

MACH

Technical Paper 2

Lessons from Community based Co-management of Large Wetlands in Bangladesh

Management of Aquatic Ecosystems through Community Husbandry



April 2007



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CARITAS Bangladesh



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Dhaka

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Abstract

The MACH project has over a period of eight years worked in three large wetland sites, where at its maximum extent in the monsoon water covers a total of some 32,000 ha, ecosystems that contribute to the livelihoods of over 650,000 local people. The approach developed and evolved over this time to include establishing community management of wetland resources, livelihood support, development of community based organizations, and ultimately in establishing co-management institutions between government and community organizations. MACH has demonstrated that it is possible to restore the productivity and functioning of large wetland ecosystems in Bangladesh and thereby enhance livelihoods of poorer wetland users and biodiversity. This has been recognized in the recommendation of this approach in the Bangladesh Poverty Reduction Strategy Paper and the incorporation of key components of this approach in the Inland Capture Fisheries Strategy of the Ministry of Fisheries and Livestock and Department of Fisheries. This report brings together over 130 lessons from this experience for the benefit of those planning and designing future initiatives for fishery and wetland co-management in Bangladesh and for those implementing such projects and programs. These can be summarized as:

1. **Sufficient time** needs to be allowed from the outset to cover a phased approach – the initial slow build up of trust, implementation which is affected by factors such as weather and short excavation seasons, building institutional capacity and a gradual phase out for sustainability.
2. Initial **staff development** and orientation are vital.
3. **Participatory planning** is an essential first step locally.
4. Involving the **Union Parishads** from an early stage is essential as they lead much of local opinion and are able to legitimize or threaten the initiative depending on their understanding and interests. In the long term they are also important to co-management.
5. It is best not to make rigid **identification of participants**. For resource management in large wetlands the community organizations should be flexible so that membership can be changed once it is clear who uses the resources and who is motivated. But sufficient quotas should be set to ensure that the poor, fishers, and women are represented.
6. The emphasis of support for institutions should be on ensuring their sustainability and that **good governance** practices become routine.
7. **Livelihood support** for the poor, especially fishers, is a vital incentive for conservation based management, so provision for training, saving, and accessing credit are important.
8. **Co-management** bodies involving local government & communities are vital for coordination and resolving problems and conflicts between stakeholders. To play an effective role in these committees, the capacity and confidence of the community organizations has to be developed.
9. **Human activities in the catchment need to be regulated** if sufficient quantity and quality of dry season water are to be ensured. Pollution, dewatering or water abstraction, and poor cultivation on slopes causing erosion are all problems affecting the MACH sites.

Acknowledgements

This report summarizes the lessons from the MACH project over an eight year period, so the contributions to this success of every past and present member of the project team from Bangladesh Centre for Advanced Studies, Caritas Bangladesh, Center for Natural Resource Studies and Winrock International must be appreciated along with the co-managers themselves – the officers of Department of Fisheries and other government agencies, Upazila administration, Union Parishad chairmen and members, and the local communities and their organizations – the Resource Management Organizations and Resource User Groups.

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Acronyms

CBO	Community Based Organization
DoF	Department of Fisheries
FRUG	Federation of Resource Users Group
GoB	Government of Bangladesh
LGC	Local Government Committee
MACH	Management of Aquatic Ecosystems through Community Husbandry
MoU	Memorandum of Understanding
MoL	Ministry of Land
NGO	Non-Governmental Organization
PAPD	Participatory Action Plan Development
RMO	Resource Management Organization
RUG	Resource User Group
UFC	Upazila Fisheries Committee
UFO	Upazila Fisheries Officers
UNO	Upazila Nirbahi Officers

1. Background

Bangladesh has been rich in fisheries resources due to its geographical location, environmental and climatic conditions. Bangladesh is located in the delta of three main rivers -- the Padma (also known as the Ganges), the Meghna, and Jamuna/Brahmaputra -- and many lesser rivers and streams. Over half of Bangladesh comprises floodplains. About four million hectares of floodplain wetlands form a major capture fishery (Ali, 1997). The floodplains form a productive habitat supporting about 260 species of fish. Bangladesh ranks third (after China and India) among the world's largest inland fish producing countries. The floodplains are a source of livelihood for 800 people per km² and are intensively used for agriculture, fishing and other aquatic resources. Over 70% of households in the floodplains catch fish either for income or food (Minkin et al., 1997; Thompson et al., 1999). These fisheries contribute about 46% of all fish consumed (Department of Fisheries, 2000). Natural floodplains have provided rural communities for generations with many products and services beyond just fish: plants for food, fodder, building and fuel; navigation routes; water to irrigate crops; habitat to hunt wildfowl and to raise domestic ducks; grazing lands; absorbing flood waters, recharging ground water etc. (Barbier et al. 1997). Moreover several of these wetlands are recognized as being of international importance for biodiversity conservation (BirdLife International 2004)

The pressures of population growth, increasing exploitation of resources, industrial development, agricultural expansion and intensification, siltation, deforestation, and flood control structures all contribute to loss of these wetlands. The contribution of inland capture fisheries to total fish production in Bangladesh declined from 63% in 1983-84 to 42% by 2000 (DOF statistics quoted in Thompson et al. 2002). A recent review estimated that inland capture fisheries catches had fallen by 38% between 1995 and 2002 (Muir 2003), this is equivalent to a loss of over Tk 500 million per year. Since 1985, natural carp spawn production has declined by 75% and catches of major carp and large catfish have declined by 50%. Despite rapid growth in pond aquaculture, fish production has not coped with human population expansion and fish consumption declined between 1995-96 and 2000 by 14% to 11.1 kg/person/year (Bangladesh Bureau of Statistics household expenditure survey data quoted in Muir 2003). Hence there is a growing burden on the economic and nutritional status of the poor including fishers. Indeed, there has been growing concern over the need for policy change to ensure the participation of resource users in development and management of wetland resources, and this has been reflected in the recent strategy developed for inland capture fisheries (DOF 2006).

In the past the institutional arrangements for improving fishery management and for resource users' participation received very limited attention. The government focus was to collect revenue from fisheries rather than sustainable management. From the early 1990s this has gradually changed, at least on a pilot scale, initiatives have started to empower fishing communities and enable them to take management decisions themselves for sustainable use of these fisheries have moved forward.

2. The MACH Project

Considering these problems and early experience in community based management, the project "Management of Aquatic ecosystems through Community Husbandry" (MACH) was developed by USAID and the Government of Bangladesh. The goal of the project is to promote ecologically sound management of floodplain resources including fish and other aquatic products to ensure the livelihoods and supply of food for the poor. It is doing this by demonstrating and testing the viability of a co management approach to natural resource management and habitat conservation over an entire wetland ecosystem. This is in support of the government's environmental and fisheries objectives and policies including: preservation, conservation, protection and development of natural resources, and increasing fish production and biodiversity.

The MACH project started in October 1998, after reviewing potential working areas it initiated activities at two field sites in June 1999 and at a third site in July 2000. The purpose of this paper is to draw together lessons from over seven years of experience in community management of wetlands to help inform future initiatives in wetland management in Bangladesh and internationally. In this section a brief overview of the project is given, more information may be found in other MACH technical reports.

2.1 The Approach

MACH Project emphasis is on flexibility, adaptability and involvement of local people's knowledge and experiences for improving and restoring wetland resources for their sustainable use. MACH is a process project that has developed over time a co-management approach involving user communities and local government.

To achieve this, the project has worked with community based organizations known as Resource Management Organizations (RMOs). The RMOs are formed with the representatives of different stakeholders from the villages located around project wetlands. Under strong guidance of the MACH staff, the communities developed their organizations, and norms and rules for resource management. A complementary investment support project supported by Government of Bangladesh through MACH has focused on restoration and conservation of wetland habitats principally for fisheries, wildlife and birds but also including restoration of swamp forest and riparian trees in the areas managed by the RMOs.

The MACH approach is different from other similar projects because all socio-economic groups and different stakeholders (communities, local elected government and officials) are involved in the co-management bodies. This has been complemented by organization of the poor, particularly poor fishers, to improve their livelihoods and be represented in the other organizations. This co-management approach is based on:

- Participation of the wider communities (fishers, farmers, local leaders and development allies) that use wetland resources,
- Participation of local government institutions (Union Parishad) and government agencies (principally at the Upazila level),
- Consideration of an entire ecosystem rather than a single water body. In each ecosystem there are a number water bodies with different sizes.
- Addressing most of the elements (fish, plants, land use, water) and factors (pollution, land degradation, over fishing, siltation, etc.) impacting those wetlands.

2.2 Location of Sites

The MACH project has demonstrated its approach in three sites located in different ecosystems in Bangladesh Figure 1 shows their locations and key features of each site.

Hail Haor is located in north-east Bangladesh and is typical of deeply flooded basins in that region known as *haors*. It is in the anticline between the Balishara and Barshijura Hills to the east and the Satgaon Hills to the west. Water originates from the surrounding hills and flows through 59 streams (once 350 were reportedly active) into the haor and on into the Lungla/Bilashi River. The haor is located in five unions of Sreemongal Upazila and in two unions of Sadar Upazila of Moulvi Bazaar District. The watershed of Hail Haor covers about 600 km² (237 square miles). The basin water originates from the surrounding hills, approximately 85% of the catchment lies in Bangladesh and 15% in India.

Hail Haor was formerly connected with the Kushiya and Manu Rivers. A series of flood control dikes along these rivers and a sluice gate on the Kamerkhali Khal restrict river flows and fish access to and from the haor. Another dike, intended to turn the haor into a large reservoir but now in disrepair, was built around the northeastern and eastern sides of the haor. The Shaka-Borak River and Kamarkhali Khal pass through Boro Haor (north of Hail Haor) and, if they were not blocked, would connect Gopla River (which flows through the Haor) with the Kushiya River. The wet season area of Hail Haor is approximately 14,000 ha, whereas the dry season area is typically just over 3,000 ha on an average. Approximately 172,000 people live in 61 villages around the haor.

The **Turag-Bangshi** site is located just north of Dhaka and is typical of most low-lying floodplains of Bangladesh. The project site covers seven unions¹ of Kaliakor Upazila under Gazipur District and one

¹ A Union is the lowest administrative level in Bangladesh, typically there may be about 10 unions in a sub-district or Upazila. An elected council or Union Parishad governs each union comprising of representatives from the 10 or so villages within a union.

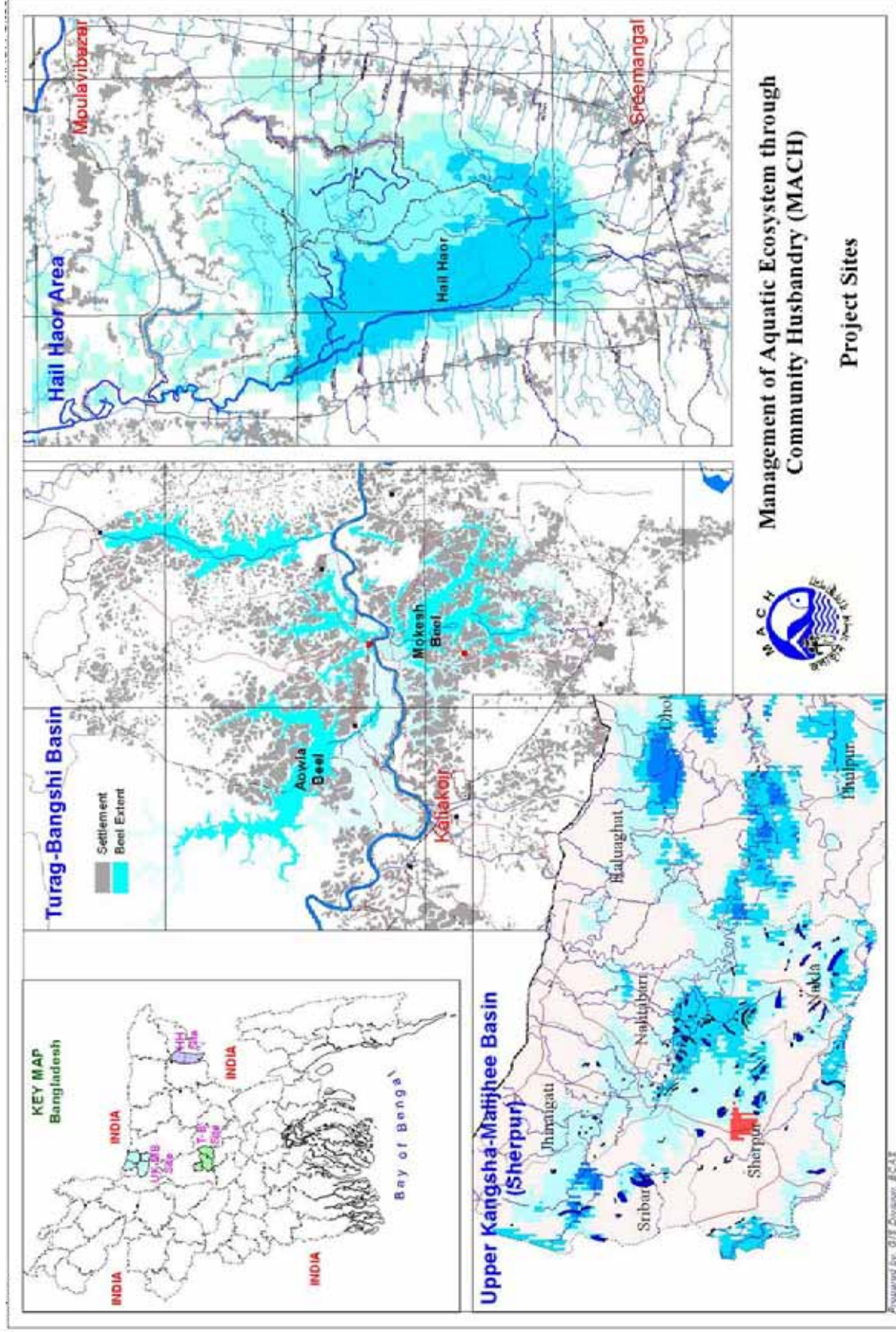
union of Mirzapur Upazila of Tangail District. The Turag-Bangshi River runs through the site with numerous beels and canals on either side of the river. At the beginning of the rainy season, as floodwaters enter the upstream portions of the Bangshi, water spills over the riverbanks through khals (canals) that connect the river to those adjacent beels. Through these canals fish move from the river to the beel/floodplain areas for spawning or nursing, and then later as water recedes after the monsoon the fish move into the deeper perennial portions of the beels or back into the river. Dry season water levels in the local rivers and beels are much reduced from their former levels due to the vast expansion of ground and surface water extraction for boro (dry season) rice irrigation. In drought years, flows cease in the formerly perennial Turag River. Fish remain only in the deepest portions of the beels and the river. Annual fish production depends largely on the size of the breeding populations that survive the dry season.

Within the Turag-Bangshi site, there are a total of 26 beels with a water surface area of approximately 10,000 ha at full flood, which diminishes to less than 700 ha at the end of the dry season. The Turag River runs for approximately 30 km through the site and another 28 km of canals exist within the area. Seasons in the Turag-Bangshi floodplain, like all similar areas of Bangladesh, are determined by rainfall and water levels, which divide the monsoon (wet season) occurring during May-October from the dry period in November-April. Approximately 225,000 people live in 226 villages that make use of the river and floodplains.

The **Kangsha-Malijhi** site is located in the north-central part of Bangladesh in Sherpur Sadar and Jhenaigathi Upazila of Sherpur District. The area is geographically a part of Garo-Tura Hills watershed and includes the catchments of the upper Kangsha and Malijhi river system. The hills of this area were once covered with natural Sal (*Shorea robusta*) forest; now only remnants of natural forest remain. The wetlands and floodplain have a water area of approximately 8,000 ha during the wet season, which diminishes to about 900 ha in the dry season. The floodplain area contains 47 beels or low pockets, of which 18 are perennial. The population of the area is approximately 279,000 in 163 villages.

The Sherpur project site is prone to flash floods. The farmers of the site repeatedly suffer heavy damage of their crops by flooding from the Shomeswari, Malijhi, and Chellakhali Rivers. Each year, flash flooding from the neighboring hills occurs in these rivers more than once, flooding much of the lower land in this system, but then draining away. These flash floods discourage intensive pond aquaculture in the area because of the risk of loss of fish from ponds when they are overtopped. Continued flood damage to the monsoon crop forces farmers to shift to cultivating more dry season boro. The resulting increase in extraction of surface and ground water for irrigation poses a threat to wetlands and the environment in general during the dry season.

Figure 1. MACH project sites



2.3 Resources and Stakeholders

Livelihoods of Bangladeshi people especially those living in and around floodplain wetlands are largely dependent on floodplain resources. People fulfill economic and social needs from the nearby floodplains. These highly productive ecosystems provide a renewable resource base that contributes not only aquatic products but also to the productivity of agricultural systems. Floodplain functions include: groundwater recharge, habitat for wildlife, pollution abatement, soil fertility, and producing renewable natural resources principally fish and aquatic plants. Besides supporting agriculture directly in the dry season and through irrigation of neighboring lands, floodplains have many other uses and benefits that are essential to local communities such as a means of water-borne communications, fuel, housing material, raw materials for handicrafts, medicinal plants, fodder, and human food. The benefits are multidimensional and reach all classes of people.

2.4. Project Activities

To establish effective community based co-management in the three wetlands has involved a wide range of activities. Table 1 briefly summarizes the main activities and outputs to put the lessons into context.

Table 1 MACH Project Activities and Outputs up to October 2006

Components	Activities	Outputs
Natural Resource Management		
Co-management institution development	Participatory planning Community organization development Capacity building Registration Awareness raising and motivation Establishing Upazila level committees Orientation of committee members Government approval and order for establishing endowment funds	Formed 16 Resource Management Organizations, 15 registered with Social Welfare Dept, 53% of members come from Resource User Groups, all operating independently Local Government Committees approved by government and functioning in four Upazilas, two endowed with funds and the others due to receive funds in 2007
Physical interventions	Re-excavation of beels and canals Creation of sanctuaries with signs and fish protection devices Tree planting Buildings for community organizations	44 ha of beels and 28 km of canals re-excavated 56 sanctuaries covering 173 ha established, over 22,000 fish protection devices installed 605,000 trees planted, 21% for swamp forest restoration 10 buildings completed, 17 in progress
Biological interventions	Indigenous fish specie re-introduction, Demonstrations of crops with low water demand Rules and norms to reduce use of harmful gears, hunting, observe closed seasons, etc.	1.19 million fish of 15 species released all 16 RMOs are following management plans that include these rules
Catchment management	Contour cultivation Pollution mitigation	Contour cultivation of pineapple adopted by 32 farmers on 37 ha Advised set up of one Effluent Treatment Plant, MOU agreed between Department of Environment and Kaliakoir LGC, participatory monitoring of water quality established.
Environmental Education	Workshops, seminar, Competitions, rallies etc Courtyard meetings Theatre and song shows Posters, leaflets and other printed media TV and video	Several national workshops, round tables, etc. organized with government and other projects About 52,000 participants About 2,000 courtyard meetings 220,000 attendees Wide range of printed materials including policy briefs, posters, newsletters, calendar, etc 4 documentary films made and shown on TV
Impact monitoring	Fish catch monitoring Fish consumption monitoring	Fish catch increased by 2-5 times, from 58 to 320 kg/ha/yr in Turag-Bangshi and from 170 to 380 kg/ha in Hail Haor Fish consumption increased by 45%, e.g. from 27 to 44 g/person/day in Turag-Bangshi
Alternative enhanced livelihoods for poor resource users		
Institutional development	Organizing Resource User Groups Creating Federations of RUGs as independent organizations with their own revolving funds	No. of RUG 246 (M- 168 & F-78) Members 5194 (M- 3489 & F- 1705) 13 FRUGs formed, 10 registered, xx have their own staff Revolving funds worth US\$ 0.35 million handed over to FRUGs
Training	General capacity building Skill training Vocational/trade training Adult literacy	Over 15,000 participants in trainings 3,500 participants in skill trainings
Micro-credit and savings	Loan disbursement Savings collection Revolving funds owned by members of RUG-FRUG system	Cumulated amount of Tk 77 million disbursed. Total of over Tk 7 million in savings deposited by members Tk xx million handed over to FRUGs
Policy influence and outreach		
	Proposals from Resource base (i.e. from GB, RMO through Concerned Ministries) consensus & recommendations from different levels (GB, RMO through MACH Steering Committee)) and obtain Government. Approval Influence on Inland Capture Fisheries Strategy, action plan and program approach	Permanent national sanctuaries established Fishing norms Hill slope cultivation Co management approach

3. Lessons Learnt

3.1 Locations

Wetlands should be selected for community management and restoration according to the following criteria:

1. Priority should be given to wetlands degraded to different extents but that have scope to be restored.
2. Access should be such that benefits will be spread among the whole community, especially the poor.
3. Prefer locations where the whole of a wetland within one catchment or hydrological boundary can be brought under community management.
4. For cost-effectiveness, prefer locations where there are several waterbodies (small or large) that are connected with one another that can be brought under similar management.
5. Before selection of the waterbodies detailed and accurate information should be collected and provided for taking lease.
6. The area of waterbody taken up by any one CBO should be large enough to have an impact over the remaining part of the wetland system and to generate from fish catches sufficient funds to cover the management costs of the CBO, while being of manageable size for the CBO.
7. The site limits should include the whole catchment, not just a waterbody.
8. Consider the wetland and catchment irrespective of administrative boundaries.

However, there are also a number of limitations on the scope to adopt community based approaches and features to avoid:

1. Initially avoid locations where known vested interests control part or all of the wetland and might clash with poor users, but gradually these more difficult sites can be included when community acceptance grows.
2. Lack of information on the status of waterbodies was a constraint for MACH – the legal status of areas is not easy to trace. In some cases the concerned authorities are unwilling to disclose the information.
3. Care must be taken when proposing handover of jalmohals to ensure the lease value is reasonable in relation to the waterbody's productivity.
4. Most khas wetlands particularly beel jalmohals are used by nearby land owners who become effectively owners of khas land based on fake papers with the assistance of the local elite or power holders, limiting the scope to introduce community management.
5. Community cooperation in most khas lands is difficult to achieve because of domination of local leaders and powers. As a result it takes a lot of time even to know the present status of such khas lands.

3.2 Staff Capacities

Inexperienced or inappropriate staff tend to impose their views on the participant communities which hampers achieving the goals of a community based approach. Staff should be realistic and avoid encouraging unrealistic and unachievable expectations. Therefore:

1. Trained / experienced personnel should be recruited with the appropriate skills for respectively social/institutional activities and biological activities. In particular trained/experienced field staff with community organizational skills are needed. These experienced staff should work closely with any inexperienced personnel.
2. Staff need to be well oriented on project approaches and facilitated by the project management to learn by doing and then share their lessons with their peers.
3. Staff should not disobey or disregard local norms, attitudes and culture, they need to learn at the outset the local norms.
4. Staff at all levels need a clear orientation on the approach and philosophy and need to listen to each other across seniority levels.

5. The attitude of all staff needs to be community oriented.
6. Staff visits should start with much patience and aim to understand the local norms, social systems, present status of wetland resources and management systems, and government services and their effectiveness, before moving on to suggestions for change.
7. With staff turnover and the evolution of field activities, an on-going provision for learning and capacity development of staff is needed.

3.3 Government Role

The MACH Project was a new approach with less involvement of Government, initial approaches with communities in this situation need to consider the following:

3.3.1 National government down to Upazilas

1. Ministry of Land has a procedure for handing over waterbodies to Ministry of Fisheries and Livestock for technical management, but other decisions referred to it were stalled due to inbuilt slow processes and lack of clear processes.
2. Critical government decisions can be taken if the need and solution come first from users, then the Union Parishad, then the Upazila and District, this works to ensure compliance at the national level if there is a clear justification made through direct contact with senior officials.
2. Some Upazila Fisheries Officer (UFO) posts have been vacant for a long time, and government staff change frequently, hampering efforts to involve government in co-management. For example in MACH project sites in all Upazilas during the last 7 years the Upazila Nirbahi Officers (UNOs) and UFOs have been changed several times. Each time a new UNO and UFO has to be briefed about MACH and its approach.
3. Government land records can be outdated and confused regarding khas land, updating of these would save projects much time and wasted resources, and reduce wasteful legal cases. For example, confusion over the amount, if any, of khas land in Kalidah Beel resulted in legal cases and disputes, and there were similar experiences in at least four RMOs.
4. A bottom-up process approach (such as MACH) is desirable, but government is used to well defined project plans, and this gap in understanding had to be overcome gradually through the project demonstrating its effectiveness.
5. MACH was unusual for Bangladesh as it is a development project supervised by central government but implemented by NGOs without a responsible Government Department in the field. This created concerns among some government officers, and the project seemed to be given a lower importance than other projects.
6. Timely central government instruction to district and upazila authorities advising officials of their expected roles facilitates implementation.
7. Central government agreement (through a Memorandum of Understanding) to form local government coordination bodies at the outset was an important step that ensured links with local government. Local Government Committees became effective institutions for the implementation of the project, that later became a major component of post-project sustainability by being converted to co-management bodies. However, this needed subsequent strengthening by a supporting government decision.

3.3.2 Union Parishad

1. Inform and get support of the local UP, and especially the UP chairman, as this is the key local institution to be mobilized behind any initiative.
2. Evenly balanced competing factions, especially those patronized by UP chairmen are difficult to overcome. For example, when one faction supports the project activity and the other is opposed but is supported by the UP Chairman – this prevented community wide activities in Aurabora Beel. If this cannot be overcome at an early stage, it is better to cut losses and move to another community/wetland area rather than to keep on trying to make it work.
3. Waterbody status reports should be maintained in each Union office. Then the RMO will easily get information for planning their resource development projects.
4. Avoid those locations where UP chairmen are widely seen as negative influences.
5. UP chairmen have been bureaucratized and now need a government order to cooperate.

3.4 Project Planning and Implementation

3.4.1 Timetable

1. Enough time should be taken at planning and field levels for project design and awareness raising - 5-6 months were needed to inform the communities including local government.
2. Establishing community organizations and co-management takes time - 4-5 years need to be allowed at a minimum to develop capacity and local institutions, and then a phase of about 3 years is needed to phase out so that they can sustain by themselves.

3.4.2 Participatory Action Plan Development (PAPD)

1. This planning process was introduced into MACH part way through the project, by building on the methods used in the initial sites, it was successful at ensuring poor people's opinions were reflected in initial resource management plans and was one reason why activities in the Sherpur site caught up with those in the other sites that had started earlier.
2. Process Documentation by the villagers needs support from the facilitators
3. A gap developed over time – the initial consultations, planning and PAPDs may not have involved the appropriate villages and areas covered by subsequent RMOs. A system of referring back to the wider community and reviewing plans or repeating modified PAPDs after a few years could have helped.
4. Opportunities should be taken to maximize use of local knowledge in locally owned planning.

3.4.3 Identification of target people and elites

1. In rural areas many people from different villages use wetland resources for income and subsistence purposes. Time needs to be spent to understand locally how stakeholders should be classified and defined. Determining who they are is important for initial planning. Which villages depend in which ways and to what extent on which wetland areas needs to be mapped.
2. In the absence of any reliable lists of resource users – time is needed to conduct censuses. But people are not comfortable to provide information that they are resources collectors – fearing that they might lose access, or claiming roles that they do not have in an attempt to gain control. So time is needed to understand the local situation and to cross check on reports.
3. Identifying the users was a problem that was complicated by a mis-match between the interests of the two NGOs working – one for livelihood development and the other for resource management, and was also complicated by the uncertain coverage for resource management.
4. Consequently user groups for livelihood support were formed among people less dependent on the resources, or in areas that proved impossible to introduce improved resource management, or resource management initiatives were taken where few livelihood groups were formed (Goalia).
5. Formation of CBOs is a crucial task, the failure and success of wetland resource management depends on it. For livelihood support the model is simple, the groups have to be of poor people and homogeneous. Separation of livelihood support organizations from natural resource management organizations was successful, although the necessary overlapping membership requires time from local people. Consequently heterogeneous natural resource management organizations could be formed, but for this it is vital that socially acceptable and socially responsible persons join to represent the community.
6. Local leaders showed their enthusiasm for benefits for the whole community and for future generations. But, as soon as they understand that there is less scope for personal benefit then in some cases they start non-cooperation and disassociation with the project.
7. Lineage conflict needs to be understood and minimized. For example, while forming RMOs in Hail Haor one of the local UP chairmen tried to ensure that all the members came from his lineage. Due to this, RMO representation from among the poor and fishers was low. Latter on the membership of the RMOs was revised, and poor were incorporated, but this was a difficult process.

3.5 Institutional Development

3.5.1 Formation of RMOs

1. All of the villages inhabited by users of the resource base should be represented in the RMO.
2. CBOs, open to all, create an opportunity for local elites to join executive bodies, influence decision-making and take control of resources by use of their status and power. Neither the elites nor the poor should be excluded; elites can influence local opinion in favor of conservation.
3. Without a concerted effort to build institutions that empower the poor, the majority of people (who are poor) do not have bargaining power and do not understand their rights. MACH addressed this through general awareness raising events such as popular theatre, ensuring participation in Union Parishad and local government committees and by helping the poor to form Resource User Groups that had capacity building programs and have their representatives included in the RMOs
4. Poor resource users needed to be a majority in RMOs to ensure decisions did not favor the wealthy: by 2005 about 60% of the members were poor resource users.
5. RMOs better represent the poor when the poor were organized (RUG) before RMOs. For example in Sherpur site RUGs were formed earlier and provision of RUG members in RMO was prefixed at over 60%.
6. Special efforts to develop the capacity of poorer participants were needed so they could hold key positions in RMOs. The poor must be aware of their rights and need leadership training to play a role in local institutions.
7. Constitutional arrangements (secret ballots, eligibility for different posts, roles of leaders, term limits) governing the operation of the RMOs, promote pro-poor participation.
8. Inclusion of women as members of RMOs is complex, for example Hail Hoar is a very conservative area and women have little involvement in wetland resource use and are constrained from moving outside their village, so suitable ways of involving women have to be worked out.
9. Despite successfully setting quotas for women's participation in RMOs, it is difficult to make the organizations accessible and relevant to women and to overcome cultural biases. Women do not fish and are not considered to have first hand experience in managing the resource, yet their livelihood is affected by the resource. By the end of 2005 seven RMOs had general bodies with 25% women or more.
10. Another constraint is the limited number of women recruited by NGOs or willing to work in the field.
11. Successes in Sherpur came from introducing "Women's wetland days" when women en mass could visit the fish sanctuaries and be briefed on project /RMO activities.
12. Leaders of the organizations need to be reminded to listen to resource users and inform them of major decisions, and resource users should understand what they should expect from their leaders.
13. Elections by secret ballot are most appropriate for choosing office bearers.
14. Project designs from the outset should place a major emphasis on institutional sustainability.
15. Formal recognition of RMOs is essential for their survival. All but one RMO has been registered with the Social Welfare Department as independent organizations.
16. Sound financial management is a requirement, and RMO representatives need to be trained in record keeping and financial management. The RMO needs to be able to prepare annual budgets that fit its resource management plans, raise funds in fair ways (such as fishing fees), and account for this to the members and wider community of users (fishers). Independent audit subcommittees can further strengthen transparency and good financial management practices.
17. Projects should regularly assess the strength of community institutions and provide training to address the gaps.

3.5.2 Formation of RUG

1. Correct targeting of poor wetland resource users was difficult, for example the need to avoid overlapping membership with other NGOs' activities particularly micro credit means that members of other NGO groups could not become members of RUGs.
2. In future to strengthen the links between wetland resource management and access to support for alternative livelihoods, arrangements to cooperate with other NGOs to ensure wide coverage of poor resource users in resource management should be made.
3. NGOs working within a community should coordinate so that everyone knows clearly about the future prospects and activities of the institutions to be formed. Selection should not exclude the poor from benefits or limit benefits to a particular faction of the community.
4. Projects that aim to establish organizations of poor people operating their own revolving funds should from the beginning emphasise exit plans for institutional sustainability, as this requires very different activities from traditional NGO managed micro-credit. Success criteria need to be decided and updated through participation.
5. Projects should educate group members so they can maintain their own records transparently and avoid any malpractice.
6. Leadership training should be continuous so that FRUG leaders can perform their roles and responsibilities.
7. It is essential to create a new generation of FRUG-aware RUG-members as future leaders.
8. Elections by secret ballot are most appropriate for choosing office bearers.
9. Sound financial management is essential. RUGs should be able to prepare appropriate annual budgets. A credit operation manual and training are preconditions for handover of funds.
10. FRUG ownership of revolving funds is empowering, improving loan approval, visits by FRUG leaders to weaker RUGs to motivate members, and collection of overdue loans.
11. Annual and monthly planning of activities at RUG and FRUG levels needs to be linked and the responsibility of the members, and not to serve outside needs.
12. Projects should use regular assessments of RUGs as a tool to help RUGs improve their performance. In addition regular performance review by FRUGs would exert peer pressure and help them improve their performance.
13. FRUGs need to have legal recognition, be able to recruit and manage efficient staff, have skills in identifying viable enterprises for loans, and understand their finances.
14. FRUG constitutions should allow them to gradually recruit more poor people dependent on wetland resources in the RUGs.
15. By forming independent community organizations there is no incentive for the members to graduate themselves (losing benefits) or to bring in new untried members (risk of defaulters).
16. It is relatively easier to involve women in credit and savings organizations especially when the groups are single gender. Now 33% of RUGs are women groups. They are gradually taking part in decision making in the FRUG level, by reserving some posts for women. But in addition part of the credit fund should be reserved for women groups, and a quota (such as one third) of women in the decision making bodies should be ensured. Moreover the capacity of women leaders should be strengthened, while gender relations training for both men and women is desirable.

3.5.3 Co-management bodies

The approach developed by MACH evolved over time and was based on a participatory process, working with local stakeholders to understand problems and identify possible solutions. Community organizations were developed for resource management (RMOs) and for livelihood development (RUGs). These groups were then linked to the government through the formation of Local Government Committees which started as project based committees to coordinate implementation. However, these have evolved into long term co-management bodies known as Upazila Fisheries Committees. Emphasis has been placed on making these institutions self reliant and self-sustaining, providing funds that they could manage, and establishing transparent procedures that make those taking decisions accountable. All this has happened over eight years, including the inception period.

1. It is important to involve all the concerned UP Chairmen, the officers of relevant agencies at Upazila level and representatives of each CBO, to balance one another's power. Even so, issues remain over how to balance power between the three types of stakeholder in these committees, and how to ensure they are active without project funding.
2. Registration of CBOs was helped by registration authorities being LGC/UFC members.
3. Co-management seems essential for the sustainability of wetland resource management after the exit of the project.
4. The LGC/UFC does work as a forum for participatory decision making and problem solving. It is also an approach to empower the poor and fishers, through the organizations that are created) and establish their access to local government and Upazila administration.
5. Political commitment and willingness are necessary for co management to work in natural resource conservation. A success of the project has been the acceptance of this concept by DOF and its proposals for expanding this approach to other areas as part of its strategy for inland capture fisheries.

3.6 Resource Management

MACH followed a bottom up approach to local resource management planning. So the key lessons overall are the need to take a flexible process based approach rather than to fix in advance targets for types of interventions, areas, quantities, etc. Apart from initial participatory planning the key tools in this are annual reviews and updating of management plans by the RMOs, and the UFC as a forum to approve plans, resolve conflicts, and harmonize management over a wider area.

3.6.1 Sanctuaries

1. In general the details of setting aside areas as local fish or wetland sanctuaries, where exploitation is banned year-round, depends on the local fishing community and stakeholders identifying key parts of public lands where they have rights to control access, and that are critical dry season fish habitat. Usually these are deeper spots such as the deepest part of a river or canal (*kum/kur*). However, this involves a trade-off the sanctuary may result in more fish to catch in the rest of the wetland after fish have bred, but it excludes local people who traditionally used those fishing grounds.
2. For permanency MACH has promoted the use of concrete fish protection devices in the form of "hexapods" and wide pipes, these are intended to provide substrata on which natural fish foods grow, provide hiding places for fish, and prevent poaching in sanctuaries. Care needs to be taken in placing these so that they remain submerged in the dry season. Also there needs to be agreement and understanding in the fishing community that these locations will be permanent sanctuaries, as the structures are deliberately hard to relocate. Lastly, because of the risk of exacerbating siltation, and to navigation, concrete structures are not recommended for use in sanctuaries in flowing waters, where traditional brush piles remain effective.
3. The GoB through the MoL can set aside formerly leased water bodies permanently as sanctuaries should the process of selection and approvals at the local level be carried out before submitting to the Ministry for final approval. Approval first by the users, then by the UP, then by the Upazilla and District does work to ensure compliance at the national level if there is a clear justification made through direct contact with senior officials.

3.6.2 Excavation

A major intervention to improve and restore the water holding capacity of wetlands in the dry season has been to excavate so that areas hold water all year, as well as improving year-round connectivity of some wetlands. These works were planned by the communities, although there is a risk that the technical aspects of planning will exclude the RMO and community from being involved as much as is desirable. However, in most cases were implemented by contractors under agreement with the project and supervised by a local Project Implementation Committee (PIC) comprising of members of the concerned RMO.

1. Paying for PIC members services is a problem. They need to be paid for their services to remote spots to check on the earthwork teams and contractors, but when people get a payment as PIC members, then RUG and RMO members only want to be on the PIC.
2. The time available for excavation in wetlands is very short and is affected by flash floods, so the implementing organizations and contractors need to be well organized to implement the work within the short suitable period typically January-March.
3. Use of local laborers and contractors for earth works is preferable as it generates local employment.
4. The key principle to follow is that excavation should not change the nature of the wetland. In particular technical assessment is needed to ensure that excavation of channels to restore connectivity does not result in draining out remaining wetlands.
5. Dredging was found to be effective where manual excavation could not be accomplished due to slushy soil and the uncertain short period for manual excavation. However, it is only feasible for relatively large works when a contractor can custom build a local dredging machine. Also it is very much dependent on the skills and experience of the contractor, some prove not to be capable in practice of running such machines and meeting their targets.

3.6.3 Swamp/riparian forest restoration

1. Based on observed growth rates riparian plantations can produce 8-10 cubic meters of timber per hectare per year (120–150 cft. per acre per year) on average. This would provide an income of over Taka 100,000 from one kilometer of linear plantation (in two rows) in a 10 year felling cycle. Although, since the objective is also biodiversity conservation this would not be achieved as all the trees would not be felled.
2. Tree planting directly enhances bio-diversity in terms of the species planted, and also has created habitat for wildlife, particularly birds.
3. Maintaining quality of sapling supply is difficult, care needs to be taken in working with the local people who receive help to establish nurseries as income generating activities so that they schedule providing saplings of the desired size and species. Also the supplier should be obliged to replace saplings that die within an initial period of one month from the date of planting . Nurseries can yield a good return on investment for the rural poor with access to a modest land area. Annual sale of 5,000 good saplings, raised on 15-20 decimals (0.06-0.08 ha) can earn a net income of Tk 30,000 (or an average of just over US\$ 1 per day). Guaranteed purchase of saplings by the sponsoring project ensures an income level for the nursery operator; however, non-project sale is profitable for non-swamp tree species.
4. Best growth and success is obtained when planting is accomplished in favorable weather in May- June.
5. For disturbed public places and wetlands the best success is obtained when saplings about 2 m (6 ft) tall are planted. Even so the survival rates of saplings of swamp forest trees is very low, so the costs of a likely long term 25-33% survival and replacement when planning to restore swamp forest in a given area need to be factored in, along with guarding to prevent damage by livestock in the initial years.

3.6.4 Fish re-establishment

MACH regularly released indigenous fishes of some 16 species in the project wetlands, using project funds. These included both fingerlings and adults. The stated aim was to restore self-reproducing populations of fishes that formerly occurred in the wetlands or which were rare there.

1. In practice the availability of fish to stock can be limited, care should be taken not to pad out such a program with stocking of hatchery produced major carps when those may not be able to make spawning migrations due to blockages of routes, and which may be genetically degraded due to hybridization and selection in the hatcheries.
2. Beel resident species along with some riverine species may be stocked where a beel is connected with a river. Riverine species stocked in a beel do then migrate to the river to breed enriching the whole system. For example Kalibaush and Gonia are now available in Turag river due to introduction in the connected Mokosh and Alua Beels.

3. However, only some species appear to have succeeded as a result of releases. Deshi sarpunti released in Mokosh Beel did not result in a sustaining population, this could be due to water pollution or some other reason.
4. Species choice is vital. The species which were once abundant in a site but at present are lost or very rare, and which are capable of breeding within the habitats available under the existing management regime should be the first to be re-established. No exotic species or hybrid fish should be introduced.

3.6.5 Fishing norms - reducing excess effort and fisher livelihoods

The key lessons related to limiting fishing effort, are that closed seasons when fish are breeding are widely adopted, but need to be publicized and planned with the fishing community, and linked with support to adopt alternative sources of income since they will at least seasonally adversely affect the livelihoods of poor fishers.

3.6.6 Water pollution

In Kaliakoir the river and beels near to the rapidly growing number of industrial plants (especially dying industries) were found to suffer serious pollution problems. As a result the water quality is far outside the acceptable national water quality standards in various places, particularly in Mokeshe Beel. High concentrations of heavy metals such as chromium were also found in sediments near the industries. Water quality has deteriorated to a level which is detrimental to fish and other aquatic life requiring oxygen. This has reduced the availability of fish, fodder and other wetland products and services which local people have for generations depended on. There are reports of regular fish kills in the dry season and reduced rice production. Despite the existence of national water quality standards and legal requirements for these types of industries to install effluent treatment plants, the problems are worsening. Lessons from research conducted on water pollution from the dying industry comprise:

1. Alternative production options can raise dye fixation to 70% from the present 40-65%, thereby reducing the dye that is discharged to water bodies. This could **save** the average factory each year the equivalent of tens of thousands of dollars in dye costs alone and significantly reduce the necessity for re-dyeing and re-shading.
2. It is estimated that factories processing 5 tons of fabric produce 750,000 to 1,800,000 liters per day (i.e. 750-1,800 ton/day) of effluent water. The average treatment cost is currently Tk. 20-30 per 1,000 litres. By flow segregation and optimization of chemical dosing, the operating cost of effluent treatment can be reduced by up to 30%.
3. However, few industries are willing to invest in meeting their environmental obligations unless they are pressured to do this, international pressure from buyers, and national pressure from government enforcers are vital or wetland productivity will be destroyed in many areas where industry is growing.

3.6.7 Hill slope cultivation

Observing that the least environmentally friendly land use practice on hills within the Hail Haor watershed was pineapple cultivation in up-down slope rows, and that siltation rates in the haor were high, MACH added a small component to test and extend alternative cultivation practices based on contour planting of pineapple on slopes: This has generated the following lessons:

1. Contour cultivation markedly reduces run off and soil erosion, helps retention of soil fertility, allows a denser planting (30% more plants), produces larger fruit (averaging a 62% higher sale value) and more than doubles the profit margin for farmers.
2. Changes from traditional up-down slope farming practices are difficult to achieve. This needs convincing field demonstrations and protracted persuasion.
3. Absentee landowners/leaseholders are less interested in higher profit and better land management, and their managers may lack an incentive to adopt contour cultivation.
4. Planting pineapple suckers in beds of two parallel lines running 45-50 cm apart and suckers planted at 30-35 cm distant in the lines gives the best result; bed to bed distance is best at 1.10 - 1.25 m; wider spacing does better on more fertile soils.

5. The post-monsoon planting period (November – January) is the best garden establishment timing as it reduces soil erosion, there is better plant survival and growth, it generates a higher fruiting percentage and bigger fruit size.

3.6.8 Dry season water use

Separate projects have demonstrated the scope to reduce dry season water use for agriculture, by promoting less water hungry crops. Under MACH as part of the alternative livelihoods program such crops were demonstrated, but this dealt with small farmers individually and could not target larger farmers as it was limited to RUG members. Co-management offers a framework to reduce conflict between fishers and farmers and develop operational framework to ensure a more productive use of dry season water based on understanding of the fishery returns over the year of maintaining sufficient dry season surface water. However, only limited progress was made among the RMOs. This may have been because of the different organizations involved – separate CBOs and separate supporting NGOs. It may also reflect attention having been paid more to excavation in the dry season since this involved visible large scale works and was funded, rather than coordinating individual unpaid changes in cultivation decisions.

3.7 Alternative Income Generating Activities

MACH has emphasized Alternative Income Generating Activities (AIGAs) to help the poor, including fishers, who are most depend on wetland resources. The aim was to reduce pressure from aquatic resources collection and fishing in the wetlands, and to develop new income sources particularly during the period of seasonal fishing bans. Skill training was imparted in areas such as cow rearing, poultry raising, carpentry, tree nursery, and small businesses to RUG members who could then access loans. Initially the loans were from the project, but for sustainability these revolving funds were handed over to Federations of RUGs to manage independently before MACH closed. The following lessons are drawn:

1. AIGAs were effective in reducing fishing effort among RUG members. Poor fishers can use new skills to enhance their income and 35% of those receiving micro-credit apparently gave up fishing. They are now involved in up to 34 different types of AIGAs.
2. Successful alternate income generation activities need skill development, appropriate loans, and marketing channels.
3. Access to training should be a pre-requisite for any micro-credit based development work, and skill training should be given prior to any loan.
4. It is necessary to assess whether the prospective trainee has resources to use skill training, for example a tree nursery needs land.
5. Training is not enough, participants need help to analyze the costs and benefits of their planned enterprises, so that loans can be properly used and profitable alternative income generating activities (AIGAs) are adopted.
6. Assessment of the risks for poor participants related to alternative income generating activities and loans should be mandatory, and a coping strategy should be developed for each risk.
7. Introduction of people-owned and people-managed credit enhances the participants' sense of ownership and self-identity.
8. Alternative means of earning reduced competition for fishing.
9. Saving has become institutionalized in the RUGs. However, so far those savings are not re-invested in the FRUGs' micro-credit as security through the formal banking system was preferred.
10. By transferring responsibility for their savings to the FRUGs, the savers can be empowered.
11. Checks and guidelines on re-investing savings are needed if the additional benefits for poor people are to be achieved without risk of losing their savings.

3.8 Communication, Awareness and Misinformation

1. Staff visits to communities need to start slowly and patiently, so that staff understand the local and social norms, status of wetland resources, management system and government services

and their effectiveness. Staff need to understand the project concept, have capacity to assess community knowledge and practices, and be able to adapt.

2. Frequent meetings Awareness among the user's communities effective to motivate them through and detailed explanations of wetland resource management issues the concept of MACH accepted by local communities and local elites. The most effective method for this was village discussion meetings – *pathanatak*.
3. Frequent meetings and detailed explanations of wetland resource management issues were needed before local communities and local elites accepted this.
4. Communities raised their concerns over NGO interests – the role and neutrality of NGOs needs to be clearly explained to local opinion leaders by respected sources from outside the NGO.
5. Misinformation is common for various reasons, especially in the early stages of projects. It usually involves those with vested interests claiming that a change will reduce the access of community people, when those same interested people may or may not be controlling the resource. Often they may actually risk losing control to poorer people in the community who are their clients because of the project.
6. All partners at all levels should give uniform messages to keep communities free from confusion about NGOs and project concept.
7. For any new approach project awareness and motivation is badly needed at the community and official level.
8. Make awareness programs appropriate to local customs, and gain support of local religious leaders first to minimize misunderstandings, and gain credibility and trust.
9. Simple awareness materials that are mainly visual and are in *Bangla* are more effective at community level.

3.9 Policy Development and Advocacy

The experience in influencing policy changes has been mixed. Some policy changes were successful but these have been on an ad hoc basis, in other cases the outcome is still uncertain:

1. Establishing a long term co management structure – LGCs have been redefined by government as UFCs, and this has been taken up by DOF in its Inland Capture Fisheries Strategy.
2. Declaration of permanent sanctuaries in selected waterbodies. The Ministry of Land set aside some waterbodies outside of leasing for all time subject to nominal payments by the RMOs responsible for ensuring that there is no fishing in them.
3. Proposals for other decisions and policy changes have been made but typically linger in the concerned Ministries.

Lessons from this experience include:

1. The adverse effect of frequent transfers of government officials at all levels requires frequent investment in orienting new incumbents on the community based co-management approach and policy issues being pursued.
2. The hierarchical decision making system is best tackled by demonstrating success and persuading of the need for change locally and having successive tiers of government propose changes or write endorsing proposals so that there is no scope for the upper tiers to delay decisions by referring down to lower levels for their opinion (since lower level opinions are already documented with them).
3. Having a successful demonstration of what is sought to be mainstreamed or changed in policy is most effective. Take senior officials on visits, target working groups to show successes and use windows of opportunity such as initiatives by others to develop strategies or policies.

3.10 Sustainability

To continue the management system established by MACH involving RMOs, RUG/FRUGs, and UFCs requires resources. The situation of the RUGs/FRUGs is most straightforward, as the AIGAs are profit bearing and based on borrowing capital, the members are familiar with this process.

Handing over the capital for revolving funds to the FRUGs is expected to sustain, and they have been able to employ workers to support their credit and savings operations with the salary and other costs being paid from the interest earned on their lending.

For paying the annual leases to waterbodies, and maintaining their operations and buildings, the RMOs have established systems to collect payments from fishers. However, to cover the costs of further habitat restoration and wetland management they require additional funds. Similarly the UFCs have been made permanent but have no fund allocation from central government, yet there is a need for at least a low level of continued supervision and monitoring of the community organizations, and for regular meetings to coordinate wetland management and resolve problems. To address both of these needs MACH project has obtained government approval for setting up endowment funds. The annual interest from these is under the control of the respective UFCs to be used to make grants to RMOs for wetland habitat management/restoration, and to cover the operating costs of the UFCs.

4. Conclusions: Key Lessons

The MACH project has over a period of eight years followed a process of learning in establishing community management of wetland resources, livelihood support, development of community based organizations, and ultimately in establishing co-management that is expected to sustain. The benefits and success of this have been recognized in the recommendation of this approach in the Bangladesh Poverty Reduction Strategy Paper, and the incorporation of key components of this approach in the Inland Capture Fisheries Strategy of the Ministry of Fisheries and Livestock and Department of Fisheries. This report aimed to bring together lessons from this experience that will be of use to those planning and designing future initiatives for fishery and wetland co-management in Bangladesh, and for those implementing such projects and programs. Over 130 lessons are listed. In conclusion, MACH has demonstrated that it is possible to restore the productivity and functioning of large wetland ecosystems in Bangladesh, and thereby enhance livelihoods of poorer wetland users and biodiversity. The main lessons from this experience are summarized here:

1. Establishing effective community based co-management takes **time** – enough time needs to be allowed for start up (when building local trust and awareness, dealing with government and reserving access to waterbodies all take time), main implementation (building community organizations and re-excavating wetlands take time and can be delayed by many factors), and a gradual phase out that places emphasis on the sustainability of institutions and processes set up under a project.
2. Initial **staff development** and orientation are vital.
3. **Participatory planning** is an essential first step locally.
4. Involving the **Union Parishads** from an early stage is essential as they lead much of local opinion and are able to legitimize or threaten the initiative depending on their understanding and interests. In the long term they are also important to co-management.
5. It is best not to make rigid **identification of participants**. For resource management in large wetlands the community organizations (RMOs) should be flexible so that membership can be changed once it is clear who uses the resources and who is motivated. But sufficient quotas should be set to ensure that the poor, fishers, and women are represented.
6. The emphasis of support for institutions should be on ensuring their sustainability and that **good governance** practices become routine.
7. **Livelihood support** for the poor, especially fishers, is a vital incentive for conservation based management, so provision for training, saving, and accessing credit are important.
8. **Co-management** bodies (UFCs) play a significant role in coordination and resolving problems and conflicts between stakeholders. To play an effective role in these committees, the capacity and confidence of the community organizations has to be developed.
9. Wetland resource management, for example sanctuaries, excavation, closed seasons and tree planting, have all been successful. However, human activities in the catchment need to be regulated if sufficient quantity and quality of dry season water are to be ensured. Pollution, dewatering abstraction, and poor cultivation on slopes causing erosion are all problems

affecting the MACH sites. Flexibility to initiate actions against these causes of wetland degradation is needed, but they cannot be addressed by local wetland stakeholders alone.

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