ADB

Regional Flyway Initiative · Site Study

May 2026

RFI Priority Site · Hail Haor (including Baikka Beel)

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Asian Development Bank

General Site Information

Country	Bangladesh			
RFI Site Name	Hail Haor (including Baikka Beel)			ID008
City/ Municipality, Province, Region	Moulvibazar District, Sylhet Division			
Geographical coordinates	24.37 N, 91.68 E		Area (has)	21,799 ha
Key species	Baer's Pochard and 10 species of migratory ducks, Black-tailed Godwit			
Key habitats (biomes)	seasonal/ intermittent freshwater lakes, permanent freshwater marshes/ pools, seasonal/ intermittent freshwater marshes/ pools, shrub-dominated wetlands, permanent rivers/ streams/ creeks, seasonal/ intermittent/ irregular rivers/ streams/ creeks, and permanent freshwater lakes			
Key ecosystem services	Flood hazard regulation, and cultivated goods (crops such as rice)			
Key drivers of change	Unsustainable use of water resources for agriculture, climate change			
Conservation status (mark all that applies)		Protected Area		Flyway Network Site
		Ramsar Site		Others _____
IBA/ KBA name (and number) and other designations	Hail Haor			
Management Stakeholders	Haor Development Board, Forest Department, Department of Environment, Fisheries Department			
With management plan?				
Project concept themes	Eco-tourism, fish sanctuary establishment and maintenance. Wetland restoration and addressing water sedimentation.			
Length of project	5 years			
Sector/s				
No. of potential beneficiaries	172,000 people			
Indigenous Peoples		No		Yes _____
Anticipated Implementation Risks	Impact of the new fish harvesting regulations and fish sanctuaries on the livelihoods of the local communities, noise from infrastructure development, stakeholder interest in the co-management approach, and conservation priorities and capacity of wetland management stakeholders			
Estimated Project Budget (US$)	8,150,000 USD over 5 years.			
Potential Source/s of Financing		Loan (to be identified)		Private Sector
		Grant		Public-Private Partnership

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Abbreviations

ADB	Asian Development Bank
BDT	Bangladesh Taka
CREL	Climate Resilient Ecosystems and Livelihoods
CSR	Conservation Status Review
DMC	Developing Member Country
EAAFP	East Asian-Australasian Flyway Partnership
IBA	Important Bird and Biodiversity Area
MACH	Management of Aquatic ecosystems through Community Husbandry project
NGO	Non-governmental Organisation
RFI	Regional Flyway Initiative
RMO	Resource Management Organisation
TESSA	Toolkit for Ecosystem Services Assessment
USAID	United States Agency for International Development
USD	United States Dollars

Executive Summary

Hail Haor is a freshwater wetland in Moulvibazar District, Sylhet Division, north-east Bangladesh. It is a large shallow wetland consisting of several smaller lakes sitting within a saucer-shaped depression, bounded by the Balishara and Barshijura Hills to the east and the Satgaon Hills to the west. As a whole, Hail Haor is estimated to cover an area of 21,799 ha (including abutting areas of cultivated land). During the monsoons, the wetland area expands to as much as 14,000 ha but recedes to 3,000-4,000 ha in the dry season. Long-term bird counts during the Annual Waterbird Census have recorded regular congregations of the Black-tailed Godwit *Limosa limosa* (NT) and Ferruginous Duck *Aythya nyroca* (NT). In fact, large flocks of Ferruginous Duck (as many as 4,000-5,000 individuals) has been detected at Hail Haor alongside small, but annual occurrence of the highly threatened Baer's Pochard *Aythya baeri* (CR). In recognition of its importance to migratory species, Hail Haor was established as a wildlife sanctuary in 1983 and as an EAAFP Flyway Network Site in 2011. Jurisdiction of the site is largely by the Ministry of Land, and in part under the Sreemangal *upazila* and the local district land administrations. Ecologically Critical Areas (ECAs) within the Hail Haor landscape are managed by the Department of Environment while the 170 hectares (Baikka Beel) is managed by the Baragangina Resource Management Organization (RMO). As of 2013, it is estimated that some 172,000 people live in 61 villages around Hail Haor.

Provisioning services for cultivated and harvested wild goods (i.e. rice, fish) are Hail Haor's most important ecosystem service. Estimates of annual returns from Hail Haor in early 2000s was approximately 8 million USD and restoration work has increased this by 36% within 5 years. However, over time, droughts, habitat shifts and alteration, and livestock farming and grazing is expected to pose substantial threats to Hail Haor, while erosion from the surrounding hills have increased sedimentation. Severe threats to the wetlands of Hail Haor include anthropogenic activities such as annual and perennial non-timber crop production and expansion (wet rice, fruits) which continually modifies land use and has contributed to habitat degradation or the landscapes surrounding Hail Haor. The Baikka Beel Sanctuary (170 ha) is a well-known segment of Hail Haor designed to protect fish sanctuaries and migratory waterbirds with co-management structures developed for fisheries and nature-based tourism, and which has oversight from local councils and the *upazila* administration. The successful establishment of Baikka Beel to protect Hail Haor's fish stocks, while stimulating local participation in ecotourism and wetland protection also provides a useful model that can be implemented and further scaled across Hail Haor for the same conservation and livelihood outcomes.

Other interventions proposed for Hail Haor include the excavation of channels to link wetlands, and establishment of ecological connectors to facilitate fish migration and spawning. Capacity building and awareness activities for biodiversity and fisheries management can be led by the Bangladesh Forest Department and the Fisheries Department in coordination with the local administrations and implemented over a period of 3-5 years. Civil society organisations with a focus on biodiversity conservation and fisheries (rural) development can be expected to play a major role with leading and delivering training activities on the ground at the selected villages for ecotourism development, fish conservation and habitat restoration

1. Background of the Regional Flyway Initiative

In July 2021, the Asian Development Bank made a commitment to develop a long-term Regional Flyway Initiative (RFI) in the East-Asian Australasian Flyway (EAAF) (Sovereign Project 55056-001) to protect and restore priority wetland ecosystems and the associated ecosystem services they provide in the EAAF, the most threatened migratory bird flyway globally. The Initiative is slated for implementation in nine ADB developing member countries (DMCs) in East, South and Southeast Asia: Mongolia, People's Republic of China (PRC), Bangladesh, Viet Nam, Cambodia, Philippines, Thailand, Malaysia and Indonesia. In 2023, the geographic scope of the RFI was further extended to two DMCs in Southeast Asia and the Pacific respectively, Lao PDR and Papua New Guinea.

The primary aim of the RFI is to enhance and expand the existing efforts in conserving and managing wetlands of the highest priority for migratory birds within the EAAF through innovative loan and grant financing, and at scale. Consultations and analyses over the development period help identify key interventions to strengthen the management of wetlands, enabling the implementation of nature-based solutions while strengthening biodiversity protection. Over time, the RFI seeks to leverage collaborative opportunities by developing partnerships among important stakeholders including national governments, civil society organizations, communities, regional organizations like the East Asian-Australasian Flyway Partnership (EAAFP), development agencies, the private sector, and other relevant entities.

Through the RFI Technical Assistance (TA) implemented over the RFI's development phase from 2021 to 2024, BirdLife International takes the lead in providing and coordinating technical support for development of the RFI. This is carried out in collaboration with the EAAFP and a consortium of international non-governmental organizations including Wetlands International and the Paulson Institute, as well as two universities, namely the University of Southampton, UK and the National University of Singapore. Over the development phase, the TA team undertook a site selection analysis to identify priority wetland sites in all 10 countries based on recent bird data benchmarked against internationally accepted criteria under the Convention on Wetlands of International Importance (or Ramsar Convention), EAAFP Flyway Network Sites and Important Bird and Biodiversity Areas (IBAs). The team further developed ecosystem services profiles for prioritised wetlands using a multi-pronged approach used the TESSA ecosystem services assessment tool, and data-driven modelling of water-based ecosystem services and stored carbon.

In Bangladesh, a total of 20 wetland sites, including many Asian Waterbird Census count sites, were initially assessed through data analysis and expert consultation, of which eight (8) were defined and identified to be RFI priority sites on the basis that they support more than 1% the flyway population of at least one EAAF migratory waterbird species. Five of the RFI sites identified in Bangladesh are coastal wetlands, a consequence of the country's long coastline, with the largest cluster of priority sites being the Sundarbans and the Meghna Delta, which consist of a cluster of three sites. Three sites are floodplain wetlands in the Haor Basin of northern Bangladesh, in the watershed of the Brahmaputra. 17 EAAF species exceeded the 1% threshold at the site level in Bangladesh, with species such as Masked Finfoot reaching in excess of 50% of its flyway (and global) population (eastern Sundarbans) and the Spoon-billed Sandpiper. Other species with important non-breeding populations in the Bangladesh include the Indian Skimmer *Rynchops albicollis* and the Baer's Pochard *Aythya baeri*, one of the most threatened duck species in Asia.

2. Site profile of Hail Haor (including Bakka Beel)

Location: Hail Haor is a freshwater wetland in Sreemangal Upazila of Moulvibazar District, Sylhet Division, north-east Bangladesh. It is a large shallow lake in a saucer-shaped depression, bounded by the Balishara and Barshijura Hills to the east and the Satgaon Hills to the west, which are covered by a chain of tea gardens and natural forest blocks.

Area: Hail Haor covers an area of up to 21,799 ha, including a 100-ha fish sanctuary, Baikka Beel that is under local management. The area of the wetlands there varies widely during the year, with a wet season water area of up to 14,000 ha, and a dry season water area of 3,000-4,000 ha.

Altitude: 4-5 metres asl.

Geographical coordinates: 24.37 N, 91.68 E

Description of site: Hail Haor comprises of open water with much of the lake surface overgrown with emergent vegetation (mostly lotus and water hyacinth), and a fringe of native swamp forest planted about 10 years ago. The lake floods during the rainy season, when the maximum depth of the water is about 3 metres. It almost dries up during the dry season, when the land exposed as the water recedes is converted to rice paddies. The AWC counting locations at Hail Haor are Baikka Beel, Hail Haor, and the east side of the fishponds at Hail Haor.

Site administration, management and land tenure: Hail Haor was established as a wildlife sanctuary in 1983 and as an EAAFP Flyway Network Site in 2011. All wetlands in Bangladesh are government property controlled by the Ministry of Land, and Hail Haor is under the jurisdiction of Sreemangal Upazila and the local district land administrations. Haor wetlands are typically designated as Ecologically Critical Areas (ECAs), which are managed by the Department of Environment. The Forest Department is responsible for Wildlife Conservation in the wetlands; the Haor Development Board under the Ministry of Water Resources is responsible for water management and water control infrastructure; and the Ministry of Fisheries is also involved in the management of the water bodies. Baikka Beel of Hail Haor is a permanent Fish Sanctuary, which is managed by the District Land Administration, Moulovibazar; the Department of Fisheries; and participating local communities through a resource management organisation or RMO (https://eaaflyway.net/the-flyway/flyway-site-network).

Social and economic values: Approximately 172,000 people live in 61 villages around Hail Haor (Majumder *et al.* 2013). Fishing is the principal economic activity at the wetland, and the wildlife sanctuary was established there to protect and restore aquatic biodiversity, in particular the populations of fish and birds. A secondary aim was to create visitor facilities, to enhance enjoyment of the site and understanding of nature, the value of wetlands and the need for their conservation. The Baikka Beel wildlife sanctuary is managed with the participation of local people through the 'Baragangina' Resource Management Organization (one of two established RMO in Hail Haor), which is supported by the local government (Thompson et al. 2018). During the dry season, aquatic vegetation is collected for the preparation of compost. Surrounding areas are under cultivation, mainly for rice. The lake is an important water source for the local people when all other sources dry up during the dry season.

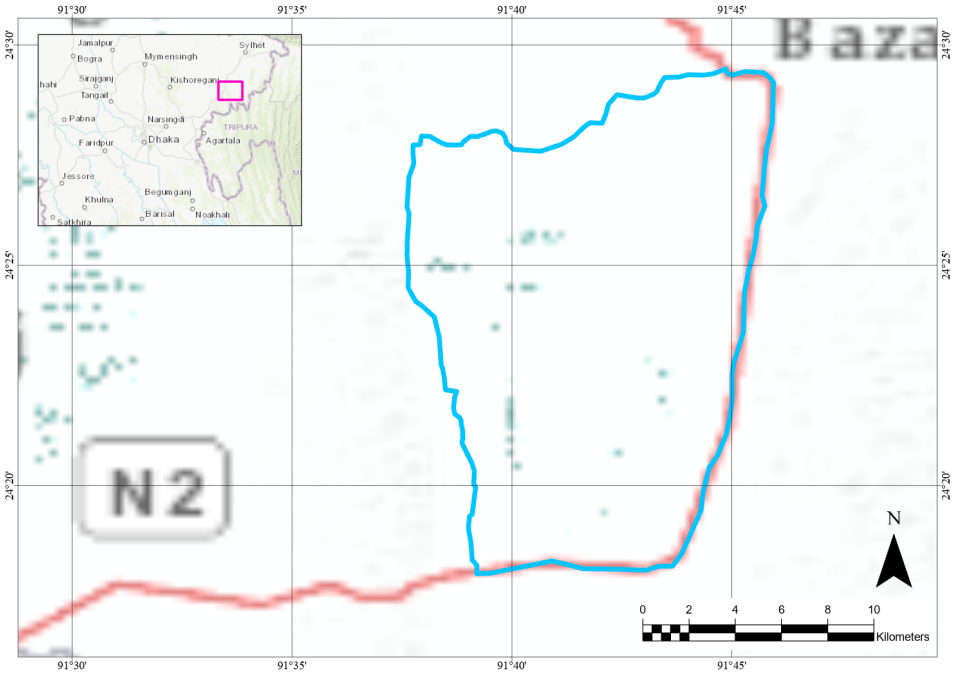

Figure 1 Map of Hail Haor, showing its boundary (in blue) and location within Bangladesh (in pink) (data from EAAFP Site Information Sheet).

3. Biodiversity value of Hail Haor (including Bakka Beel)

3.1. Key habitats

Hail Haor is a large, shallow lake in a saucer-shaped depression, bounded by the Balishara and Barshijura Hills to the east and the Satgaon Hills to the west. It comprises open water with much of the lake surface overgrown with emergent vegetation (mostly lotus and water hyacinth), and a fringe of native swamp forest planted about 10 years ago. The lake floods during the rainy season, when the water reaches a maximum depth of approximately 3 metres. It almost dries up during the dry season, when the land exposed as the water recedes is converted to rice paddies.

Key habitat types in Hail Haor, based on the stakeholder-based assessment at the Regional Flyway Initiative workshop in May 2024, included seasonal/ intermittent freshwater lakes, permanent freshwater marshes/ pools, seasonal/ intermittent freshwater marshes/ pools, shrub-dominated wetlands, permanent rivers/ streams/ creeks, seasonal/ intermittent/ irregular rivers/ streams/ creeks, and permanent freshwater lakes.

3.2. Importance of Hail Haor for migratory waterbirds

The extensive freshwater wetlands at Hail Haor support large congregations of ducks and other migratory and resident waterbirds, although the numbers of migratory ducks visiting the lake have declined in recent decades. This site attracts large numbers and a high diversity of shorebirds and marshland warblers.

Count data from the 2016, 2017, 2020, 2021 and 2022 Asian Waterbird Census (AWC) was used in the RFI analysis for this site. Multiple counts were conducted there annually in these years, other than in 2022 when there was a single count. The results of these counts were averaged over this five-year period and then compared to the Conservation Status Review (CSR1) 1% population estimates to calculate a score for each species. The single migratory waterbird species (see Table 1), Pacific Golden Plover, was found to regularly exceed the 1% population estimate during these five years, and the CSR1 score for this species contributed to the overall site score.

In addition, the AWC recorded small numbers of two near-threatened species at Hail Haor between 2016 and 2020, namely Black-tailed Godwit *Limosa limosa* (NT) which involves multiple subspecies, and Ferruginous Duck *Aythya nyroca* (NT). Large numbers of the latter species occurred at Hail Haor in the past, and small numbers of the highly threatened Baer's Pochard *Aythya baeri* (CR), with as many as 4,000-5,000 Ferruginous Duck recorded in years when there was an abundant growth of aquatic vegetation. Two threatened raptor species occur, a breeding population of Pallas's Fish-eagle *Haliaeetus leucoryphus* (EN) and wintering Greater Spotted Eagle *Clanga clanga* (VU).

Table 1 EAAF waterbird species that exceed their 1% flyway thresholds based on CSR1.

Species name	IUCN	Average count	CSR1	CSR1 score
Pacific Golden Plover *Pluvialis fulva*	LC	1,271	1,200	1.1

3.3 Other notable biodiversity

Hail Haor supports rich and diverse aquatic vegetation. At least one threatened mammal species occurs there, Fishing Cat *Prionailurus viverrinus* (VU).

4. Ecosystem services

4.1. Ecosystem services provided by Hail Haor (including Baikka Beel)

The Hail Haor wetland landscape encompasses diverse habitats, offering valuable provisioning, regulating, and cultural ecosystem services (Fig. 2). The results from the RFI workshop[1] highlights the top ecosystem services provided by the site, emphasising their essential and non-substitutable nature (Table 2). Provisioning services, particularly cultivated food, benefit communities within and adjacent to the site. This service has seen an increase in the past and is projected to continue increasing in the future. Genetic resources, however, benefit communities within and distant from the site and have experienced a decrease in the past, with further decreases anticipated in the future. Regulating services, such as local climate regulation and flood hazard regulation, are crucial for the region, positively impacting communities both within and at varying distances. Despite their importance, both services have shown a decrease in the past and are expected to continue declining. Cultural services, especially the aesthetic experience, significantly benefit communities at all distances. This service has seen an increase in the past and is projected to continue growing in importance, reinforcing the value of Hail Haor to both local and broader populations.

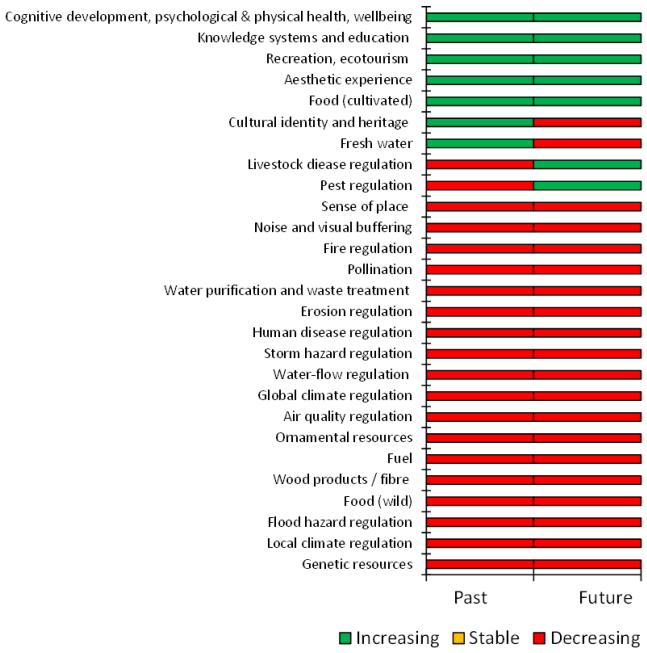

Figure 2 List of ecosystem services provided by Hail Haor (including Bakka Beel), as identified through stakeholder consultation at the Bangladesh Regional Flyway Initiative workshop in May 2024.

[1] Asian Development Bank. (2024, May 27–29). *Bangladesh: Wetland Ecosystem Services Workshop* [Workshop]. Srimangal, Moulvibazar, Bangladesh. https://events.development.asia/learning-events/bangladesh-wetland-ecosystem-services-workshop

Table 2 List of top ecosystem services provided by Hail Haor (including Bakka Beel).

Ecosystem services	Essential or non-substitutable	Benefits to communities			Change	
		Within the site	Adjacent to the site	Distant to the site	Past	Future
Provisioning services						
Food (cultivated)	Yes	✓	✓		Increase	Increase
Genetic resources	Yes	✓		✓	Decrease	Decrease
Regulating services						
Local climate regulation		✓	✓	✓	Decrease	Decrease
Flood hazard regulation	Yes	✓	✓		Decrease	Decrease
Cultural services						
Aesthetic experience	Yes	✓	✓	✓	Increase	Increase

4.2. Global climate regulating services

Based on the look-up values from Dondini et al. (2023) and IPCC (2006), the amount of carbon stored in Hail Haor's wetlands is estimated to range from 15,700 to 22,700 tonnes, while the annual carbon sequestration rate is estimated at 1,100 tonnes per year.

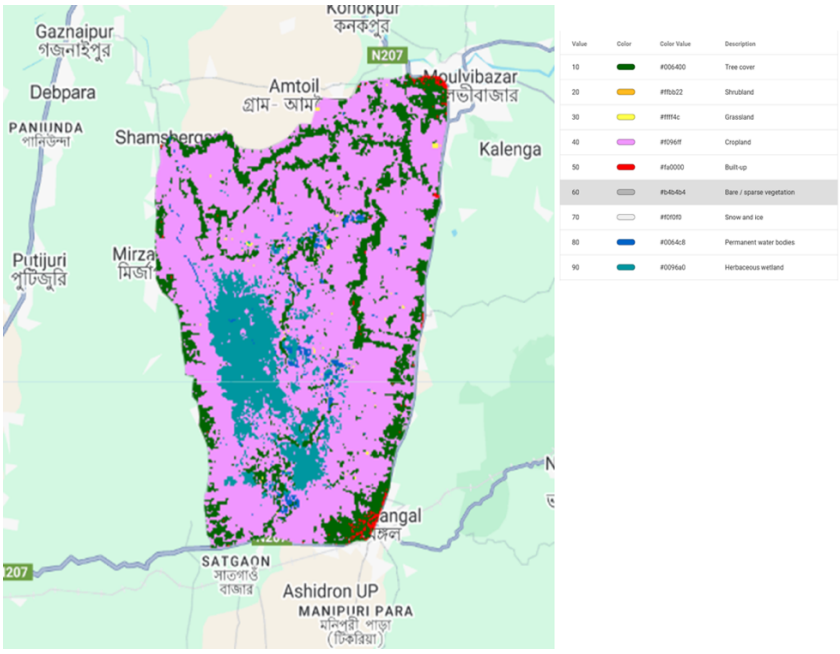

Figure 3 Map of Hail Haor, showing the relative distribution of different land cover types (map: Radhika Bhargava). The grey line represents the international boundary with India.

4.3. Flood mitigation services

The flood mitigation services provided by Hail Haor were assessed using biophysical values only (see Table A1 and Annex 1 for details). When compared to both the average of the three RFI inland sites and the average of all other inland wetlands in Bangladesh (Table A2 in Annex 1), Hail Haor shows some only partly mixed results in terms of benefits and beneficiaries:

1. for the average green storage capacity per sq. km of wetland, Hail Haor is consistently above average (407 vs. 325 Giga Litres or GL of water per km^2 for RFI inland sites and 407 vs. 355 GL/km^2 for all other inland wetlands);
2. for the average population uniquely benefitting from influential green storage upstream per sq. km of wetland, Hail Haor is also consistently above average (382 vs. 294 people/km^2 for RFI inland sites and 382 vs. 348 people/km^2 for all other inland wetlands when compared to RFI inland sites); and
3. for the average built-up area uniquely benefitting from influential green storage upstream per sq. km of wetland, Hail Haor is above average when compared to RFI inland sites (1.07 vs. 0.96 ha/$km^{2)}$ but below average when compared to all other inland wetlands (1.07 vs. 1.93 ha/km^2).

5. Drivers of change and their potential impacts on Hail Haor (including Bakka Beel)

5.1. Current drivers of change and their level of impact

Stakeholders at the RFI workshop[2] identified several drivers of change impacting Hail Haor (Baikka Beel), and their corresponding levels of impact on the wetland site (see Table 3). High-impact drivers include annual and perennial non-timber crop production such as wet rice, which significantly modifies land use and contributes to habitat degradation. Droughts, habitat shifting and alteration, and livestock farming and grazing also pose substantial threats to the ecosystem. Additionally, fishing, killing, and harvesting of aquatic resources have a high impact on biodiversity. Restoration for conservation efforts, temperature extremes, and research and education activities further influence the current state of the wetland.

Medium-impact drivers include agricultural and forestry effluents, which degrade water quality. Desertification, drought conditions, and increased fragmentation within the wetland alter the habitat and ecological connectivity. Other medium-impact factors include invasive animal and plant species, isolation

[2] Asian Development Bank. (2024, May 27–29). *Bangladesh: Wetland Ecosystem Services Workshop* [Workshop]. Srimangal, Moulvibazar, Bangladesh. https://events.development.asia/learning-events/bangladesh-wetland-ecosystem-services-workshop

from other natural habitats, loss of hydrological connectivity, loss of keystone species, and marine and freshwater aquaculture. Pathogens, recreational activities, and tourism are also noted to have a moderate impact on the site (medium impact).

Table 3 Drivers of change and their potential impact on the integrity of Hail Haor (including Bakka Beel) based on consultations with stakeholders.

Driver of change	Impact
Annual and perennial non-timber crop production	High
Droughts	
Fishing, killing and harvesting of aquatic resources	
Habitat shifting and alteration	
Livestock farming and grazing	
Research, education and other work-related activities	
Restoration for conservation	
Temperature extremes	
Agricultural and forestry effluents	Medium
Desertification	
Drought conditions	
Increased fragmentation within the wetland site	
Invasive animal species	
Invasive plant species	
Isolation from other natural habitats	
Loss of hydrological connectivity	
Loss of keystone species	
Marine and freshwater aquaculture	
Pathogens	
Recreational activities and tourism	
Activities of site managers	Low
Air-borne pollutants	
Collecting terrestrial plants or plant products (non-timber)	
Commercial and industrial areas	
Dams within or upstream of the wetland site, which alter the hydrological regime	
Destruction of cultural heritage buildings, gardens, sites, etc.	
Earthquakes/tsunamis	
Energy generation, including from hydropower dams, wind farms and solar panels	
Erosion and siltation/deposition	
Excess energy	
Excess ponding of water onsite	
Garbage and solid waste	
Habitat clearing	
Housing and settlement	
Hunting, killing and collecting of terrestrial animals	
Industrial, mining and military effluents	
Introduced genetic material	
Loss of cultural links, traditional knowledge and/or management practices	
Natural deterioration of important cultural wetland site values	
Oil and gas drilling; extraction of sand	
Roads and railroads	
Shipping lanes and canals	
Storm and flooding	
Utility and service lines	
Volcanoes	
Water extraction/diversion within the wetland site or catchment	

5.2. Potential alternative state of Hail Haor (including Bakka Beel) under current drivers of changes

Stakeholders at the RFI workshop[3] defined the most plausible future alternative state (to 2035), and how this will translate to a net change in the cover of different types of wetland habitat types within this site (current habitat cover vs future alternative cover; Figure 4). The alternative state of the site assumes there

[3] Asian Development Bank. (2024, May 27–29). *Bangladesh: Wetland Ecosystem Services Workshop* [Workshop]. Srimangal, Moulvibazar, Bangladesh. https://events.development.asia/learning-events/bangladesh-wetland-ecosystem-services-workshop

will be no changes in the current drivers of change impacting the site, and the current management regime.

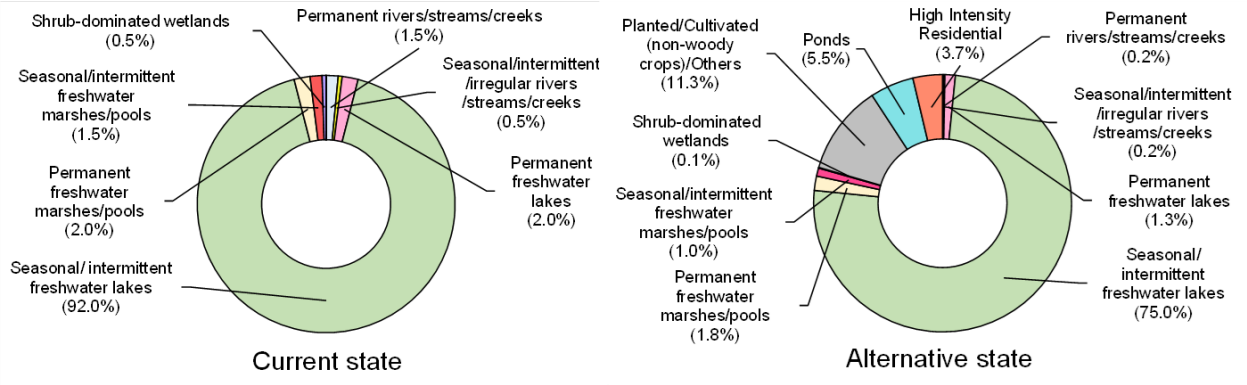

Figure 4 The proportional change in the extent of different habitat types between the current and alternative states of Hail Haor (including Bakka Beel).

5.3. Expected changes in the ecosystem services of Hail Haor

Stakeholders at the RFI workshop[4] documented the future trends in the provision of ecosystem services in Hail Haor, indicating if the ecosystem services provided by this site (to 2035) will increase, decrease, or will remain stable if the current drivers of change impacting this site will continue in their present condition, with the intervention remains unchanged.

Figure 2 and Table 2 highlight that provisioning service for cultivated food has seen an increase in the past and is projected to continue increasing in the future. Benefits from genetic resources has experienced a decrease in the past, with further decreases anticipated in the future. Regulating services, such as local climate regulation and flood hazard regulation, have shown a decrease in the past and are expected to continue declining. Cultural service providing the aesthetic experience has seen an increase in the past and is projected to continue growing in importance.

In the alternative state, the loss of 28% of wetland (which includes permanent freshwater marshes/pools, seasonal/intermittent freshwater, and shrub-dominated wetlands) will result in a loss of stored carbon. estimated to be between 4,320 and 6,240 tonnes, and an increase in carbon sequestration rate (carbon accumulation) by approximately 303 tonnes per year.

A loss of 3,946 hectares of seasonal/intermittent freshwater lakes, permanent and seasonal freshwater marshes/pools, and shrub-dominated wetlands as presented in Table A5, equivalent to 18% of the total land use for the site, is expected to result in an effective loss of 19% or 77 Giga Litres of green storage capacity per km². This effective loss, calculated relative to the core green water habitat area, may amount to nearly 73 people and 0.20 hectares of built-up areas losing flood mitigation benefits per km² of wetland.

[4] Asian Development Bank. (2024, May 27–29). *Bangladesh: Wetland Ecosystem Services Workshop* [Workshop]. Srimangal, Moulvibazar, Bangladesh. https://events.development.asia/learning-events/bangladesh-wetland-ecosystem-services-workshop

6. Capacity needs in Hail Haor (including Baikka Beel)

The stakeholder consultation and analyses with stakeholders representing government and civil society identified at least five major groups of stakeholders with clear roles in the long-term sustainable management of wetlands in the Haor Basin. Major gaps exist for government stakeholders in relation to strengthening the management and restoration of wetland landscapes, biodiversity and agricultural landscapes, and livestock. In Hail Haor, the Fisheries Department and Bangladesh Forest Department (BFD), are major stakeholders and is expected to play key roles in ensuring that Haor wetlands are well protected, while regulating fishery activities. Stakeholders in Hail Haor face constrains in awareness of policy frameworks, and the logistical (and field) constrains in implementing policies on the ground, a major capacity need to address.

Table 4 Stakeholder groups and their corresponding capacity gaps and needs in Hail Haor.

Stakeholder group	**Current role in wetland management (Positive or Negative)**	**Possible future role in wetland management**	**Current capacity for sustainable wetland management**	**Form of capacity development (e.g. training, 16rganizational strengthening etc.)**
Forest Department	Biodiversity conservation	Creation of new protected areas	Limited, with constrains in human resources and logistics	Strengthen awareness and policy frameworks Strengthen logistics and field coordination
Fisheries Department	Management of fisheries in the wetlands	Conservation of native fish	Limited by constrains in human resource	Training to strengthen awareness of policy frameworks Strengthen logistics and field coordination
Agriculture Department	Management of cultivated land	Expand cultivated land		Training to strengthen awareness of policy frameworks
Livestock Department	Management of grazing activities	Management of grazing activities		Training to strengthen

Stakeholder group	Current role in wetland management (Positive or Negative)	Possible future role in wetland management	Current capacity for sustainable wetland management	Form of capacity development (e.g. training, 16rganizational strengthening etc.)
				awareness of policy frameworks
District Administration	Manage the lease of waterbodies (*jalmahal*) for economic activities	Expand the administration of land leases		Training to strengthen awareness of policy frameworks

7. Opportunities for RFI interventions

7.1. Recommended Interventions

The Haor Basin of northern Bangladesh overlaps with several freshwater wetland landscapes of high conservation priority such as Hail Haor. Most, however, are under very limited protection, and are managed by the Ministry of Land, the Haor Development Board and various government bodies for economic activities through short-term *jalmahal* leases. Some jurisdiction is shared with the Departments of Environment, Fisheries and Forests for areas identified for biodiversity conservation. There is considerable scope for stronger (and better coordinated) management and conservation interventions that can be complemented by interventions to improve the livelihoods of local communities involved in fisheries and to some extent, nature-based tourism. Strengthening access to alternative livelihoods, especially for fishing households with limited access to other economic activities, can also be expected to ensure a more sustainable use of declining fisheries. Meanwhile, there is scope for soft interventions to strengthen local awareness of wildlife such as migratory species and form village-level conservation groups, as already developed elsewhere in Bangladesh.

In the Baikka Beel Sanctuary (170 ha), a well-known segment of Hail Haor designed to protect fish sanctuaries and migratory waterbirds, co-management structures for fisheries and nature-based tourism have already been established and supported with strong participation from village communities through at least two resource management organisations or RMOs (Thompson & Colavito 2007; Majumder et al. 2013), which in turn are linked to local councils and the *upazila* administrations. Revenue collected from tourist access to the wetlands is fed into a revolving community fund (an established ticketing system is currently under review until the zonation process for Baikka Beel is completed), which is expected to delineate zones in the wetlands for tourism and fish conservation) which directly benefit local people. Five fish sanctuaries have been established within Baikka Beel alongside alternative income-generating

livelihoods (including through tourism) to alleviate the impact from unsustainable harvest of fisheries while co-management structures have been established to regulate use and access to the wetlands for local people and can be upscaled across the site. Other interventions may include the excavation of channels to link wetlands, and establishment of swamp plantations to facilitate fish migration and spawning (Biswajit 2011; Ul Haque 2011). Similar co-management approaches of the wetlands can be established in other parts of the Hail Haor wetlands, potentially with investment from the private sector.

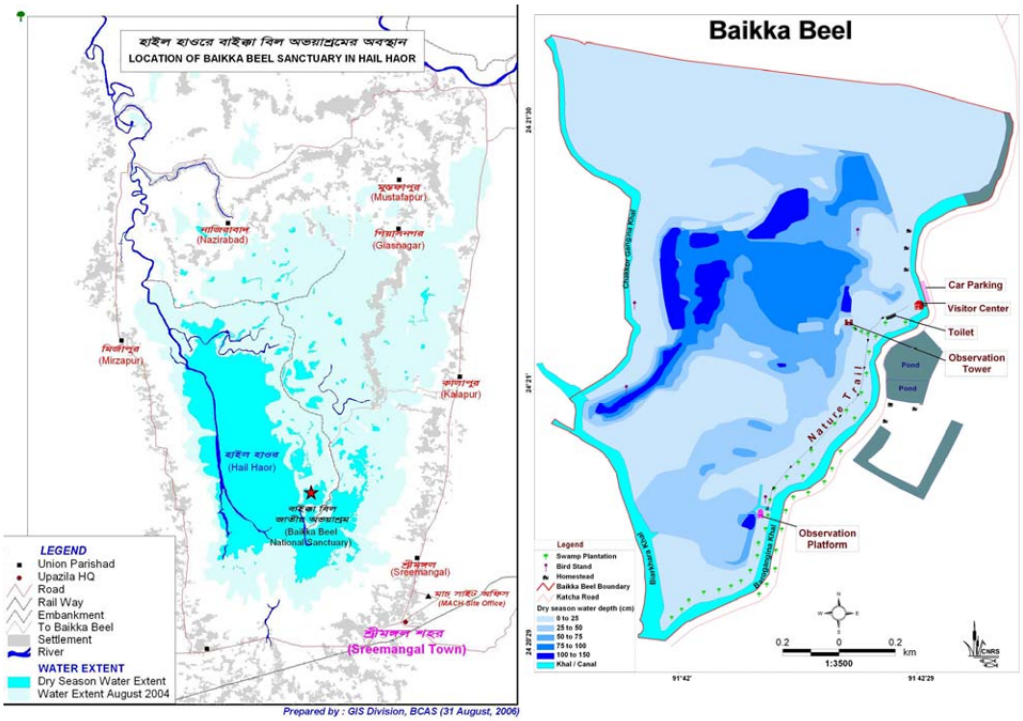

Figure 5 Map of Hail Haor (left) and Baikka Beel (right) (map adapted from Thomson et al. 2018).

Table 5 Summary of key RFI interventions proposed for Hail Haor

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
Component 1: Strengthening sustainable wetland-based ecotourism					
Up-scaling nature-based tourism with a focus on fishing and birdwatching tourism through capacity building	Strengthened local, nature-based tourism, co-managed with local communities. Improved local capacity for nature-based tourism, with	Number of people benefitting from livelihood activities, with up to 30% beneficiaries from women, youth, elderly,	500,000.00	2 years	Forest Department Fisheries Department District Administration

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
	stronger capacity for administration of nature facilities. Capacity of existing cooperatives for strengthened ecotourism, and benefit-sharing for participating operators enhanced.	indigenous people, and other vulnerable groups Number of people trained on livelihood activities			Tourism operators Local communities Conservation NGOs
	Access structures, shelters in the wetlands improved while the existing wetlands interpretation centre enhanced. This may include constructed boardwalks to improve access into parts of the wetlands, whilst taking into consideration flooding regimes during the monsoons.	Number of ecotourism infrastructure established	300,000.00	2 years	
Component 2: Coastal wetland habitat protection and management					
Strengthen site and resource management involving local communities (through existing or new resource management organisations or RMOs). Integrated and community-based management approach, and the	Productivity of fisheries are maintained over time. Wetland biodiversity more resilient. Wildlife population (e.g. migratory birds) sustained, or showing signs of recovery. Status of knowledge of wildlife improved.	Number of supported resource management organizations (RMOs) activities Number of new RMOs facilitated	500,000.00	3 years	Forest Department Fisheries Department District Administration Agriculture Department

Intervention	Outcome	Indicators	Cost (USD)	Timeframe	Potential Stakeholders
development of ecologically friendly infrastructure. Wetland management and restoration activities at newly created community protected areas.		Number of accessible, gender-sensitive, and culture-sensitive knowledge products distributed Percentage of target population reached by knowledge products			Livestock Department Local communities Conservation NGOs
Identification and creation/construction of at least two (2) new fish sanctuaries and community-led protected areas using a model based on Baikka Beel. Construction is expected to involve dredging and excavation of lake sediment, and creation of canals (for fish movement)	Productivity of fisheries are maintained over time. Wetland biodiversity more resilient. Wildlife population (e.g. migratory birds) sustained, or showing signs of recovery. Status of knowledge of wildlife improved.	Number of fishery management policies facilitated Number of established fish sanctuaries	1,000,000.00	5 years	
Socioeconomic surveys and consultation with local communities			50,000.00	1 year	
Total investment for five years			8,150,000.00		

7.2. Potential Financing

The estimated project cost is USD 8,150,000 over five years. This project budget supports the establishment of new nature-based tourism infrastructure, wetland restoration activities spearheaded by local communities, and the creation of at least two fish sanctuaries. Table 5 summarizes the projected budget distribution across the proposed project components.

Scaling the co-management approach to other parts of the Hail Haor wetlands can be explored through private sector investment.

7.3. Proposed Institutional Arrangements

A track record of local community participation and empowerment has been developed in parts of Hail Haor through existing projects (e.g. the MACH project funded by USAID), and which as culminated in the establishment of several resource management organisations to bring together stakeholders from local communities. Other local communities in the Hail Haor landscape can be further involved in the conservation and co-management of wetland sites, using an existing model and structures developed for the management of the Baikka Beel Sanctuary (Thompson & Colavito 2007; Ilyas & Thompson 2018), alongside efforts to secure lease rights to waterbodies. This, for instance, may involve strengthening the enforcement of take policies, creating new fish sanctuaries, and addressing illegal and unsustainable fishing activities and encroachment.

Capacity-building and awareness activities may be led by the Bangladesh Forest Department and the Fisheries Department, in coordination with local administrations, and implemented over 3-5 years. Civil society organisations with a focus on biodiversity conservation and fisheries (rural) development can play a major role in leading and delivering training activities on the ground at the selected villages. The Fisheries Department in coordination with the local administration, may lead the implementation of fishery-related components of the project, focusing on activities to, (1) establish new co-management structures and RMOs, (2) scope and develop co-management plans (2-4 years) at selected communities, and work with conservation organisations to implement the management plans. Implementation will be coordinated with the local government, local administrations, and civil society organisations.

7.4. Project Beneficiaries

Improving wetland management in Hail Haor benefits approximately 172,000 people residing in the adjacent 61 villages. Fishing is the primary livelihood in the area, which heavily depends on the productivity of the wetlands. Creating fish sanctuaries through a co-management approach with local village groups will ensure the long-term provision of resources for both communities and migratory waterbirds. Moreover, taking the co-management approach with local villages will promote stakeholder

ownership and nature stewardship, thereby protecting Hail Haor. Nature-based tourism as an additional livelihood opportunity for local villages can be explored.

There are indigenous communities in Hail Haor, but they are marginalised and have access to less livelihood opportunities compared to other groups. In addition, there are significant opportunities to enhance the representation of women and marginalized fishing communities, including fishing households that are currently unrepresented in broader frameworks, in shaping management structures that impact their livelihoods.

7.5. Anticipated Implementation Risks

Social Safeguards: The implementation of new fish harvesting regulations and fish sanctuaries, as part of wider fisheries co-management plans and zonation plans of Haor Basin may have significant implications on the livelihoods of local communities. Scoping studies will be necessary to assess the impact of fishing quotas on domestic incomes, the challenges of implementing quotas in a complex environment, and the development of alternative income sources for affected communities.

Environment: Nature-based tourism has been identified as a key project concept theme. The proposed interventions include new infrastructure, such as shelters and boardwalks, that would enhance access in Hail Haor. Building these infrastructures, however, would induce noise that may disturb the wildlife in the area. Planning with the stakeholders is critical before any infrastructure development.

Stakeholder: Establishing a co-management approach for the wetland requires engaging local village groups in Hail Haor. Stakeholder mapping and discussions with local communities will help determine their interests and perceived benefits from co-managing the wetland. Engaging women, indigenous people, and marginalized fishing communities whose livelihoods are directly affected by the new fish harvesting regulations and fish sanctuaries can provide an inclusive conservation approach.

Political and Governance: Understanding the relevant management stakeholders, conservation priorities, and capacity is essential for implementing project interventions effectively. All wetlands in Bangladesh are government property controlled by the Ministry of Land, and Hail Haor is under the jurisdiction of Sreemangal Upazila and the local district land administrations. Haor wetlands are typically designated as Ecologically Critical Areas (ECAs), which are managed by the Department of Environment. The Forest Department is responsible for Wildlife Conservation in the wetlands; the Haor Development Board under the Ministry of Water Resources is responsible for water management and water control infrastructure; and the Ministry of Fisheries is also involved in the management of the water bodies. Baikka Beel of Hail Haor is a permanent Fish Sanctuary, which is managed by the District Land Administration, Moulovibazar; the Department of Fisheries; and participating local communities through a resource management organisation or RMO (https://eaaflyway.net/the-flyway/flyway-site-network). Stakeholder mapping would facilitate better coordination with management stakeholders.

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Annex 1. Supplementary information on flood mitigation services

To further validate the identification of the top ecosystem services by means of stakeholder consultation, an expectedly essential or non-substitutable regulating service across all RFI sites, namely coastal protection and flood mitigation (i.e., storm and flood hazard regulation), was assessed based on a combination of globally available datasets supplemented by web-based tool Co$tingNature (Mulligan, 2022). Estimates for flood mitigation were spatially inferred in QGIS from a selection of metrics expressing different biophysical values modelled online by the Water World component of this tool. Equivalent data to assess monetary values similarly to coastal protection were not available for the RFI region.

The key metrics selected for biophysical values (Table A1) were the average green storage capacity, which is the volume of water stored by each square kilometre of wetland itself as well as its soil and vegetation, and the direct influence of this storage capacity on beneficiaries found downstream of the wetland, both as the average number of people and the average built-up area that are uniquely benefitting from the resulting flood mitigation (and not from other green storage found upstream).

Table A1. Contribution of the wetland habitats to flood mitigation in Hail Haor (including Bakka Beel) based on site-level (biophysical) values inferred from Mulligan (2022) and expressed as ranges to represent the resulting uncertainty.

Influence of the wetland on flood mitigation (metrics)	**Benefit/Beneficiaries**
Average green storage capacity per sq. km of wetland in million cubic metres (GigaLitres/km2)	389 – 424
Average population uniquely benefitting from influential green storage upstream per sq. km of wetland (n/km2)	365 – 398
Average built-up area uniquely benefitting from influential green storage upstream per sq. km of wetland (ha/km2)	1.03 – 1.12

Table A2. Biophysical benefits from and beneficiaries of RFI inland wetland sites (expressed as ranges to represent the resulting uncertainty) and at the national level.

Site name	**Green storage capacity (GigaLitres/km^2)**	**Downstream population (n /km^2)**	**Downstream built-up area (ha /km^2)**
Hail Haor (Baikka Beel)	407 (±18)	382 (±17)	1.07 (±0.05)
Hakaluki Haor	269 (±24)	244 (±21)	0.40 (±0.06)
Tanguar Haor	299 (±19)	256 (±16)	1.13 (±0.07)
Bangladesh RFI average	325	294	0.96
Bangladesh national average	355	348	1.93

Table A5. Key habitat types in Hail Haor (including Bakka Beel) based on stakeholder-based assessment at the Regional Flyway Initiative workshop in May 2024.

Habitat type	Current state		Alternative state (2035)	
	Area (ha)	Cover (%)	Area (ha)	Cover (%)
Permanent rivers/streams/creeks	327.0	1.5	32.7	0.2
Seasonal/intermittent /irregular rivers /streams/creeks	109.0	0.5	32.7	0.2
Permanent freshwater lakes	436.0	2.0	283.4	1.3
Seasonal/ intermittent freshwater lakes	20055.3	92.0	16349.4	75.0
Permanent freshwater marshes/pools	436.0	2.0	392.4	1.8
Seasonal/intermittent freshwater marshes/pools	327.0	1.5	218.0	1.0
Shrub-dominated wetlands	109.0	0.5	21.8	0.1
Planted/Cultivated (non-woody crops)/Others	0.0	0.0	2463.3	11.3
Ponds	0.0	0.0	1199.0	5.5
High Intensity Residential	0.0	0.0	806.6	3.7
Total	21799.2	100.0	21799.2	100.0