki *haor* under Gilachara union of Fenchuganj upazilla and Sujanagor union of Barlekha upazilla. Gilachhara Union has 16 villages with a population of 11,000 while Sujanagar has 14 villages with a 11,196 population. As mentioned earlier, the environmentally worse degraded *beels* and degraded swamp forest areas in Barolekha (Sujanagar Union) and Fenchuganj (Gilachhara Union) were selected for community-based management at Hakaluki viz. *Changer khal, Radhadubi beel, Volar Kandir khara, Baro Kachua beel, Lidori beel* and *Padni Dor beel*.

Water tolerant *Panibaj*

4.2 Floodplain sites

Floodplains are distinct, complex and diverse sub-systems of main rivers and provide numerous lotic and lentic habitats. It is the temporary storage of excess water from the main river channel during monsoon, which tends to enhance the productivity of numerous flora and fauna of riverine systems manifold. Yields are often closely related to the extent and duration of flooding. Furthermore floodpains establish connectivity between *beels* and river that leads to exchange of biomasses. During the wet season, the floodplain environment offers dramatically increased living space for the aquatic fauna and availability of resources. Changes in hydrology are probably the most crucial and important stimuli to life cycles. Fisheries of the country are important in terms of economy and livelihood of rural people. Diversity and abundance of fishery is substantialy depends on the health of floodplains.

Panibaj

Salix tetrasperma Roxb.
Synonym: S*alix azaolana* Blanco

Panibaj is found in the Bangladesh swamp forests in and around the streams at low and medium altitudes. It also occurs in India to China, Formosa, Sumatra and Java. It is a small tree, flowering after leafing. Its bark is rough, with deep, vertical fissures. Young shoots and leaves are silky to touch. Leaves are lanceolate, 8 to 15 centimeters long, with minutely and regularly toothed margins. Male sweet-scented catkins are 5 to 10 centimetres long, and borne on leafy branchlets. Female catkins are 8 to 12 centimetres long. Capsules are long, stipulate, occur in groups of 3 to 4. Yellowish Flowers appear in the November-January.

Wood is used for posts, plough, planking and well construction. It is also suitable for fancy works and matchboxes. The bark which yields a "tonic substance" is used as a febrifuge. A squash of fresh leaves is believed to control dysentery, earache, worms, etc. Inhaling the aroma of fresh flowers of willow relieves headache and mental tension. These trees serve as a good refuge for birds, which save crops from insects and rodents.

Palm groves (*Tal*) in Kapasia

***Baira*- A floating garden**

Baira is an indigenous practice of the farmers of Gopalganj, Barishal, Patuakhali etc southwest districts of Bangladesh for cultivating seasonal vegetables and seedlings during the monsoon. Water hyacinths are congregated on the water to make a floating organic platform. The platform usually anchored in the convenient places of beel or canal. The surface of floating platform once decomposed and seeds of selected vegetables are placed into a growth media prepared with the roots of submerged floating vegetation. Growth media is then put on the platform for germination and subsequent raising.

Since the growth medium is organic the seedlings grow fast and usually the farmer sell the seedlings like- cucumber, gourd etc in the local market. The seedlings are transplanted in the soil. Cultivation in the *biara* is a means of earning money for cultivars during monsoon when whole *beel* and its peripheries are inundated for about 6 months of the year.

A potter's wheel

Spawning activity of most migratory fish species occurs during this season. 256 fish species have been recorded in fresh and brackish waters of Bangladesh. Among them, 12 species are recorded as critically endangered (Red Lists of Bangladesh Threatened Animals, IUCN Bangladesh, 2000). Based on the experiences gathered of SEMP interventions, the Brahmaputra and Shitalakhshya floodplains were included as additional floodplain sites under the project in July 2001.

4.2.1 The Jamuna-Padma floodplain

The SEMP floodplain resource management activities undertaken in the Jamuna-Padma floodplain cover two locations under the Shivalaya and Harirampur upazillas respectively of Manikganj district closely: (a) the Arua *beel* in Arua union and (b) Gopinathpur *beel* in Gopinathpur union. The contiguous Kanchanpur union was also included subsequently for awareness raising and other conservation and resource management activities in response to the demand of the local communities. The sites are located in the lower reaches of the Jamuna-Padma floodplain and at the confluence of the Jamuna and the Ichhamati rivers respectively. For implementation of the activities, comparatively smaller, manageable and representative segments of the floodplain ecosystem were selected. Major interventions were concentrated in Arua union, covering 24 villages inhabited by about 13,000 people. Gopinathpur union has 13 villages with a population of about 15,000.

4.2.2 The Madhumati floodplain

In the Madhumati floodplain, the site chosen was in Chanda *beel* in Gopalganj Sadar and Moksedpur upazillas under Gopalganj district. Of the total 45 beel villages boasting a 56,732 population size, five were selected for implementing the core activities viz. *Beel* Chanda, Betgram, Barampalta, Andorkota, Shanpukuria. The villages are within the Madaripur-Gopalganj peat basin consisting of a basin-like depression interspersed with stretches of perennial water or *beels*.

The physical and hydrological characteristics and processes of the Madhumati floodplain ecosystem differ considerably from those of other wetland ecosystems such as the *haors*. Seasonal variations from predominantly aquatic to predominantly terrestrial environment are the result of considerable annual fluctuations in river and floodwater. The ecology is massively influenced by this regimes between aquatic and terrestrial phases.

4.2.3 The Brahmaputra floodplain

Programme Management Unit (PMU) and UNDP awareded the Brahmaputra - Shitalakhshya floodplain site in October 2000 as additional site for successfull implementation of community based *haor* and floodplain resource management components under the project in October 2000. The project site was selected at a later stage in October 2000 in the floodplains of Brahmaputra river in the unions of Bailar and Rampur under Trisal upazilla of Mymensingh district for project interventions. Lately, the subject area has been further extended to cover the lower Brahmaputra-Sitalakshya floodplains, which also includes the Kapasia wetlands partly. Major interventions in this sector have been concentrated in 15 villages with a population of 26,000 around Boka and Galhar *beels* in Trisal and 7 villages with a population of about 10,000 in the lower Brahmaputra/Sitalakshya-Kapasia floodplain and wetlands.

Participatory land use planning

Fuel gatherings

5. Approach and Methodology

Even though broadly classified under *haor* and floodplain categories, each of the SEMP wetland sites is unique with its characteristic of natural, cultural and traditional features. The fact remains that the all pervading common ailment they have been diagnosed to have stemmed mainly from the unplanned resource harvesting by the ever-increasing populations they harbour. Therefore, to start with, necessary interventions had to be sought and selected for changing the resource users' behaviour first, by which when we proposed to reverse the erstwhile reckless resource plundering, with a view to thwarting an imminent ecological disaster. To effect that, we started with identifying the problematic behaviours responsible for the perceived negative trends, the much needed positive motivation and ways of inculcating environment-friendly attitudes in the people living there, towards all kinds of resources-natural and otherwise. Recognising that the overall quality of life of the people living in and around the wetlands are inter-linked with the diversity, productivity and quality of the ecosystem, and understanding that interaction also exists among different groups of stakeholders there, it was decided that we should be addressing those interactions with a view to developing a balanced and participatory approach aimed at effecting human and ecosystem well being simultaneously, which would eventually lead to sustainability.

Keeping this in view, the SEMP Community Based *Haor* and Floodplain Resource Management Components did adopted a participatory approach that integrates ecological protection and human needs to strengthen and bolster the fundamental connection between economic prosperity and environmental wellbeing in both *haor* and floodplain environments. This much-tested and proven approach provides a framework for bringing the grassroots, the Government, private sectors, public groups and other stakeholders together on the same platform of positive action. It is goal-driven and hence based on a collaboratively developed vision of idyllic future conditions that integrate and address ecological, economic, social as well as legal factors.

A village whole sale fish market

Development and conservation

Sustainable *haor* and floodplain resource development and conservation have to be linked together to provide greater livelihood security to the multitudes. The people, particularly the poor living in the *haor* and floodplain areas are dependent on the wetland resources for their subsistence. It is, therefore, essential that these resources be managed with the aim of

sustaining their availability for the wellbeing of the human population. The project, therefore, emphasised resource development and conservation through community participation where the local resource users were participated actively in planning and implementation of project activities.

Gender consideration

Participation of women in the project planning, implementation and monitoring processes has been duly considered and ensured to be realised through the following measures:

- Increasing involvement of rural women in relevant resource inventory and project planning activities
- Increasing involvement of rural women in resource enhancement/ rehabilitation activities
- Encouraging rural women positively to participate in conservation training sessions and workshops
- Considering participation of women in the project implementation and management activities.

Plantation nursing

Methods considered and deployed

While implementing the project, proven and tested participatory methods were used to assess the sustainability of the wetlands resources with a view to planning their development and managing the actions sustainably.

For ensuring community participation, the following activities were accomplished in phases:

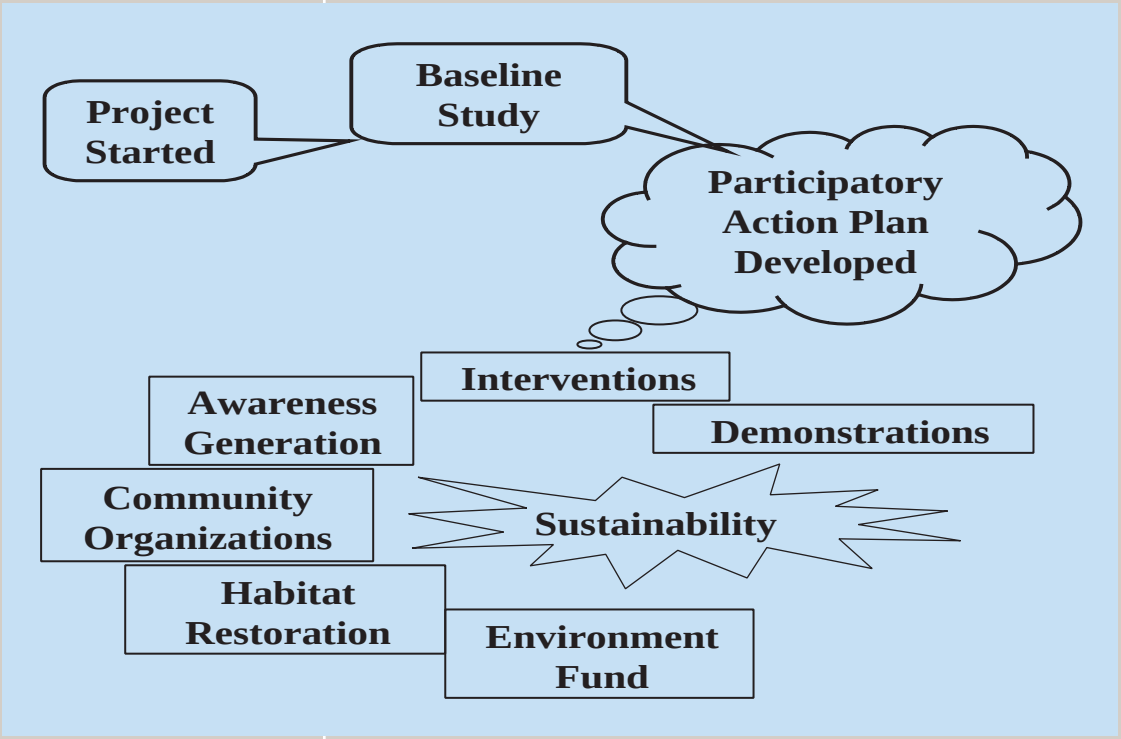
- Assessment of the sustainability of the wetlands resources
- Development of appropriate action plans for sustainability of the wetlands resources
- Analysis and diagnosis of the situation prevailing in the ecosystem
- Identification and prioritisation of options
- Development of strategy and action plan
- Development of implementation and monitoring frameworks.

Tools for project implementation

A variety of tools have been in used while implementing the methods outlined above, viz.:

- Participatory Rural Appraisal (PRA) techniques including focus group discussions (FGDs), transect walks, cause-effect linkages, etc.
- Strategic negotiations
- Mapping
- Visual aids to be adapted, as appropriate, during community interactions
- Participatory Action Plan Development (PAPD)

The overall approach adopted for implementation of the project is shown in the schematic diagram below:



6. Activities

6.1 Baseline information and mapping

Baseline information gathering is an important activity for assessing the status of an area with a view to monitoring and understanding the changes to take place over time towards a desired goal. Within the scope of the project, physical, biological and socio-economic characterization and assessment of resource exploitation, utilization and regeneration practices in agriculture, swamp forest, fisheries etc had been undertaken. The secondary information were also reviewed, analyzed and compared with the primary information of the project.

Action plan

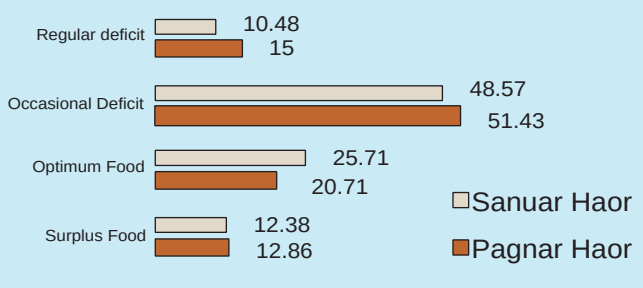
Community participation and involvement of different stakeholders in different stages of the project are equally important factors for sustainability of a development

Some socio-economic baseline information of haor site

A baseline survey was conducted involving sample households selected from the census lists of the project area. Household baseline survey was conducted in 4 villages of Pagnar *haor* and 3 villages of Sanuar-Dakuar in order to get the ideas and information on the existing social and environmental issues and status of the project area. 35 households were randomly selected from each of the seven villages for conducting the interviews; hence the total number of households involved stood at 245.

Data revealed that about 53% and 54% of households of Pagnar and Sanuar-Dakuar *haors* possessed on average 4 and 7 decimals of cultivable lands (considered landless) respectively, while for Pagnar, 19% households were considered as large farmers (possessing on average over 815 decimals of land) and for Sanuar-Dakuar, 19% were rated as large farmers possessing on average 700 decimals of land. Primary occupations of the people living in the project area are mainly farming and fishing and under secondary occupations, poultry farming (15%), fishing (11%), day labour (11%), non-agricultural day labour (9%), fuel wood collection (8%), and farming own land (8%) could be grouped. Most of the households in the *haor* are partly or fully dependent on haor wetland resources. Project interim reports show that about 30%, 8%, 16%, 25%, 17% and 32% households earn less than 20% of their total livelihood income from fishing, farming, agricultural day labour, non- agriculture day labour, business and other sources respectively; on the other hand, 10-15 years back it so happened that over 42% households in the Pagnar haor basin used to be engaged in farming which alone could then meet over 80% of their total living expenses. Baseline socio-economic data also showed that livelihood opportunities are scarce in the whole *haor* belt. *Haor* inhabitants have been found to be migrating out for work to Jokigonj under Chhatak upazilla where they usually mine sand and boulders from the river bed. People from 49% and 39% households of Pagnar and Sanuar-Dakuar *haors* respectively migrate out in search of work during the monsoon. Though womenfolk are interested in income earning activities, it is not appreciated or encouraged by the still orthodox *haor* society.

Figure 1: Food security status of Pagnar and Sanuar-Dakuar *haors*. (expressed in % of household)



programme. In this case, site-specific action plans were developed involving the local communities. Understanding the intrinsic nature of the key problems is also crucial to any community based resource management project. In addressing this particular issue, problem census and series of community workshops were organized for developing an activity plan.

Participatory land use survey/ resource mapping

Participatory land use survey is another vital activity which involves the local community in identifying and marking the use of existing land, physical features, social interactions with the land and water resources in the project area.

A Participatory Land Use Survey (PLUS) was conducted initially at the *mouza* level. Villagers familiar with the *mouza* maps and land use patterns were selected as participants during the survey. Participants were heterogeneous. Separate sessions were organized for each of the different social, economic, political, functional and occupational groups of 6 to 20 participants. To begin with, the survey objectives were explained to the participants; it was the villagers who identified the people who could help in this regard. A whole day was spent in conducting a session. Often more than one sessions had to be organized, however, to enable the team identify all the features of a *mouza*.

> Land use survey findings in Sanuar-Dakuar *haor* indicates that 75% of the beels there, covering an area of 16 acres are owned by the Government, which are leased out as *jalmahals*. The remaining *beels* are owned by schools/colleges/mosques, local communities and private parties, constituting 16.4%, 7.7% and 0.9% respectively of the total number of the *beels* there. The local mosque committees lease out *beels* for commercial harvesting and the revenue thus earned is used in maintaining and developing such institutions.

6.2 Awareness campaign

Awareness programme is again a crucially helpful activity for raising the awareness level of the community people centred around conservation and sustainable use of wetland resources. The main objective of the activity is to generate a greater awareness among the people of the functions, services and values of wetlands. Meetings with the stakeholder groups, discussion sessions and debates on specific issues, observation of national and world days, staging folk dramas and holding workshops and seminars on the conservation management aspects of wetland resources and biodiversity resources were

Environment friendly agricultural plot

carried out for generating awareness among the community people. For further bolstering and sustaining the awareness enhancing activities, school awareness programme, nature clubs, community meetings and demonstration of sustainable farming systems were also established and implemented on a regular basis. It is recorded that in the 5 project sites more than 800 awareness meetings have been conducted with the community people, school students, fishers community, women etc. The agenda of the meetings are wetland resource management, sustainable fish harvesting, bird hunting and its impact on environment. Table-2 shows the activities conducted during the project period for awareness generation of resource users.

Table-2: Awareness generation activities conducted during 1999 to 2004

Sites	Awareness Meeting	Folk Drama	Knowledge Sharing meeting	Important Day Observation	Bill/Sign boards
Pagnar and sanuar-Dakuar *Haor* site	123	18	15	12	79
Hakaluki *Haor* Site	71	6	6	14	117
Padma-Jamuna Floodplain Site	236	92	10	8	210
Madhumati Floodplain Site	125	8	45	16	320
Brahmaputra Floodplain Site	265	40	-	7	165
Total	**820**	**164**	**76**	**57**	**891**

Inspecting restored swamp forest

On the return of the awareness raising campaign among community people, school student, fishers, leaders of Union Council, Government Officials become enthusiastic for conservation and sustainable management of ecosystems. It has been found community people are resisting the fishers against using of small mesh gill nets in the *beels*. In the Nali *beel*, Kapashia community people and even traditional fishers

didn't fish during the breeding season i.e. from May-July of 2003 what resulted in higher abundance of fishes and relatively large fish like rohi, catla, and other cat fish were found to a moderate extent.

Fishing in the *haor* during monsoon

Boys of nature clubs are found pro-active to prevent any measures against destruction of habitats and killing of wildlife and birds in their locality. Boys are taking care of the globally threatened Pallas's Fish Eagle for conservation in the Pagnar *haor*, Sunamganj and Gopinathpur village of Manikgonj district. Community people often nurse's weak and ill wildlife such as Pallas's fish eagle, owls, ring lizard etc. for the enhancement of wildlife abundance and diversity. Hence the changes found are the results of awareness campaign.

6.3 Organizing community people and raising community organizations

Local institutions have been found to be of paramount importance and hence are a prerequisite for the sustainability of a community-based project. For this project, the baseline and socio-economic survey reports afforded the project managers the vital understanding that the community people had to be included in the stakeholder groups involved in planning and implementation of all project interventions. Right from the start, the project title itself proclaimed that the project aimed at

Participatory planning workshop

A distinctive *karoch* grove

ensuring community participation from multi stakeholder groups for planning, implementation and monitoring of all project activities. To realize this goal, Village Groups (VGs) have been established with the participation of vulnerable women and men, who are mainly dependent on the natural resources of the wetland ecosystems. The groups have been provided with financial support in the form of seed money to enable them access alternative livelihood opportunities. Village Environment Committees (VECs) have been formed in the project villages with the participation of representatives from multi-stakeholders. Women's participation has been ensured from the VGs and other social classes.

Capacity building of the VECs has been a major concern all through as the communities are expected to be enabled to sustain the conservation and management activities before

the project is handed over to them. Training sessions on leadership development, natural resource management and financial management have been organized for the community organisations. The Village Groups (VGs) and VECs have been accorded legal recognition by registering them with the Cooperative/Social Welfare and Woman Affairs Department at the upazilla level as appropriate. These committees constitute the mainstay for continuing with the implementation of the project activities following 'phase out'.

Aiming to strengthen local institutions, 14 VEC have been registered with the Upazilla Cooperative Department to formalize the local institutions. More than 25 VECs will be registered with the same department during this year. It has been observed that CBOs as well as community people are proactive for association building for their ecosystem conservation that would ultimately lead to enhance their daily income and subsistence. In this regards community people of 8 villages donated their lands for building Wetland Management and Training Centre (WMTC) where they will meet to have meeting and discuss local environmental and social agenda. VECs are now in a position to manage their fish sanctuaries, afforested areas, environment friendly agricultural demonstration plots and environment fund operations. The Kathalia Mahila Samity (Women Association) of Brahmaputra floodplain site, Trishal consisting of 20 members took Tk. 24000 from the environment fund and made a profit of Tk. 28000 investing the capital in goat rearing. The cumulative amount is now invested for 20 cattle rearing and they hope substantial profit to change their livelihood and simoultaneous they will be able to reduce load on their nearby wetland- Boka *beel*. It has been also evidenced that VECs are able to mitigate their conflict that would emerge in the community level regarding the project implementation and management.

Fishers at work

6.4 Skill development

Recognising that capacity building of the community people around livelihood practices is another key contributory factor for sustainability of such programmes as SEMP, various training sessions on leadership development, financial management, right based approach, natural resource management, fisheries management have been organised for the community people and other stakeholders under the aegis of this project.

Table-3: Skill development training organized in different sites (1999-2004)

Sites	VEC training	VG training
Pagnar and Sanuar-Dakuar Haor site	74	100
Hakaluki Haor Site	22	26
Padma-Jamuna Floodplain Site	20	39
Madhumati Floodplain Site	47	71
Brahmaputra Floodplain Site	7	12
Total	**170**	**248**

Around 5000 participants from the VECs and 7000 from VGs attended the trainings showed in the table 3. The project followed up the training provided to the community members with financial and technical back-up with a view to enabling them apply their acquired knowledge and skills. Specifically, financial support from the SEMP Environment Fund has been provided to the vulnerable households to enable them access alternative livelihoods, so that they are rendered less dependent on the wetland resources.

6.5 Ecosystem restoration and rehabilitation

As mentioned before, the wetland ecosystems have been subjected to degradation due a number of factors, viz. over harvesting, excessive pressure on natural resources, embankments, siltation, degradation of swamp forest etc. To reverse the negative trends, a number of activities e.g. re-excavations of water bodies, swamp afforestation, roadside plantation etc have been fielded under this project with active participation of the local communities.

6.5.1 Plantation

The raised stretches of land or kandas in the haor once used to be naturally covered with wetland plant species, providing good habitats for the local biodiversity. These swamp forests have now almost wholly disappeared; only a few such patches of the remainder trees bear witness to the luscious-rich swamp forest of yore.

Earthwork labourers taking a break

It is envisaged for Pagnar *haor* site that each household of a village having 100 families will get a benefit of US$ 100/year by selling the polarded branches from a regenerated forest of 20000 *hizal* and *karoch* planted during the project period.

Based on the information gathered from the land use survey, *khas* and *ejmali kandas* and other suitable lands for swamp forest regeneration and protection were first identified and subsequently planted in phases with local varieties of wetland plant species viz. *hijal* (*Barringtonia acutangula*), *karoch* (*Pongamia pinnata)* and *barun* (*Crataeva nurvala*) for enhancing the ecosystem wellbeing. The local people have been kept closely involved in the selection of species, caring and maintenance of the planted areas.

In the Pagnar and Sanuar-Dakuar *haor* and in Hakaluki *haor* over 450,000 saplings of swamp forest species have been planted covering an area of about 500 acres for regeneration of swamp forest. In addition to the swamp forest restoration, other biodiversity friendly plants and reeds like *nal* (*Saccharum spontaneum*), *khagra* (*Phragmites karka*) etc have also been planted with a view to reviving the green life into the degraded nature and inspiring local communities to nurture their environment and prospect for alternative income sources.

About 250 ha area of Hakaluki *haor* has been protected to accelerate natural succession of wetland flora and fauna. After two years of protection, successful successions of *hizal, karoch, barun, ban tulshi* (*Ocimum americanum*), *gujja kanta* (*Rosa clinophylla*), *asparagus, nal* (*Saccharum spontaneum*), *khagra* (*Phragmites karka*) etc. are observed and community people reported that some large fauna like mongoose, fishing cat, snakes, frogs etc are often seen when they work in the *haor*.

Vegetation coverage has been increased in the floodplain sites through plantation along the roads, canals and rivers. A total of 80 km roadside and river bank has been planted with native species of timber and fruit bearing trees involving the community people. Plantation also done with the local species in the premises of schools, shrines and community lands for conservation of local flora as well as fauna. Precise benefit sharing mechanism has been worked out with participation of multi-stakeholders from community, union council and government concern departments.

6.6 Erosion proofing

The village mounds in the *haor* have always been subject to erosion due to wave action during the monsoon. Traditionally, the *haor* people are used to protecting their homestead by binding the vulnerable mound-faces using *chailla* (*Hemarthria protensa,* a tall grass abundant in *haor*) grass and by deploying other indigenous techniques. Due to the current scarcity of *chailla*, villagers find it hard to protect their homesteads against wave erosion. As a protective measure under this project, a pilot scale activity has been undertaken, which deploys an erosion thwarting technique using both geo-textile and *chailla* together. Demonstration of geo-textile based erosion protection conducted in two villages of Pagnar haor while 4 other villages demonstrated with water hyacinth and bamboo based erosion proofing measures. Also, greenbelts of local wetland plant species viz. *hijal* (*Barringtonia acutangula*), *kaorch* (*Pongamia pinnata*) etc have been raised around the erosion-prone faces of the village mounds as a protective measure. To this connection 11 km long strip plantation with *hizal* and *karoch* has been done along the edges of 2 villages of Pagnar *haor*. It is anticipated that vegetative hedge will reduce the strength of the wave from eroding the village mounds in addition to enhancement of aquatic biodiversity. It has also been observed, plantation of swamp species in the degraded *kanda* enhances succession of *chailla* grass and people from the local community are harvesting this resource for protecting their homesteads.

6.7 Biodiversity conservation

6.7.1 Fish Conservation

Fishing carried out using harmful gears have proved detrimental to the fish biodiversity and fish population in the wetlands of Bangladesh. During the dry season, the traditional as well as the seasonal fishermen end up dewatering the deeper parts of the *beels* and exhaustively catching all fishes without keeping any brood fishes, which is why a lot of species of fishes have altogether disappeared lately. To address this, 'fish conservation areas' have been developed for protecting the mother fishes and enabling their multiplication. In the five sites of haor and floodplain, a total of 20 fish sanctuaries has been established for conservation of threatened fish species and broods for future resource's recruitment. Fishing in areas earmarked as conservation zones remains suspended through the stipulated time frame. The local community groups have been managing these conservation areas successfully. As a result, fish biodiversity and population have already increased to an extent.

Fish conservation at Nali Beel, Kapasia

Community people around the Nali *beel* decided to give up their fishing efforts during the breeding period of most of the fishes in Nali *beel*. In this connection a consensus in multi stakeholder groups has been made in 2002 and they did not fish in August-September aiming to enhancement of brood stock and diversity. After 4 months of patience of not-fishing community people and fishers got a tremendous increase in abundance and diversity of fish at Nali beel. The exposure of fisheries resource enhancement supported to build a strong belief of fish conservation and sustainable use of the resources for betterment of aquatic biodiversity and their livelihood.

6.7.2 **Ring Lizard Conservation**

Wildlife resources have lately been depleted all over the country especially due to destruction of natural forests and wetlands. Initiatives have been undertaken for rehabilitating and restoring degraded wildlife habitats. At the Padma-Jamuna and the Madhumati floodplain project sites, four specific locales have been identified as wildlife conservation areas, in consultation with the local people. A fragmented population of the Ring Lizard (*Varanus salvator*) has been recorded in Ujani of Chanda *beel* area. Villagers of Ujani village have been motivated for conservation of the rare reptile and in this connection financial incentive has been provided for feeding during winter of the year. This animal has been listed as 'endangered' in the IUCN Bangladesh Red Book of Threatened Animals, 2000.

6.7. 3 Fresh Water Turtle Conservation

In Bangladesh, turtles are highly threatened animals, which needs immediate attention for conservation and protection. As pilot interventions, two hatcheries and some conservation areas have been developed to protect these species. In the hatchery of Padma-Jamuna floodplain site, 6 nos. of species have been conserved *ex situ*. More than 150 hatchlings have been produced in the hatchery which were afterward released to natural wetlands. Apart from this, turtle hatchlings are reared in some selected ponds of Hindu hermitages of Chanda *beel* and Arua-Gopinathpur for multiplication with a view to ensuring sustainable environment for them.

6.7.4 Pallas's Fish Eagle Conservation

Pallas's Fish Eagle (PFE), which stands enlisted as a critically endangered bird species all over the world is now seen only in a few floodplain and *haor* areas of Bangladesh. Specific interventions have been implemented for conserving this globally important bird , such as a) assessment, mapping and identification of nests and conservation plan development, b) erecting appropriate towers to afford the bird species secured nesting facilities, c) raising awareness and creating understanding among the community people of the importance of this prize species, and d) regular monitoring.

Due to habitat destructions, population of PFE has been declining at a higher rate. Only a few pairs of PFEs still survive in the *haor* and floodplain areas threatening with extinction. A study within the project showed that 15 nesting pairs of PFE with nests have been observed in 13 villages of Jamalgonj upazila. The status of PFE is shown in Table 4 based on the experiences of local people of Jamalgonj upazilla. It is expected that conservation measures and positive motivation of community people would help to resist the declining trend of majestic bird from *haor*. PFE conservation measures have been taken also in Arua-Gopinatghpur area under Padma-Jamuna Floodplain site where 2 nests have been found in 2002. Due to attention provided to conserve the threatened species with the active participation of community people, the PFE nests were increased to 4 on 2004.

A pallas's Fish Eagle juvenile

Table 4: Population status of PFE nests in Jamalgonj

Time (years)	Villages (no.)	Nests (no.)
At Present	13	15
1-2 years Before	19	22
3-5 years Before	35	39
6-10 years Before	50	57
11-20 years Before	61	68

6.7.5 Reintroduction of Locally Extinct Species

It was found during the baseline survey that the erstwhile rich biodiversity of the project area had marked a decline and some species were critically endangered and needed immediate attention. The *sarpunti* (*Puntius sarana*) and some fresh water turtle species were found extinct from the local wetlands. As measures for conservation and restoration under the project, more than 150,000 hatchlings and fingerlings of pabda *(Ompok pabda)*, *heronpunti*, sarpunti *(Puntias sarana)*, local magur *(Clarias batrachus)*, rui *(Labeo rohita)* and mrigel *(Cirrhinus mrigala)* have been reintroduced in Boka and Nali *beel* of Brahmaputra site. Reintroduction and conservation management of water bodies and fish sanctuaries would lead to restore the threatened aquatic livings.

6.8 Promoting Eco-tourism

Realizing that in addition to conserving the wetlands resources through ensuring their wise use, the aesthetic and scenic values, the wildlife and other relevant ecosystem services pertaining to this unique ecosystem might also help the local resource managers generate incomes, the SEMP-IUCN programme component attached due importance to wetland based ecotourism activities. An action plan was developed accordingly to organise ecotours at the *haors* and the Padma-Jamuna and the Madhumati floodplains and implement the initiation of this budding sector.

Aloe vera regenerated

Among the approaches considered and implemented, the following deserve special mention: (a) construction of a dolphin watchtower, turtle rearing in shrine ponds and establishing rudimentary natural history museum in schools at the Chanda *beel* site in the Madhumati floodplain (b) in Padma-Jamuna floodplains, construction of a river biodiversity watch hut, waterbird sanctuaries, turtle rearing ponds, the Ichhamati riverine trail and (d) at Kapasia, Shitalakha floodplain site, deciduous forest trails and the local orchards have started drawing tourists from home and abroad.

6.9 Promoting medicinal plants

As a result of unchecked deforestation everywhere, our unique wealth of medicinal plants will be depleted unawares, even before they are fully assessed and evaluated. Under this project, demonstration plots dedicated to nurturing and raising valuable medicinal plant species have been established in all project areas. Resource users of the project areas are aware with extensive awareness meetings with all level of community people. The conservation significance of medicinal plants has been disseminated through folk dramas. Furthermore, workshop has been organized with herbal practitioners of Madhumati floodplain site to workout conservation measures and sharing medication scopes and ways by different medicinal plants.

Under the project scope, a total of 46, 100 and 194 plots of medicinal plants have been demonstrated at the village, community, institution and homestead levels of the Madhumati, Padma-Jamuna and Brahmaputra floodplain sites respectively. Community people regardless of social classes and herbal practitioners are extracting the parts of medicinal plants from the demonstration plots for ailments of locals, in addition to dissemination of conservation mode of worth plants. People of Brahmaputra Floodplain site use to sale the surplus medicinal plants in the local market, more specifically, they sale *sarpagandha* (*Rauwolfia sarpentina*) from the demonstration plots. Establishment of marketing network for the medicinal plants would be an incentive for conservation of the medicinal plants.

7. Renewable Energy Options

7.1 Fuel saving oven

Reduction of pressure from the resource bases is prerequisite for conservation and sustainable use of wetlands. People of haors and floodplains collect fuel wood for domestic uses. Fuel wood extraction by the increasing population is thus the cause of declining of swamp forest and reeds of the wetlands at an alarming rate. Introduction of fuel saving oven in the village-household level has been initiated for cooking purposes that create more heat by efficient burning of fire wood compare to traditional oven of rural Bangladesh.

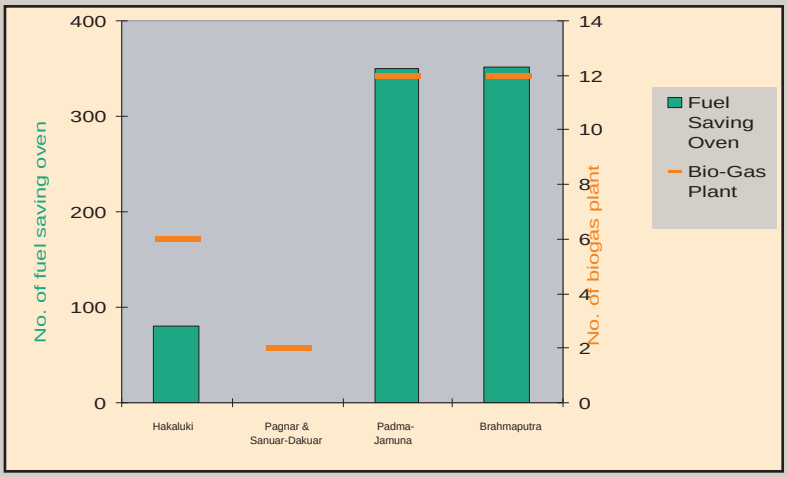


Fig 2: Fuel Saving Oven and Biogas Plant distributed in different project areas

Fuel Saving Oven, an innovation of Bangladesh Council of Scientific and Industrial Research (BCSIR), is an earthen stove can be made by the locally available materials that cost Tk. 300-400 per unit. Community people more specifically potters of the project area have been trained on the preparation of earthen oven following the procedure of BCSIR. Trainer from BCSIR has provided the training on the preparation and use of the oven. To enhance the practice of the fuel saving and disseminating the efficient utility, a total of 81, 350 and 352 ovens have been distributed among the members of women groups in Hakaluki, Padma-Jamuna and Brahmaputra sites. In addition, some parts that are difficult to make by the community people or potters have been provided with a subsidized price by the project. Awareness programme for promotion of the oven has been conducted among the women

of the community of haor and floodplains. Some fuel saving ovens have been demonstrated in the restaurants of bazaar in Brahmaputra and Padma-Jamuna Floodplains site and found the owners of the restaurants satisfied with the efficiency of oven. According to them, fuel consumption of kitchen of their restaurants reduced by 50% using the fuel saving oven.

7.2 Biogas Plant

Biogas means the gas produced from the fermentation of dung and other fermentable materials i.e. domestic organic waste, cow dung, poultry droppings, agriculture residues etc. It composed of 60%-70% methane, which can be used as fuel. To reduce pressure on the haor and floodplain ecosystems of project areas piloting of biogas plants has been conducted in the household level. Fixed dome model has been made using bricks, sand and cement, which is reasonably low-cost but long lasting. BCSIR procedure has been followed for building the plants in different sites.

Biogas plant has been introduced for demonstration in the Padma Januma Floodplain, Brahmaputra and Hakaluki haor sites. A total of 31 biogas plants have been established in the Padma-Jamuna, Brahmaputra, Pagnar and Sanur-Dakuar and Hakaluki haor sites (Fig 3) where women of the communities cook their food by contributing organic residues of their household to the dome of the plant.

The residues of biogas can be used as bio-fertilizer. The biogas plant owners are using the organic manure for producing number of seasonal crops and vegetable viz. cauliflower, cabbage, eggplant, sugarcane etc. In addition, cooking using biogas plant is less health hazards (i.e. skin problem, headache, coughing and eye inflammation) for women who cook comparing with traditional oven that lead to severe indoor pollution.

Case Study

One of the biogas plants (under SEMP Component 2.2.1 /B) was established in March '03 at the homestead of Aujit Shaha of East Bawlikanda, Arua Union, Manikganj. The purpose was to promote sustainable energy system. The family borne 25% of the total cost for constructing the biogas plant. Recently, we visited the family and found that a double burner cooking gas stove has been placed at the kitchen connecting the biogas plant. The family has 3 large size cows (improved variety) and two calves, from whom they get about 30 kg dung per day. Sandha Rani Shaha, the oldest housewife of the family informed that they stir dung and pour it to the inlet tank at every evening for charging the plant over night. They cook three meals with the gas, among them breakfast can be cooked properly and the rest partly (because, it is a big joint family of 15 members and the established biogas plant able meet the fuel needs of medium family of 6-7 members only). The manure produced from the residue of biogas is being used in their vegetable garden and cropland. She also informed that they had used the manure in the vegetable garden and harvested a good number of cauliflowers and cabbages a few months ago. At present, they are using it in the field of sugarcane and eggplant. She expressed her satisfaction with the system, as it is easy handling, less time consuming, pollution free and modern technology.

7.3 Solar Electrification

Haor areas are fairly remote where extension of national power grid is not a feasible option, because of the high cost coupled with other technical difficulties. To reduce pressure on the natural resources and develop management and operational skills of the haor community towards attainment of sustainability as well as generation of funds, the project has installed solar system in Binnyajura, a project village at Pagnar haor site in consultation with the community members. Villagers have contributed for the systems and also agreed to pay an agreed amount for each bulb and TV as subscription per month which would be deposited in the VC's account in a schedule bank. MoU between the VC and Project has been signed in this regard mentioning clear indications about regular maintenance, replacement of accessories, subscription collection etc. Apart from the regular maintenance of solar panel, the system provider will replace the batteries and panels against the warranty if it requires within 5 and 20 years from the date of installation in the village.

Haor village enjoying solar power

Binnyajura village inhabited by 154 households ranges from landless to large farmer groups. The solar system supports all household of the village with one or more bulbs and at least one TV points those who own TV. In this connection, a total of 232 bulbs and 7 TVs are getting power from the system at the rate of Tk. 20 and Tk. 30 per month. Number of bulbs provided to the households according to the requisition of the households. Twenty poor households of Binnyajura village having no capacity to bear whole subscription cost have given 50% off for a bulb.

The total initial investment for installing the system stands at Tk. I,426,854 and the cost recovery analysis shows that a total amount of Tk. 752,921 will be recovered within five years (which is about 53 % of the capital investment) of installation of the solar panels, of which over 1 lac taka has already been recovered and deposited with the community's account maintained in a scheduled bank. It is expected that villagers of Binnyajura would able to replace the batteries after 5 years and panels after expiring at 20 years old. The rest amount remaining in the accounts would be used for the welfare of the community and their ecosystem.

Based on the successful initiation, Care Bangladesh has keen to replicate the model in some parts of haor through their projects. Alternative power generation would help to reduce pressure on the national power grid and save money of the rural people from buying of kerosene for firing lantern.

8. Environment Fund

Almost all households of the haor and floodplain SEMP sites have varied linkages with the wetlands resource bases. Desperate and helpless dependence of the people on the natural resources has led to serious degradation of the wetlands. In a bid to taking the extreme pressure off the wetland resource bases, especially during the breeding season of fish, an incentive in the form of seed money has been provided to vulnerable women and men of the project areas to enable them look for alternative income. Traditional fisher groups, potters, handicraft producers, herbal healers etc have also been aided with the fund to serve similar conservation goals.

Environment fund has been provided to groups after providing adequate motivation for reduction of pressure on the natural resource bases as well as training on various employment generating options viz. poultry and duck rearing; handicraft production, cattle fattening, nursery development etc. During the five years of project phase, a total of 238 trainings provided to the women of some 158 Village Groups and members of some VEC and FRMC those who earmarked for income generation from alternative sources. At the time when the groups or committees deemed considerably capable to manage environment fund in Income Generation Activities (IGAs) are provided fund and a total of about Tk. 5,500,000 among 158 VG, 5 VEC and 1 FRMC of haor and floodplain sites.

Typical cooking activity

Follow up evaluation of the using of environment fund shows good successes in the some groups. *Kathalia Mahila Samity* (Women Group) of Bailor Union under Brahmaputra Floodplain site has experienced a double profit from the seed money investing in rearing of goats. They are now satisfied with the enhanced capital and further investment with cattle fattening business. More profit is expected in future from cattle fattening which may lead to uplift their livelihoods as well as reduce load on aquatic resources of *Boka beel*. Similar success cases are found in the Madhumati and Padma-Jamuna Floodplain sites and also in the *haor* sites, which indicate substantial increase of income from alternative sources.

9. Monitoring and evaluation

The Project Implementation Plan (PIP) of Community Based Haor and Floodplain Resource Management projects prepared in the inception period of the project when Logical Framework Analyses (LFA) had been carried out sequentially, maintaining the linkages among goal, purpose, output and activities. LFAs of different sites of haor and floodplain projects have been used as the basis for monitoring and evaluation of regular activities, outputs including staff performance, efficacy, efficiency and relevance.

While carrying out regular monitoring and evaluation of the project activities, abundance or depletion and flora and fauna diversities have been monitored continually to record an understanding of the changes in the light of the seasonal variations and various interventions occurring under the project.

A catch monitoring in Pagnar and Sanuar-Dakuar *Haor* with push net in the case (sanctuary) and control (non-sanctuary) areas shows that catch is three folds higher in the case area compare to control area during the dry season. The composition of the catch was with spawn of 29 fish species in the case area whereas 21 species were found in the control area. The reason was probably due to water level depth, which is higher in the case area. During the early monsoon, catch is lower in the case area since water depth starts to increase in the same area compare to control area and fishing with push net is difficult with same gear and effort. Abundance and diversity of flora and fauna in the sanctuaries of project are found higher compare to non-intervened areas.

10. Towards sustainability

During the implementation of this community based project, attempts at resolving the issues and problems related to the degradation of ecosystem and their restoration are being made with active involvement of all stakeholders at all stages of the project. All inventorying and formulation of restoration and conservation plans are initiated at the community level, subsequently blended and fused with the tested modern day development techniques and finally implemented in the field. To reiterate, people have been involved right from the action plan development to the implementation and management of the project for ensuring the deployment of participatory approach all through.

Like any other development projects, a major challenge in such ecosystem management projects too lies in dispelling the apprehensions of the project activities being abandoned after the 'phasing out' stage. The activities organized and implemented so far at the five project sites have been solely through the participation of wider resource user communities. Users were motivated and urged to involve themselves in the whole development process with a view to strengthening their capacity of resource users for ensuring the well being of the ecosystem and as well as their livelihood.

Apart from the ensured participation of stakeholders, capacity building, alternative income generation and overall improvement or restoration of haor and floodplain ecosystems following strategy has been adopted during project implementation for long term sustainability:

Continuity from operational level/Replication
A three-tier committee, viz. Village Group, Village Committee and Haor/Floodplain Resource Management Committee (HRMC/FRMC) are being formed with representatives from all stakeholder groups. The public representatives and the concerned government official are also involved in the apex body. These community organizations are expected to be responsible for long-term management of the ecosystem, hence capacity of the committee members enhanced to the competitive level for managing their ecosystems in sustainable way. In addition, successful cases should be adopted and replicated by the government for further replication in the similar degraded ecosystems of the country.

Self-Sustainability
Financial strength of the vulnerable poor would be required for poverty reduction that may lead to reduce pressure on the ecosystem resources for daily subsistence. Financial incentive for vulnerable people of the project area would resist them from the unsustainable harvesting of resources as well as make self-sustainable from alternation employment options.

Integration into Policy
Successful project or program needs to be incorporated into the mainstream for dissemination of knowledge amongst different government sectors as well as NGOs for further implementation.

Lessons learned/Best practices
Monitoring based changes and experiences from lessons-learnt deemed necessary for success and sustainability of project. Regular monitoring, progress review workshop, interim evaluation of projects would help to rectify laps and gaps of the project during project implementation.

Ownership from Sustainability Perspective
Ensured participation of multi-stakeholders in different stages of project from planning to implementation would enhance the sense of ownership of the community people. This could also be stronger through practicing financial transparency, good governance, participatory approaches and equitable access and benefit sharing within the project scope that may lead to a project sustainable.

It is expected that a replicable comprehensive model on participatory wetland resource management practices will be developed after the completion of this medium-term project, which will certainly ensure the access of the poor to the resources, thereby affording the local communities the much-needed uplift in their quality of life and livelihoods.

Roots of *karoch*

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IUCN Bangladesh Country Office established in 1991has been providing support to the national institutions-both government and non-government-by advising them on environmental planning and assessment, sustainable management of natural resources, formulation of environmental policies, habitat conservation and restoration, ecosystem and livelihood management, water management, biodiversity conservation, demonstration of knowledge application through pilot interventions, institutional capacity strengthening, environmental education and awareness promotion, environmental law and water and climate change issues.

Introduction to Community Based *Haor* and Floodplain Resource Management
Published by
IUCN-The World Conservation Union, Bangladesh Country Office
Under
Sustainable Environment Management Programme (SEMP)
Supported by
Ministry of Environment and Forests
and
United Nations Development Programme (UNDP)

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