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Institutionalizing the Community-Based Management Approach for Natural Wetlands Toward the Exploring Policy Gaps

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ABSTRACT

The diversified and complex wetland ecosystem in Bangladesh has global significance for the concern of many environmental issues. A study of two wetlands in northeastern Bangladesh examines the different outcomes produced by community-based management (co-management) and private management. The data and outcomes of the private management systems generated in the *Kawadighi Haor* were compared with those of the *Hail Haor*, where co-management had been adopted. The results strongly indicated that, in comparison to the private management system, water bodies under co-management adopt more ecological management approaches, resulting in greater sustainability of resources and a more equitable distribution of benefits. The National Wetland Policy (2009) in practice promotes a traditional short-term leasing model that is highly susceptible to elite capture. The study also found that the biophysical condition and ecology of the *Balla beel* of *Hail Haor* were in decline before co-management began, then rapidly recovered during the co-management period, and quickly declined again when private management took control over the waterbody. The study further provides a set of recommendations for the sustainable management of wetland resources in Bangladesh and in a broader global context.

INTRODUCTION

Bangladesh is the ground for many diverse and complex wetland ecosystem comprising with *Beels* (big depressions where water remains yearlong), seasonal wetlands (Oxbow lakes), *Haors* (large deeply flooded depressions), Rivers, Streams and

vast seasonally inundated floodplains which are rich as well as possess global significance (Dutta et al. 2021; Sumon et al. 2022). Bangladesh floodplains are one of the world's most important wetlands and support about 70 million rural households, including the very poorest which are critically dependent on wetlands (Sultana and Thompson 2017). These water bodies are sheltering over hundreds of species of fish, plants, wildlife and hundreds of thousands of migrating birds every year (Rahman & Begum, 2011). Wetland resources are subject to increasing pressure associated with increased population growth and demand for food products (Byomkesh et al. 2009; Chuma et al. 2012). Furthermore, intensifying agriculture cultivation, irrigation, poor management, over-exploitation, cattle grazing, and other livelihood uses have the potential to negatively impact wetlands (Nabahungu and Visser 2011; Mustafa 2019). Over the last two or three decades, many studies have addressed the co-management systems in fisheries for improving sustainable development of wetland ecosystems and fishers' livelihoods (Castrejón and Charles 2013; Kabeer et al. 2018; d'Armengol et al. 2018). Furthermore, it is necessary to realize the community-based management approach which was adopted to benefitting human needs and wetland conservation in the country (Rahman et al., 2019; Shrestha, 2013; Trisurat, 2006). Newaz & Rahman, (2019) reported that strengthening the community organization through a collaborative process could increase sustainable management of the wetland resources.

Participation of the local community in managing wetland resources is widely accepted among communities around the world (Gichuki and Macharia 2003). In Bangladesh, such participation is relatively recent, having been ushered in by development projects in the late 1990s. Community-based organizations (CBOs) are now acting as new actors in natural resource governance in Bangladesh. In Bangladesh, many international development projects (Table 1) implemented by the Government of Bangladesh (GoB) with the collaboration of local communities, local government, non-governmental organizations (NGO's) and other development partners shifted the paradigm of the traditional top-down approach in several resource management sectors, including water, forests, and climate change (Islam and Morgan 2012).

To conserve and restore the wetland resources, the MACH (*Management of Aquatic Ecosystems through Community Husbandry*) Project, implemented by GoB with support from USAID, provided a framework for co-management of wetlands by establishing community-based Resource Management Organizations (RMOs) as legal entities (MACH 2005; Fox et al. 2013). The co-management approach taken by the MACH Project enabled RMOs to take ownership of waterbodies, ensured access of the poor to resources, involved participatory management in the decision-making process (MACH, 2005). Co-management also provided various means of resolution to conflict, improved community leadership and social cohesion, and promoted ecosystem approaches to the management of wetland ecosystems.

Table 1. A list of development projects that have been implemented in Bangladesh

Projects Name	Donor	Duration	Number of CBO's Established
Bangladesh: Aquaculture Development Project	IFAD	1998 - 2005	9 (closed beels in southwest part of Bangladesh)
Community Based Fisheries Management projects	Ford Foundation and UK-DFID	1994-1999 and 2002-2006	107 (different types of waterbodies)
Fourth Fisheries Project	World Bank and UK DFID	1999-2006	46 (40 waterbodies)
Management of Aquatic Ecosystems through Community Husbandry project (MACH)	USAID	1998 - 2008	16 (In three large wetlands, Hail-Haor, Turag-Bangshi and Kangsha-Malijhi)
The Oxbow Lakes Small Scale Fishermen Project phase II	DANIDA and IFAD	1991 - 1997	22 (In closed beels in southwest part of Bangladesh)

IFAD: The International Fund for Agricultural Development; UK-DFID: The Department for International Development, United Kingdom; USAID: The United States Agency for International Development; DANIDA: Danish International Development Agency

The Public *Jolmohals* Management Policy, Bangladesh was adopted in 2009, well before the expiration in 2012 of the 10-year period for most of the waterbodies in accordance with the aforementioned MoUs. Even though implemented projects on co-management ended with successful interventions, those outcomes were not incorporated into the policy of 2009 and rather provided some confusing provisions. For example, Balla RMO, formed under MACH Project, was unable to bid in the traditional leasing processes in accordance with 2009 *Jolmohals* policy because it has a mixed membership not limited only to fishers, and *Rajanigondha Matsyajibi Samabay Samity* limited, formed by some of the fishers who are also the members of Balla RMO got the lease in 2012 for three years. Therefore, the co-management approach to wetlands is now at a critical juncture due to losing or reduced access to waterbodies by the community and conversely, with undue access, the rich and powerful elites of the country are exploiting the resources without considering its future productivity and sustainability.

The four waterbodies, namely Balla *Beel*, Chiruadubi *Beel*, Hawaguliya *Beel*, and Borourri *Beel* from two *Haor* basins, called Hail *Haor* and Kawadighi *Haor*, were chosen to conduct a comparative analysis. The present study examined different outcomes produced by co-management and private management of these waterbodies for the sustainable management of wetland resources in Bangladesh. Finally, the study explored

policy avenues for institutionalizing co-management approaches and reviewed existing policies and legislation related to wetland management in Bangladesh.

MATERIALS AND METHODS

2.1 Location of the study

The study was conducted from October 15, 2015 to October 14, 2016 in Hail *Haor* and Kawadighi *Haor*, situated in the northeastern region of the country (Fig 1). The Hail *Haor* basin was selected because of the presence of successful co-managed waterbodies, such as Baikka *beel*, Balla *beel* and other waterbodies under the MACH project. The Kawadighi *Haor* basin was selected because this wetland has remained entirely under traditional private management without having ever benefited from a co-management project. Using the criteria listed in Tables 2 and 3, the four waterbodies were chosen.

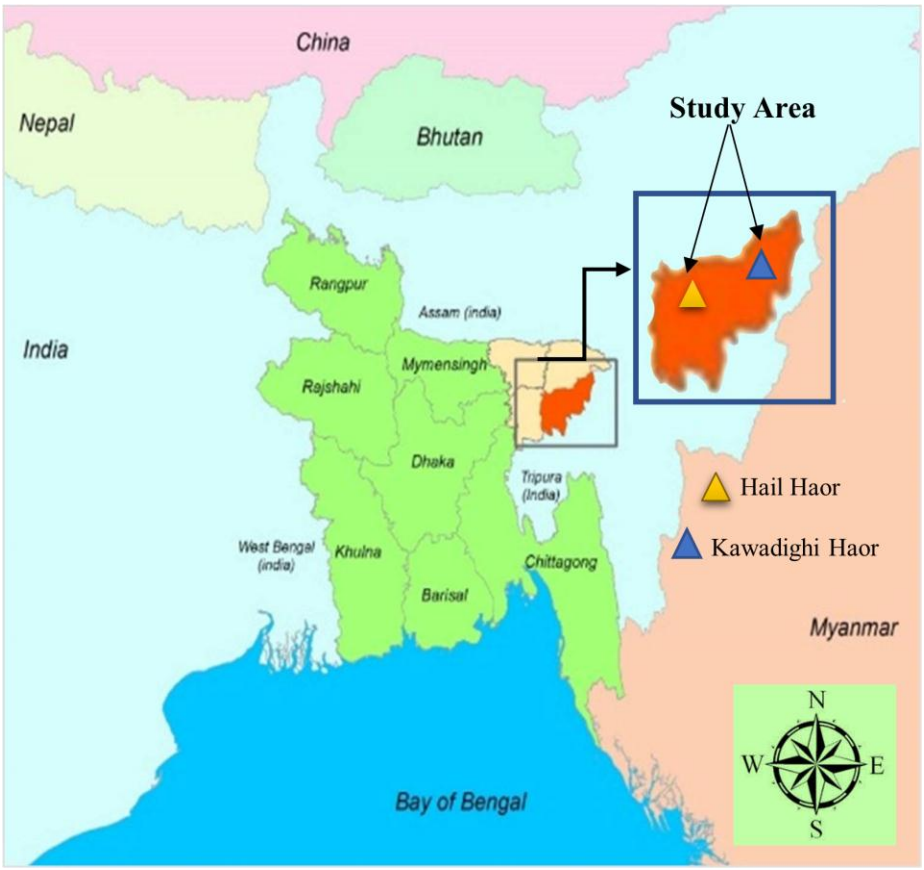

Figure 1. Location of the study area (waterbodies, Hail *Haor* and Kawadighi *Haor*)

Table 2. Lease status of the selected two *Haors*

Name of Waterbodies	Name of the *Haor*	Lease Status
Balla *beel* (70 acre)	Hail *Haor*	Experienced Co-management under MACH Project, 10 years under Balla RMO (2000 - 2011) and *Rajoni Gandha Mothsojibi Somobay Samity* Ltd. (2012-2014)
Chiruadubi *beel* (232 acre)	Hail *Haor*	Privately managed under *Publai Mothsojibi Somobay Samity* Ltd. (2012-2015)
Hawaguliya *beel* (162.40 acre)	Kawadighi *Haor*	Six-year development project under *Shahjalal Mothsojibi Somobay Samity* Ltd. (2011-2016)
Borourri *beel* (19.47 acre)	Kawadighi *Haor*	Privately managed (Three-year term) under *Boishakhi Jubo Mothsojibi Somobay Samity* Ltd. (2014-2016)

Data source: *Secondary information from local fisheries office, other concerned government and NGOs*

Table 3. Desk information of the selected sites

Name of the waterbody/ *Jolmohal*	Hail *Haor*		Kawadighi *Haor*	
	Balla *beel*	**Chiruadubi *beel***	**Hawagulaiya *beel***	**Borouri *beel***
Present lease value (Bengali year)	1422= Open 1421= *Khas* collection 1420= *Khas* collection 1419= BDT. 90,000	1422 = BDT. 185,000	1422 = BDT. 17,12,750	1421 = BDT. 750,000
Type of leasing system	10 years MoU between MoL and MoFL, Three years competitive lease	Three years lease arrangement	Six years development project	Three years lease arrangement
Location (Upazilla, District)	Sreemongal, Moulovibazar	Sreemongal, Moulovibazar	Rajnagar, Moulovibazar	Rajnagar, Moulovibazar
Type of waterbody	Open	Open	Open	Open
Waterbody management type	Co-management, Private	Private	Private	Private
Name of the organization	Balla RMO, then *Rajani gondha*	*Pubali Matshajibi*	*Shahjalal Matshajibi*	*Boishakhi Jubo Mothsojibi*

	Matsyjibi Samabay samity ltd.	*Samabay Samity* ltd.	*Somobay Samity* Ltd.	*Somobay Samity* Ltd.
Registration authority	Social welfare Department/ Cooperative department	Cooperative Department	Cooperative Department	Cooperative Department
Official area of the waterbody	70 (acre)	225 (acre)	162.40 (acre)	19.50 (acre)
Water area in dry season	20 (acre)	70 (acre)	100 (acre)	5 (acre)
Approximate attached water extent in wet season	500 (acre)	1000 (acre)	3000 (acre)	1000 (acre)
Water depth (Highest)	13 feet in monsoon	15 feet in monsoon	20 feet in monsoon	22 feet in monsoon
Water depth (Lowest)	3/4 feet in dry season	6/7 in dry season	7/8 feet in dry season	8 feet in dry season
Time of increase water level	*Boishak* to *Sravan* (mid-April to mid-July)	*Boishak* to *Sravan* (mid-April to mid-July)	Boishak to *Sravan* (mid-April to mid-July)	*Boishak* to *Sravan* (mid-April to mid-July)
Time of water decrease	*Kartik* (October)	*Kartik* (October)	*Agrohayan* to *Choitro* (mid-November-mid April)	*Vadro-Choitro* (mid-August- mid-April)
Connection with river	Gopla river	Gopla river	Munia river	Koradier Khal
Name of the nearby village	Gondhorbopur, Vunobir Union (Vimshi)	Boulasir, Mirzapur	Berkuri, Betagunja, 1 no. Fatehpur Union	Rokta, PanchGaon Union
No. of fishers	Gondhorbopur - 95 Vimshi-130	Boulashir - 300	Betaguinja village - 650 Berkuri village - 150	Rokta - 700

Data source: *Secondary information from fisheries office, local concerned government and NGOs*

2.2 Data collection Methods

2.2.1 Desk Review

The research looked at relevant publications, such as academic journals and grey literature. The research also looked at associated laws, judicial and administrative judgments, policies, and institutional structures in Bangladesh and other nations that used

co-management systems. Finally, the data and information gathered from secondary sources, including fish capture monitoring data from the ongoing CREL project, were examined, and synthesized.

2.2.2 Focus Group Discussions (FGDs)

A total of 24 FGDs were completed to generate rich discussion among fishers, lease community members of the local government, local elite, RMO members, and local officials of the CREL Project and other relevant project officers. Apart from separate discussion sessions with women, women's participation was ensured in other FGDs. Each FGD engaged 10–12 stakeholders with formal, guided discussion checklists. The checklists were based on parameters including biotic communities, hydrology, landscape, social indicators, ecological benefits, policy, and institutional approaches to co-management. Our research team members interpreted every question in a locally easy-going language and used the Bengali terms instead of scientific words.

2.2.3 Key Informant Interviews (KIIs)

Key Informant Interviews (KIIs) were conducted based on the specific checklist. A total of 25 KII interviews were conducted to cross-check the qualitative in-depth information from people with first-hand knowledge and expertise. Stakeholders selected for KIIs included community leaders, representatives of local government institutions, officials of local administration involved with decision making related to hoar management, including Deputy Commissioner, Additional Commissioner (Revenue), Revenue Deputy Collector, Upazila Nirbahi Officer, Assistant Commissioner (Land), District Fisheries Officer, Upazila Fishery Officer, members of waterbody leasing and management committees, policymakers, relevant experts and practitioners, and development partners.

2.2.4 Household Survey

A household survey was carried out with 30 households in each village, and the survey was conducted in 4 neighboring villages of the selected two *Haor*. A scoring system was applied within the survey format. To ensure its effectiveness, the survey format was retested (by experts) for the collected data, considering the objectives of the research and finalized accordingly.

2.2.5 Timeline and trend analysis

From timeline and trend analysis, trends in fish species diversity, fish production, and ecosystem health over time were documented and compared with available fish catch data in Hail *Haor*. In Kawadighi *Haor*, the recall method was used to find out how environmental and social benefits and overall trends were different.

2.2.6 Case Study

One case study was undertaken. The case study focused on the effectiveness of the Kashimpur fish pass of Rajnagar Thana in Moulvibazar, which connected to the Kawadighi *Haor* and its impact on the Kawadighi *Haor*.

2.2.7 Local Consultation Workshop with District Jolmohal Management Committee

A consultative workshop with District *Jalmohal* Management Committee members on exploring policy avenues for co-management approaches in Bangladesh was held on September 1, 2016 at the Circuit House Conference Room, Moulvibazar. The meeting included 17 government officials from the Department of Fisheries, Livestock, Land, Law, and Water development; 7 community leaders (Local Upazila Chairman, Commissioner, and co-operative members); along with local journalists and other development partners (USAIDs-CREL project officials).

2.2.8 Documentary Film

The research team utilized audio-visual instruments for documenting findings based on available evidence and interviews during field data collection in Hail *Haor* and Kawadighi *Haor*. This effort resulted in a documentary film named "A Tale of Two Wetlands" [1]. This documentary was presented in the 'Dissemination workshop' to let them know the exact situation of the study area and the importance of the wetland co-management approach.

2.2.9 Dissemination workshop

The research team shared findings and policy recommendations in a national workshop organized by the Ministry of Land in collaboration with the CREL Project. This wider audience included policymakers such as government officials from the Department of Fisheries, Livestock, Land, Law and Water Development; representatives of USAID and CREL Project were also present. The meeting was held on January 5, 2017 in Dhaka.

2.2.10. Statistical analysis

All applied statistical analyses were done using Microsoft excel.

RESULTS AND DISCUSSION

3.1 Comparison between co-management and private management

3.1.1 Resource management practice

Differences in resource management approach and practice between co-management and private management are shown in the table 4. Findings showed that Balla RMO has undertaken resource management initiatives to improve the bio-physical condition of the Balla *beel* (waterbody of *Hail haor*), which includes establishment of a fish sanctuary (4 acres), ensuring more water in the dry season via an excavation program, excavating connecting channels for fish migration, and stopping dewatering fishing (Dewatering fishing connotes removing water by pumping for fish harvesting). During co-management in Balla *beel*, catching brood and fry fish during breeding season of *Boisak* to *Asar* (mid-April to mid-June) and use of *Current Jal* (*Jal* Bangali term of fishing net) and *Kafri Jal* is partly controlled by fisheries office. Local fisheries department officials (Upazila Fisheries Officer) operated petrol checking in the breeding season of fish once or twice in a month to avoid illegal fishing and destroyed banned

fishing net (eg. *Current*, *Moshari* and *Kafri Jal*). Conversely, Chiruadubi, Hawagulyia, and Borouri *beel* were managed privately and they did not take any initiative to conserve and management of resources.

Table 4. Management initiatives taken by the RMO or cooperative for ecosystem improvement. (Symbol √, Yes; ×, No)

Management initiatives	Balla *beel* (Under RMO management period) 2000-2011	Balla *beel* (Under traditional management) 2012-2014	Chiruadubi *beel* (Under traditional management)	Hawagulyia *beel* (Under traditional management)	Borouri *beel* (Under traditional management)
Established sanctuary	√ (4 acres)	×	×	×	×
Ensured more water in the dry season with excavation	√	×	×	×	×
Excavated connecting channels	√	×	×	√	×
Released threatened fish species	√	×	×	×	×
Increased production by releasing fish	√	×	×	√	√
Stopped catching brood fish and fry	Partly controlled	×	×	×	×
Prohibited fishing during *Boisak* to *Asar* (3 months).	Partly controlled	×	×	×	×
Stopped use of Current *Jal*	Partly controlled	×	×	×	×
Stopped use of Kafri *Jal* / Mosharir *Jal*	Partly controlled	×	×	×	×
Stopped dewatering fishing practice	√	×	×	×	×
Planted swamp trees	√	×	×	×	×

The majority of respondents reported that Hail *haor* area is developed as a fish sanctuary, ban illegal fishing due to co-management implementation and also mentioned

that community peoples changed their attitude to one of positive approval of resource management (Mazumder et al. 2016).

3.1.2 Bio-physical parameters in four waterbodies

Compared to other waterbodies, the overall bio-physical (harmful fishing, dewatering fishing, water pollution, water depth, fish habitat, fish production, aquatic vegetation, swamp plantation, availability of shells and snails, migratory birds and local birds) condition of Balla *beel* reflects that the respective CBOs and Balla RMO effectively managed Balla *beel*, following a sustainable management approach, which contributed to the improved bio-physical condition. According to the majority of respondents, the data in Balla *beel* showed that harmful fishing, dewatering fishing, and water pollution decreased while water depth, fish habitat, fish production, aquatic vegetation, swamp plantation, availability of shells and snails, migratory birds, and local birds increased with greater differences between Balla and the other three waterbodies (Fig. 2). The traditional privately maintained waterbodies, on the other hand, exhibited the opposite trend.

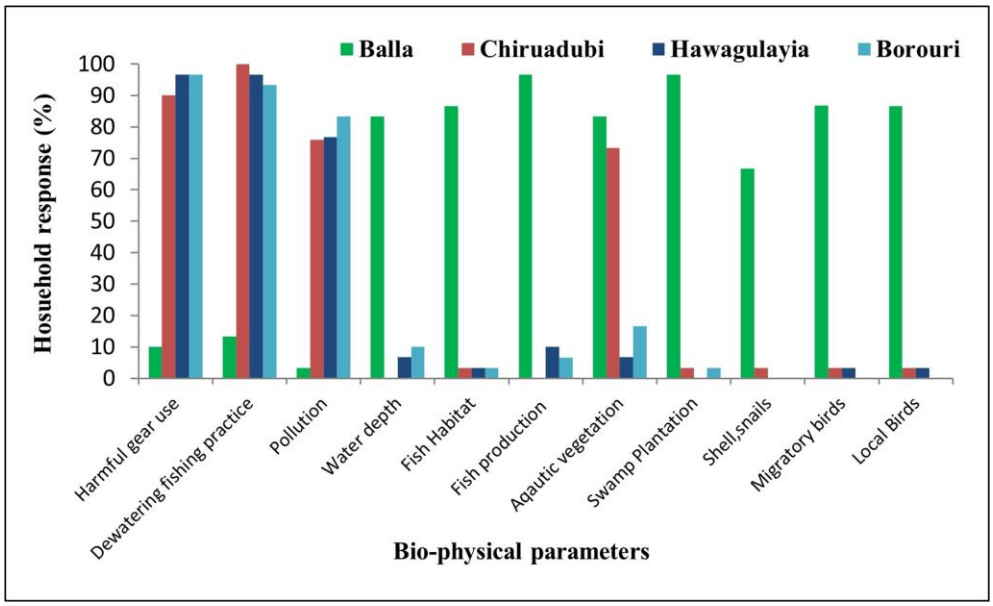

Figure 2: Reported difference in Bio-physical condition

3.1.3 Social-ecological benefits from waterbodies

Fish harvest, shell, and snail collection for using as fish bat and duck food, aquatic vegetation, fodder, cattle rearing, and duck rearing were noticeably increased during RMO management in Balla *beel* except for "*dholkolmi"* (an aquatic weed which is used by poor fishermen for cooking as fuel). In contrast, privately managed *beels* (Chiruadubi, Hawagulyia, and Borouri) showed the opposite trend because of overharvesting of fish, dewatering fishing and vegetation, and restrictions from the owner (Fig. 3).

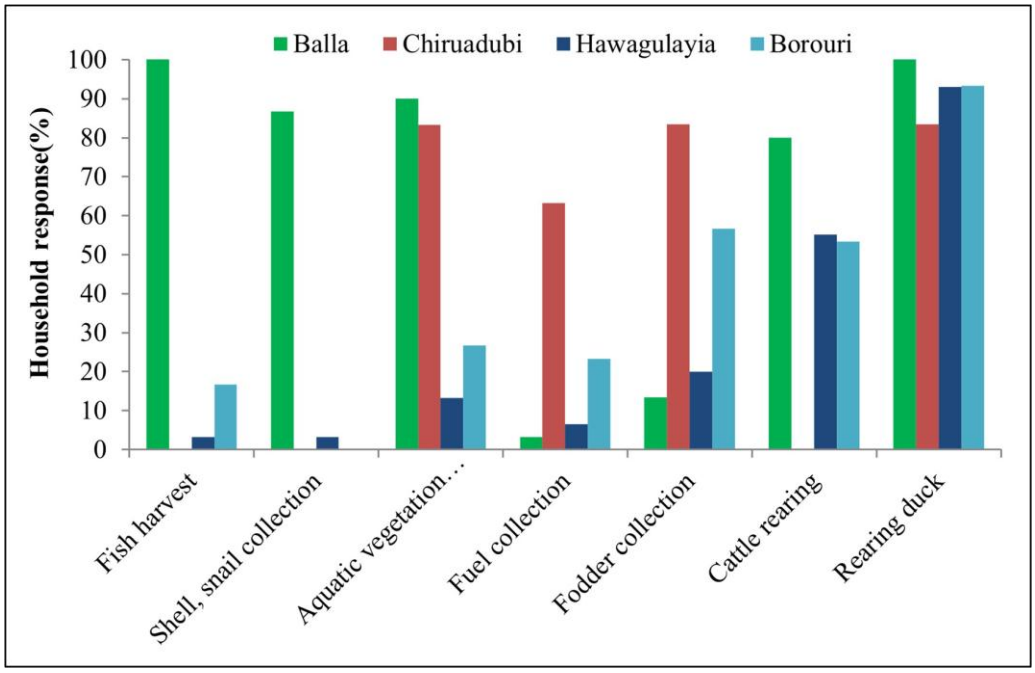

Figure 3: Difference in socio-ecological benefit in four waterbodies

3.1.4 Difference in bio-physical condition and socio-ecological benefits before, during and after co-management of Balla *Beel*

Balla *beel* is a unique case which covers both private management and co-management regimes where local fisherman and the community have already experienced differences between the two regimes. Overall, the observations, perceptions, and recall of local people indicate that the biophysical condition and ecology of the *beel* were in decline before co-management, rapidly recovered or increased during management by Balla RMO, and then even more quickly declined when the fishers' cooperative took control of the *beel* after Balla RMO lost its rights (Fig. 4). Under the traditional management period, lease holders (cooperatives) mostly targeted maximizing fish harvest using all sorts of means, which ultimately resulted in loss of productivity of the fishery and depletion of other biological and ecological resources of the waterbody. In their case study on Hail *Haor* during co-management, Mazumder et al., (2016) reported that co-management boosted monitoring of the *haor* region, *haor* fisheries, community engagement, and their means of livelihood.

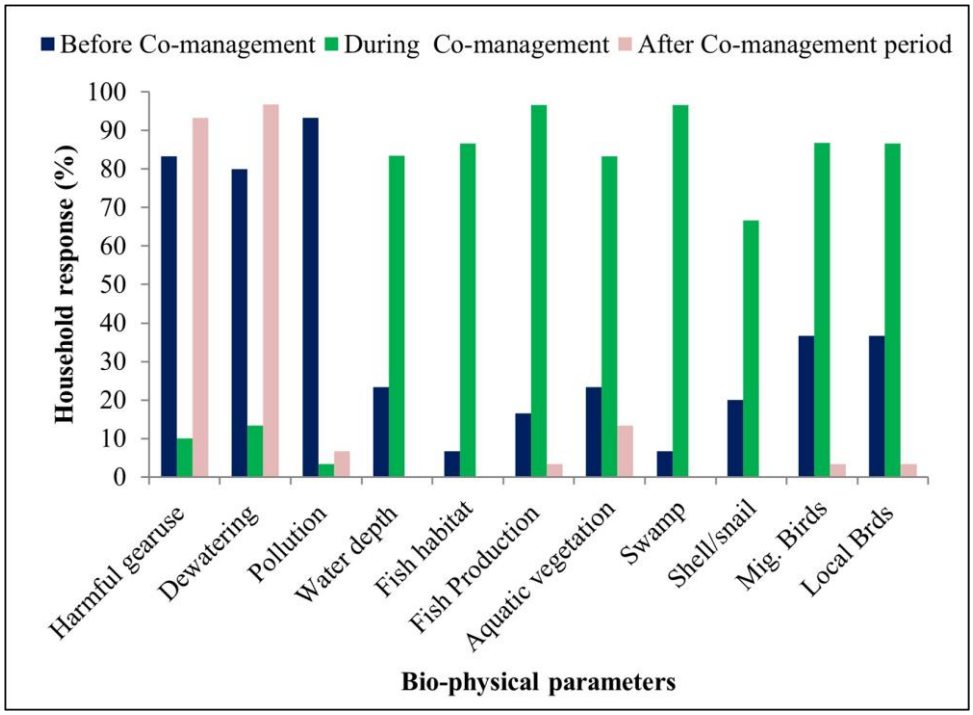

Figure 4: The percentage of respondents reported the bio-physical condition and ecology of Balla *beel*

3.1.5 Social-ecological benefit in Balla *beel* over time

The majority of Balla *Beel* respondents stated that throughout the co-management period, fish harvest rose. Respondents also highlighted more shell, snails, aquatic vegetation, and greater access to cattle rearing on Kanda land (Kanda is a wetland area that remains above water level, enabling cattle to graze), however collection of fuel wood and fodders declined. The subject of changes in socio-ecological benefits with local communities was discussed in the FGDs, and it was discovered that changes are mostly controlled by the hydrology and bio-physical state of the waterbody, as well as management of fishing practices. Furthermore, the CBO discontinued its dewatering fishing practice, increased water availability during the dry season through an excavation operation and constructed connecting canals for fish movement. These operations resulted in more accessible water and better biophysical conditions throughout the year in Balla *beel*, which were entirely missing under the conventional management regime. As a consequence, during the co-management phase, the Balla *beel* community enjoyed higher socio-ecological advantages than during the privately managed years (Table 5).

Table 5: The proportion of respondents reported changes in social-ecological benefits in Balla *beel*

Indicator	Private management (1990-2000) N=30			During Co-management (2001-2011) N=30			Private management period (2012-2014) N=30		
	Down	Same	Up	Down	Same	Up	Down	Same	Up
Fish harvest	83.3	0	16.7	0	0	100	96.7	0	3.3
Shell, snail collection	80	16.7	3.3	0	13.3	86.7	90	6.7	3.3
Aquatic vegetation collection	83.3	10	6.7	0	10	90	86.7	10	3.3
Fuel collection	3.3	13.3	83.3	83.3	13.3	3.3	3.3	13.3	83.3
Fodder collection	13.3	36.7	50	30	56.7	13.4	6.7	23.3	70
Cattle rearing in the *Kanda* land	80	20	0	0	20	80	76.6	20	3.3
Rearing duck	100	0	0	0	0	100	96.7	0	3.3

3.1.6 Access to fishing

A comparative analysis was conducted on the difference in access to fishing between co-management and private management waterbodies. Researchers conducted FGDs with local fishers, members of the Balla RMO, and members of the fisher's cooperative society to understand patterns of access to fishing according to season, gear type, and access of fishers throughout the year in the study of waterbodies (Table 6).

Table 6 demonstrates that under the cooperative's private administration, only a few persons had access to all the gear using opportunities. Few other fishermen gained access to the water by paying a fee to the cooperative authority. Local fishermen had free access to fishing in Kawadighi *haor* (Borouri and Hawagulayia *beel*) for a short time, while leaseholders made large profits during the dry season. While under the co-management of Balla RMO, the most of impoverished fishermen had year-round access to fishing using various kinds of gear. Only those interested in *Katha* fishing (brush pilling) and *Ber Jal* (seine net) paid the requisite fee amount to cover lease value and other organizational expenses. According to Thompson et al., (2003), fishery management will improve under a co-management approach in terms of sustainable fish catches and a more equitable distribution of returns, with less going to fisher leaders, middlemen, moneylenders, and leaseholders, as well as fishers who can cooperate, make collective decisions, and develop local rules to regulate fishing.

"During the time of co-management; RMO established a fish sanctuary, banned dewatering fishing and implemented other fishing rules. As a result, fish production is increased because of fishers were able to catch more fish and their income also increased." mentioned by Taranga Das (68), a woman member of Balla RMO.

Table 6. Differences in access to fishing in different selected waterbodies

Name of the gear	Balla *beel* under RMO	Balla *beel* under private management	Chiruadubi *beel*	Borouri	Hawagulayia
Dori-Bosni (small traps typically over 100 per fisher)	About 35 local poor fishermen accessed without paying any fee.	A group of 10 fishers from Co-operative and 2 people from outside got the access to fishing.	Only selected 10 members of the Cooperative free access, while 20 fishers paid fee at BDT.2000 by each.	About 20 fishers have free access for limited period. From, *Kartik* to *Choitro* (October to April) access prohibited.	About 20 Fishers have free access for limited period. From *Kartik* to *Choitro* access prohibited.
Borshi (Longline) (each unit has 1000 or more hooks)	About 10 local fishers could fish without paying fee.	5 members of the same group of the Cooperative got access.	Only selected 6 members from Cooperative got access.	About 20 Fishers have free access for limited period.	About 40 Fishers have free access for limited period.
Felun Jal (small and large push nets operated on foot and by boat)	About 5 people with full access without any fee.	3 people with limited access	About 5 people with limited access.	About 3 fishers' access to fishing for limited period.	About 10 Fishers have freely accessed for limited period
Current Jal (nylon monofilament gill net) & *Suter Jal* (gill net)	25 local fishers accessed of fishing without paying any toll.	10 people of the same group of the Cooperative, 5 people outside the group got access to fishing. Each outsider paid BDT. 2000 for access.	10 people from Cooperative were mostly benefitted, 20 fishers from same villages also accessed providing fee BDT. 2000 by each of them.	About 25 Fishers have freely accessed for limited period.	About 25 Fishers have freely accessed for limited period.
Katha (brushpile) fishing	Distributed among 5 groups of local fishers. Each group formed with 5 people. All fishers received a chance to involve. These groups paid lease value	Only selected 10 members got the access to fishing.	Only selected 3 people from Cooperative received the access to *Katha* fishing.	Only leaseholder gains the access to *Katha* fishing. Paid labours work for leaseholder.	Only leaseholder gains the access to *Katha* fishing. Paid labours worked for leaseholder.

	without any excess payment.				
Taki Jal (trap net or long funnel shaped net used to catch fish where current is available. A group of people operate the net by rotation staying in a boat.	Not applicable	Not applicable	Not applicable	Only leaseholder gains the access. In *TakiJal* eight labors are engaged.	Only leaseholder gains the access. Leaseholder engages 2 groups where 20 people are engaged as labour
*Ber Jal (*seine net, size varies by typically operated by 8-10 people)	10 people from fishers group got limited access as RMO restricted fishing during *Boisak* to *Asar*	Selected 10 members from Cooperative got the access to fishing throughout the year.	Only 30 people from Cooperative are benefitted.	Only leaseholder is benefitted. Leaseholder engages 2 groups with 16 people by providing wages.	Only leaseholder is benefited. Leaseholder engages 5 groups where 50 people engaged.
Dewatering fishing (pumping out depression and catching all fish)	Dewatering fishing is not allowed. Fish production increased for not dewatering fishing.	Only selected 10 members from Cooperative got the access to fishing. Destroyed fish sanctuary and eco-system (2 to 3 times in a season).	As the waterbody is deep and close to Gopla river, dewatering is not practiced. But in the floodplain the practice is available using manual labour*(Punga secha*).	Only leaseholder gains the access of dewatering fishing destroying the eco-system (2 to 3 times in a season).	Only leaseholder is benefitted destroying the eco-system (2 to 3 times in a season).

3.1.7 Fish catch and income

During the household survey for this research, fishermen were questioned about the types of fishing gear they use, their daily, monthly, and yearly fish capture, as well as their revenue from the two most common fishing gears (Current *Jal* and Borshi) (Fig. 5 and 6). In the study area, several types of fishing gears were observed, the most of which were traditional while some were unique to the area. Almost all of these *beel*'s surfaces were dried throughout the winter season. Nevertheless, the usage of any form of gear was highly restricted throughout that period. As soon as the monsoon rain falls and the water level rises, the utilization of all sorts of gear concurrently increases. Due to the vastness of the water bodies, current *jal*, borshi, traps are used more regularly. Due to the abundance of surface-dwelling fish at this period, more and more wounding tools (spears, harpoons, arrows) were utilized in shallow water.

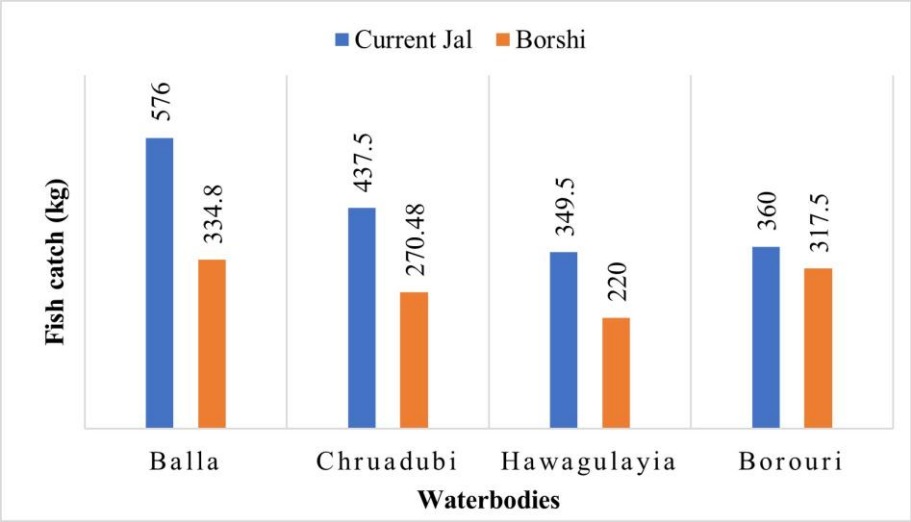

Figure 5: Reported annual fish catch (kg) per fishing unit in four waterbodies for two main fishing gears

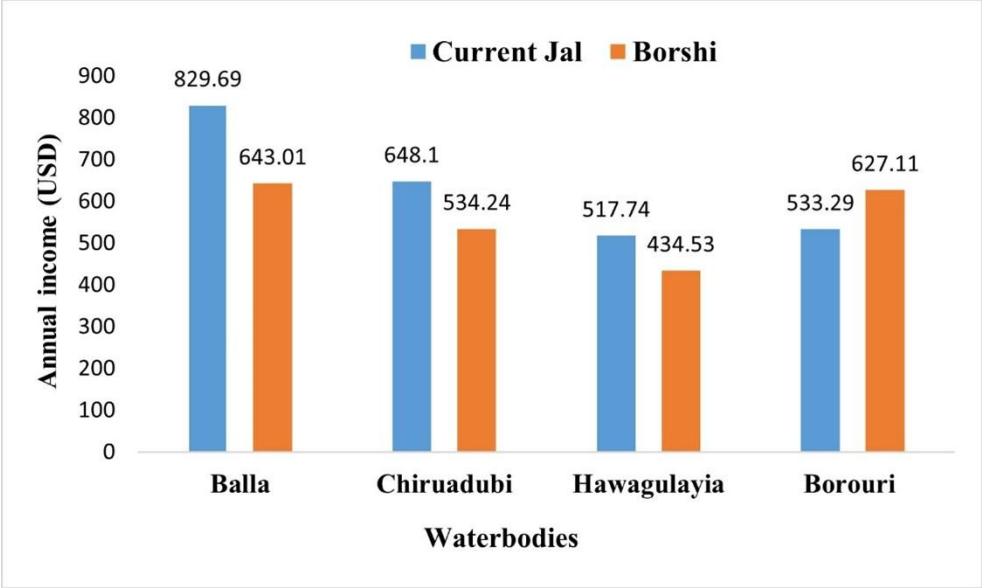

Figure 6: Annual income (USD) reported by common fishing units in four waterbodies

During the study period, the most used gears were observed the current *jal* (gill net) and the borshi (longline). Although it is officially prohibited, current *jal* was frequently used to catch fish. The daily, monthly, and yearly fish catch was different in Balla, Chiruadubi, Hawagulayia, and Borouri *beel*s and between these two gear types. The current *jal* catch has been reported to be greater than that from Borshi.

In the case of current *jal*, the average daily (3 kg), monthly (72 kg) and yearly catch (576 kg) by each fisher was higher in Balla, followed by Chruadubi, Borouri, and

Hawagualaiya, respectively (Fig. 5). The average per capita daily (4.32 USD), monthly (103.70 USD) and yearly income (829.69 USD) was also reported to be higher in Balla, followed by Chruadubi, Borouri, and Hawagualaiya*beel*, respectively (Fig. 6). In the case of borshi, Balla *beel* had the highest average daily (2.79 kg), monthly (66.96 kg), and annual capture (334.8 kg) by each fisher, followed by Borouri, Hawagualaiya, and Chiruadubi (Fig. 5). Balla *beel* also had the highest average daily (5.36 USD), monthly (128.60 USD), and annual income (643.01 USD), followed by Borouri, Hawagualaiya, and Chiruadubi (Fig. 6).

Compared to the annual fish catch and income, the fish catch and income in Hail *Haor* were higher than in Kawadighi *Haor*. While discussing with fishers, it was revealed that due to co-management and a permanent sanctuary (Baikka *Beel)* in Hail *Haor* and its bio-physical conditions, the overall fish production and species diversity has remained high (Dev 2011; Mazumder et al. 2016; Mustafa 2019). Moreover, Mustafa, (2019) reported that after the MACH intervention of 1999 to 2005, fish production (kg/ha) showed increasing trends in Hail *Haor*. On the other hand, lack of awareness about fisheries resources, overfishing, and indiscriminate harvesting of brood fishes, destruction of migration routes and embankments on the upstream of the connected river are some of the major reasons for decreasing fish species in Kawadighi Haor.

3.1.8 Fish species diversity

During the study period, a total of 60 species of fish were recorded in Hail *haor* and only 13 species of fish were found from Kawadighi *haor*. Among the 60 fish species present in Hail *haor*, 32 species are found as not threatened (NT), 10 species are endangered (EN), 12 species are vulnerable (VU) and 6 species are critically endangered (CR) (IUCN-Bangladesh, 2000). However, Mazumder et al., (2016) was recorded 57 fish species in the catches of different gears used by the fishermen in the Hail haor. Most available species were *Channa punctatus, Anabas testudineus, Mystus vittatus, Heteropneustes fossilis, Clarias batrachus, Mastacembelus pancalus, Mystus bleekeri, Glossogobius giuris, C. striatus, Colisa chuna, C. fasciatus, Pisodonophis boro, Xenentodon cancila, Hyporamphus limbatus, Gudusia chapra, Tenualosa ilisha, Lepidocephalus guntea, Somileptus gongota, Labeo rohita, Catla catla, Cirrhinus cirrhosis, Amblypharyngodon mola, Puntius sophore, C. striatus, Johnius coitor, Arius gagora, M. bleekeri, M. tengra, Ailia coila, Neotropius atherinoides,* and *Wallago attu*. However, some highly endangered species were found during the study period. These species include *Mastacembelus armatus, Botio Dario, L. calbasu, L. gonius, Osteobrama cotio, Notopterus chitala, C. marulius, Aorichthys seengghala, Ompok pabda,* and *O. bimaculatus*. The presence of these species may be because co-management and sanctuary produced a good environment for some endangered species to repopulate in the Hail *haor*. Some species reportedly found in vulnerable conditions were *Monopterus cuchia, Nandus nandus, P. ticto, Macrobrachium rosenbargii, Cirrhinus reba,*

Notopterus notopterus, Parambassis ranga, Chanda ranga, C. orientalis, Nandus nandus, Aorichthys aor and *Ailia puctata*. The most critically endangered species of that *haor* are *P. sarana, Esomus danricus, C. barca, Rita rita, Eutropiichthys vacha,* and *Bagarius yarrellii*. Fish diversity has varied throughout time. Based on the responses of fishermen, it became evident that there were more species and more fish decades ago. In the previous decade, the number of species in Hail Haor has decreased to 15; now, there were around 60 distinct species. Undoubtedly, the biological and social management of the Haor is responsible for that rose. The capture of these fish was discouraged by an RMO, and as a consequence, these fish are now abundant.

A total of 13 species were found available in Kawadighi *Haor*. Of the 13 fish species, 9 fish species were not threatened, 3 species were endangered, and only 1 species was found to be critically endangered (IUCN Bangladesh 2000). Available species are *C. punctatus, Anabas testudineus, Mystus vittatus, Mastacembelus pancalus, Mystus bleekeri, L. rohita, C. catla, C. cirrhosis and Oreochromis mossambicus*. However, 10 years prior, 19 species of fish were recorded at Kawadighi haor. The fisheries resources in this water body have been eroded due to environmental degradation, the establishment of a sluice gate, an embankment upstream of the river, improper regulation of the pump house, an improper migration route for fishes, overfishing, indiscriminate use of current *jal*, and a variety of other factors. Those fish which were dominant became rare over the course of time. Consequently, many fish have become endangered or extinct. The reasons for the extinction of these species are overfishing, siltation, and natural events like floods and drought. Moreover, lack of good management of the *haor* is another factor that has led to an increase in fish extinctions. Our case study revealed that due to the construction of Kashimpur fish pass in Rajnagar Thana in Moulvibazar, the mother fishery of Kawadighi *Haor* was severely damaged as it was cut off from the Kushiyara river by the Manu River Project embankment. This resulted in the loss of fish habitat and the consequent impoverishment of several thousand fishing families.

3.1.9 Differences in socio-economic conditions in four waterbodies

Overall, respondents' reflection showed that in the Balla *Beel*, household annual income increased 70% compared to Chiruadubi (43%), Hawagulayia (30%), and Borouri (40%) in the past 10 years. Compared to Chiruadubi (60%), Hawagulayia (26.7%), and Borouri (23.3%) during the same period, 63.3% of Balla *beel* respondents reported an increase in their food intake and nutrition level. In Balla *beel*, 76.7% of households said their social empowerment level had increased, while in Chiruadubi it was 63.4%, with Hawagulayia having a lower status with 30% of households (Fig. 7). Mentionable, when RMO and FRUGs (Federations of Resources User Groups) were working in the Hail *Haor*, social empowerment was much higher because fishers had access to microcredit and were involved in making decisions.

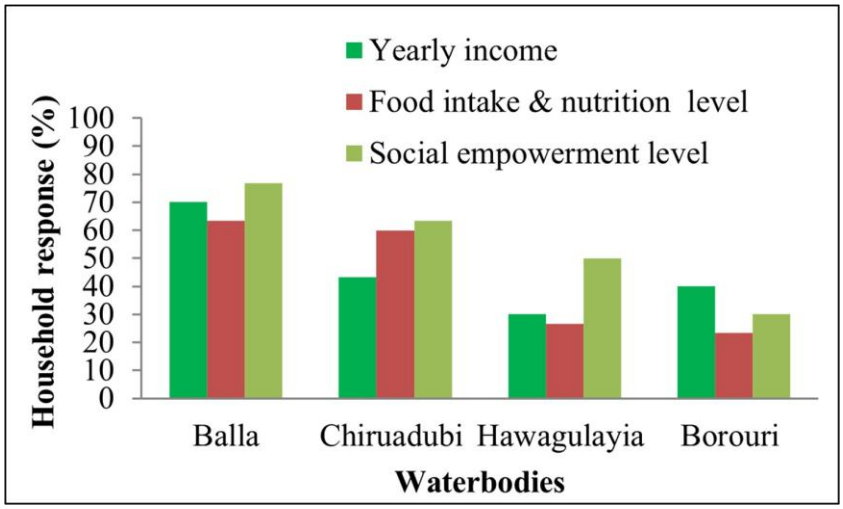

Figure 7: Changes in socio-economic conditions in four water bodies

Apart from those indicators, the research team also investigated access to medical services, capacity to support education, access to loans, and women's empowerment level. Considering those indicators, it was found that there was an overall development of livelihood in all four villages, which was not directly connected to wetland management and access issues. Rather, government programs on health, water and sanitation, education, electricity, and NGOs played an important role in the improvement of livelihoods. Furthermore, some of the household's livelihood improved due to foreign currency as their family members were working in the Middle East or other countries.

3.1.10 Difference in Institutional Capacity

The study investigated differences in institutional capacity of CBOs guided by a co-management approach in comparison with traditional management of the fishing cooperative. In this regard, Balla *beel* was selected for the study as the fishing community of this waterbody has experienced management approaches and practice under both co-management and traditional management. Apart from Balla *beel*, the institutional capacity of the CBO's from Chiruadubi, Hawagulayia, and Borouri *beel* was also investigated. When comparing the institutional capacity of the CBOs guided by co-management and private management, it was discovered that the CBO guided by co-management follows a participatory method in the decision-making process. For the selection of leaders, they used a ballot box, which allowed for financial transparency, provided access to fishing without any fees, incorporated women, received regular assistance from the UP and Upazila administration, and resolved several conflicts between different social groups, which had different conflicting interests. They also provided other social services to the poor community, like distributing blankets, providing books and scholarships for students, support for marriage and medical

treatment, etc. Such performance was absent in the CBOs guided by traditional management.

3.2 Performance Indicators for Sustainable Resource Management

It is essential to establish measurable performance indicators that will be used by both policymakers and the community to assess the performance of the CBO. The research team identified some of the key bio-physical and institutional indicators for measuring the performance of the CBOs, or fishers' cooperatives. In this study, the research team used indicators relating to bio-physical and institutional performance criteria. Bio-physical criteria were (a) Extent CBOs are using harmful gear and initiative taken for control (b) Whether CBO is in the practice of dewatering fishing or stopped (c) Whether CBO is in the practice of catching of brood fish and fry fish or stopped (c) whether CBO is in the practice of releasing scarce fish species (d) the initiative is taken by the CBOs for controlling water pollution (e) the initiative is taken by the CBOs for increasing the water depth level and connectivity with an excavation program. (f) established fish sanctuary and improved fish habitat condition (g) fish production increased or decreased (h) whether CBO is in the practice of swamp plantation (i) aquatic vegetation is available (j) whether shells-snails, migratory birds, and local birds are available in the waterbody. Institutional criteria are (a) the CBO should be a registered organization either from cooperatives or from the social welfare department of the Bangladesh government; (b) the CBO should have a constitution and the organization should be guided by the principles of the constitution. In the constitution, government rules on fishing practice are mentioned, and rules are followed during fishing time (c) The CBO is in practice to ensure the participation of the poor and women during the decision-making process. (d)The CBO is in practice to ensure access of the poor fishers for the major fishing access including access to Katha fishing (e) Financial management is transparent, and status of accounts is presented among the members on a regular basis (f) CBO conducts general meetings on a regular basis and major decisions are approved in general meetings. Furthermore, the decisions of the Executive Committee needed to be approved at the general meeting (g) Leaders of the CBO's are selected through the democratic process (h) The CBO has the capacity to resolve conflict if it arises between farmers and fishers (i) The CBO shares benefits among the community through social work.

3.3 Scope for Co-Management Approach in existing Policy frameworks

The study reviewed the broader policy frameworks related to wetland management in Bangladesh. In particular, we examined the 2009 *Jalmohal* Management Policy and conducted a field investigation with some specific indicators such as natural resource management approaches, social-ecological benefits, fisher access, social-ecological benefit sharing mechanism, institutional capacity for resource management,

community participation in decision-making processes, and transparency and accountability.

The Protection and Conservation of Fish Act, Bangladesh (1950) deals primarily with inland capture fisheries and regulates some of the concerns for gradual depletion of fishery and fish resources. In accordance with the mandate of this Act, the Protection and Conservation of Fish, Rules, 1985 was adopted and prohibited the erection of fixed engines in rivers, canals, *khals* and *beels*, construction of dams and embankments other than for irrigation, flood control or drainage purposes, and the destruction of fish by explosives in inland or coastal territorial waters or by poisoning/depleting water. The Rules also prohibited the catching of certain fish species during their spawning season. All these rules, which are set with a top-down approach without any participation of the local community and civil society, lack clear mechanisms for implementation other than through enforcement by law enforcement agencies.

While the laws and policies related to fish and fisheries deal with the conservation aspects of fisheries, the management (leasing out, etc.) of the fisheries is regulated by land-related laws. The Ministry of Land is responsible for the management of all the fisheries designated as *Jalmohals* and all other land and water bodies in the country in accordance with the land-related laws. Nevertheless, some of the soft laws, particularly on fisheries, have advanced the issue of community-based fisheries management. In previously implemented development projects, including Community Based Fisheries Management projects (CBFM), Management of Aquatic Ecosystems through Community Husbandry Project (MACH), the two pertinent ministries, i.e., the Ministry of Land (MoL) and the Ministry of Fisheries and Livestock (MoFL), signed memorandums of understanding (MoUs). The MoU between MOFL and MoL gave use rights of the waterbodies towards the community organization for 10 years' management on the condition that any leases at rates set by MoFL were paid.

It’s worth mentioning that although Balla *beel* (the focus of this study) was co-managed with a sustainable development approach by Balla RMO (DoF oversight, MACH project supported) from 2000 to 2011, after the project period, the Balla Resource Management organization (RMO) could not participate in the bidding process. According to the 2009 wetland policy, after phasing out the project, Balla *Beel* was traditionally leased by biding processes in accordance with the *Jalmohal* Management Policy, 2009 to *Rajoni Gandha Mothsojibi Somobay Samity* Ltd for three years (2012-2014). Khan, (2012) and Mustafa, (2019) concluded that overall fish production and biodiversity have been enhanced because of community-based co-management and suggested that this system should continue in the long term through resource management organizations. Effective co-management models have yet to be developed for the resource management of Bangladesh (Thompson *et al*. 2003), and till now they are not effective. The present

study indicated that co-management practice is needed to institutionalize sustainable wetland management in Bangladesh.

3.4 Policy gaps for co-management approach: context of Jalmohal Management Policy 2009

National Fisheries Policy, Bangladesh, 1998 provides the scope for a co-management approach to wetland management. However, in different sectoral policies and legislation, a co-management approach to wetland management is yet to be enacted. The Public Waterbody Management Policy was adopted in 2009, which now regulates the *Jalmohals* in Bangladesh. The current policy, which has in effect superseded previous policies, has two main objectives set forth in the preamble: (a) give priority to the genuine fishers in settling the public waterbodies/*Jalmohals*; and (b) while earning revenue, conserve and increase fish resources and conserve biodiversity. The policy of 2009 stated further that registered Fishers-based organizations needed to provide the certificate obtained from the relevant authority along with audit reports for the last two years. However, the fishing rights of the communities developed on customary rights and practices in the sub-continent are not affected. On the other hand, the lease period remains for three years, and the lease value shall be raised by 5% from the previous year's value in accordance with section. Overall, concerns remain focused on social equity in selecting real fishers and the allocation of waterbodies for management. In the contexts of selecting real fisher folks and increased lease values, policy gaps create space and opportunities for local elites to take de-facto management of wetlands. In this research study, it is evident from the four waterbodies management approaches that so-called elite people manage the waterbodies in the name of fisher folks, which ultimately deprives the access of real fisher folks.

At the same time, Section 7 (5) of the *Jalmohal* Policy, 2009, stated that if an application is submitted by a genuine fisher cooperative willing to manage the waterbody throughout the six-year development project, the waterbody in question will not be leased out in this six-year period. In accordance with these provisions, the Chiruadubi *beel* has remained open for the last year. On the other hand, Balla *Beel* is now under *Khas* collection for the last two years due to legal disputes related to an adjunct canal to the *Beel* (2015-16). The *Jal*mohal Policy, 2009, also provided provisions related to *Khas* collection. This policy only mentions that, during *Khas* collection, brood fish is prohibited. There is no detailed information concerning how fishing will be operated during *Khas* collection. The *Khas* collection is operated for only a year's lease to any interested party that offers the highest amount of lease value. This process is more short-term and subject to high exploitation of wetland resources. The research team found many destructive fishing activities, including dewatering, during the *khas* collection of Balla *Beel* in 2016. As stated before, there are no specific guidelines to ensure sustainable resource management during the *Khas* collection and impose sanctions for destructive resource management.

The *Jal*mohal Policy, 2009 also incorporated provisions related to the establishment of sanctuary in the open water bodies in collaboration with the Ministry of Fisheries and Livestock, as they are experts on the issue. However, there are no provisions for establishing a sanctuary in closed waterbodies or in leased waterbodies. To establish and maintain such sanctuaries in open and closed waterbodies, collaboration and integration among communities, land ministries, and other relevant ministries, including the Ministry of Fisheries and Livestock (MoFL), are needed for sustainable resource management. This policy fails to ensure the coordination and integration approach among the relevant institutions and stakeholders related to wetland management. Table 7 lists the negative results (policy gaps) of the *Jal*mohal Management Policy 2009 and the problems that have been found.

Table 7. Policy gaps and documented outcomes

***Jal*mohal Management Policy 2009 Issue**	Documented Negative Outcomes
Lack of procedures and criteria for socially targeted and biologically based wetland lease decision-making and monitoring.	*Leases are expensive and are captured by elite. Poor performance and bad practices are not documented nor discouraged.*
Preference for lease agreement with fishers' organizations.	*Excludes more inclusive community membership who also deprive benefits from the wetlands.*
No recognition of co-management organizations	*Difficult for RMO to obtain leases under existing policy.*
Lack of specificity on roles and membership of other institutions.	*Lack of coordination and integration approach among the relevant institutions and stakeholders related to wetland management.*
Lease agreement guidelines ambiguous.	*Unsustainable and inequitable management practices.*
No provisions for long-term conservation such as sanctuaries within *jal*mohals.	*Local sanctuaries not established or maintained within leased jalmohals.*
Performance guidelines absent or non-specific.	*Poor performance is not recognized.*
Khas land management adjacent to *jal*mohals not specified in terms of biological and social objectives.	*Conflict and inequitable sharing of benefits.*
Conflict resolution processes are absent.	*Conflicts are not solved in just or fair ways.*
Policy focuses on short term GoB revenue generation.	*Reduces long term total ecological benefits of wetlands and does not recognize equity issues.*

CONCLUSION

The fishing benefits and livelihood improvement of the co-management initiatives in the co-managed *haor* are encouraging and indicate that co-management could be a viable strategy for sustainable use of wetlands and a feasible option for protected areas. The present study suggests that wetlands under co-management adopt more ecological management approaches. It is very important to adopt a co-management approach for the long-term sustainable use of the fishery resources to sustain the fisherman's livelihood and food security. Policymakers should address existing policy gaps in the *Jalmohal* Management Policy 2009 and ensure local community participation. The study recommendations would help policymakers improve wetland management policies.

RECOMMENDATIONS

Outcomes from a comparative analysis of co-management and private management approaches, existing policy gaps in the *Jal*mohal management policy 2009, and co-management scope ensure that co-management adopts a more sustainable resource management approach through ecological management. Therefore, the following recommendations are suggested:

In terms of long-term strategy

- Government should remove the inconsistencies identified in this study from the existing sectoral legislations and policies related to wetland management in Bangladesh and establish an integrated and coordinated legal, policy and institutional frameworks for sustainable wetland resource management.
- A comprehensive study is further required to develop a strategy to remove the inconsistencies from the existing sectoral legislations and policies related to wetland management in Bangladesh. A strategy is also needed to develop a policy advocacy plan to incorporate provisions on the basic elements of community-based co-management approach and resource management. These elements include community access to resources, community participation in decision making processes, and secure benefits for local communities in all sectoral legislations and policies.

In terms of short-term strategy

Government should take initiative for amendment of *Jalmohal* Management Policy, 2009 to incorporate substantive and procedural provisions as follows:

Substantive Provisions:

- Recognition of wetland co-management approach
- Guidelines for lease organisations regarding:
    1. sustainable resource management
    2. access and use rights of fishers
    3. distribution of socio-ecological benefits

- Clear guidance on design, conditions for, and implementation of development projects in *Jalmohals*
- Guidelines for performance assessment of lease organizations
- Guidelines for imposing sanctions on leaseholders when they adopt destructive practices impacting on fish, wildlife, or wetland ecosystem, or break the terms of their lease or development project
- Stronger coordination and integration among the relevant institutions and stakeholders
- Guidelines for sustainable resource management during the Khas collection process
- Limits on lease values

Procedural Mechanisms:

- Increase transparency and accountability (e.g., making public the decisions of *Jalmohal* Management Committees)
- More effective civil society and community participation in decision making

Legislative approach to provide a framework within which *jalmohal* policy, 2009 and rules adopted there under can be operated with an effective institutional framework

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