Opportunities for benefit sharing in the Meghna Basin, Bangladesh and India

Scoping study

Vishwa Sinha, Raphael Glémet and Md. Golam Mustafa

Building River Dialogue and Governance (BRIDGE)

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CONTENTS

ACRONYMS

BAPA	Bangladesh Poribesh Andolon
BBS	Bangladesh Bureau of Statistics
BIWTA	Bangladesh Inland Water Transport Authority
BOAT	Benefit Opportunity Analysis Tool
BOAD	Benefit Opportunity Analysis Dialogue
BRIDGE	Building River Dialogue and Governance
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
CBFM	Community Based Forest Management
CBO	Community Based organisation
CEGIS	Center for Environmental and Geographic Information Services
CGWB	Central Ground Water Board
CNRS	Center for Natural Resource Studies
CRDS	Center for Resource Development Studies Ltd
CSMR	Central Soil and Materials Research Station
CUTS	Consumer Unity & Trust Society
DAE	Department of Agriculture Extension
DBHW	Department of Bangladesh Haor and Wetland Development
DoE	Department of Environment
DoF	Department of Fisheries
FD	Forest Department
FFWC	Flood Forecasting and Warming Centre
FRSP	Fisheries Research Support Project
FRSS	Fisheries Resources Survey System
GBM	Ganges-Brahmaputra-Meghna
HILIP	Haor Infrastructure and livelihood Improvement Project
IUCN	International Union for Conservation of Nature
IGAD	Intergovernmental Authority on Development
IWM	Institute of Water Modelling
JRC	Joint River Commission
LGED	Local Government Engineering Department
MBDA	Meghalaya Basin Development Authority
MoWR	Ministry of Water Resources
NWRC	National Water Resources Council
PES	Payment for Ecosystem Services
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SCBRM	Sunamganj Community-Based Resource Management Project
SHA	Statistical Handbook of Assam
SHM	Statistical Handbook of Meghalaya
SHT	Statistical Handbook of Tripura
SMM	Sio-Malaba-Malakisi
SRDI	Soil Resource Development Institute
TBSS	Transboundary Benefit Sharing Strategy
TROSA	Transboundary Rivers of South Asia
UNECE	United Nations Economic Commission for Europe
WARPO	Water Resources Planning Organization

PREFACE

Traditionally, negotiations on shared rivers have focused on sharing water, the example being the 1996 *Ganges Water Treaty* which provides a volume-based formula for sharing water between Bangladesh and India. Once the water is divided, each country (or user group) then seeks to optimise management within its borders rather than across the shared basin.

Significantly different than the traditional approach, negotiations based on benefit-sharing focus on allocating the benefits derived from various uses (and non-uses) of water, rather than the water itself at the basin level. In this construct, alternative patterns of consumptive and non-consumptive uses are considered, and agreements are reached on how to develop the shared resource (the river basin) and allocate the benefits and costs of development in an equitable manner. The benefit-sharing approach is also notable as it allows the stakeholders in a basin to jointly identify innovative ways to maximise or enhance existing benefits from the basin.

Considering the increasing recognition of the role of benefit sharing in facilitating transboundary water cooperation, the IUCN BRIDGE GBM project is facilitating development of a Transboundary Benefit Sharing Strategy (TBSS) for the Meghna Basin. This report has been developed as an input to anchor dialogue on the development of the Meghna TBSS.

Despite its transboundary nature and biodiversity and livelihood significance, the Meghna Basin is one of the less discussed basins when it comes to discourse on transboundary water governance between Bangladesh and India. Most of the available literature and information on the shared rivers in South Asia refer to the GBM Basin as a whole, with more emphasis on either the Ganges or Brahmaputra river systems. There is not a single publication on the Meghna Basin or any dialogue platform to support its cooperative governance.

This report has therefore attempted to create a compendium of the Meghna Basin, consolidating information on its geophysical, ecological and cultural value. The report also preliminarily scopes the variety of benefits provided by the basin and articulates the opportunities for joint development of the basin to maximise these benefits, such as improved resilience to flood and erosion, food self-sufficiency and security, and conservation of cultural and ecological diversity. It is hoped that the report will be widely disseminated among the key stakeholders in the Meghna Basin and will be used as a reference point to guide dialogue for the development of the IUCN-initiated Meghna Basin TBSS.

ACKNOWLEDGEMENTS

This report has been produced under the Building River Dialogue and Governance (BRIDGE) project in the Ganges-Brahmaputra-Meghna (GBM) Basin, facilitated by IUCN and funded by the Transboundary Rivers of South Asia (TROSA) programme[1]. TROSA is a regional water governance programme supported by the government of Sweden and implemented by Oxfam and partners in Bangladesh, India, Myanmar and Nepal. Comments and suggestions from the TROSA Project Management Unit (PMU) are gratefully acknowledged.

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IUCN would also like to thank Mr Daniel Constable, Independent Geographic Information System (GIS) Expert, for developing maps on elevation, hydrology, population, cities and land use in the Meghna Basin.

IUCN would also like to thank all the participants of the first Meghna Benefit Opportunity Analysis Dialogue (BOAD): *Benefit Sharing to Enhance Multi-level Cooperation for Integrated Management of the Meghna Basin*, which took place on 4 and 5 July 2018. The dialogue provided critical input on the current benefits of the Meghna Basin, and opportunities and challenges linked to building transboundary cooperation and enhancing these benefits, as discussed in Chapter 4 of this report.

[1] https://cambodia.oxfam.org/what-we-do-natural-resource-governance/transboundary-rivers-south-asia-trosa

METHODOLOGY

To develop this report, a review of newspaper articles, government websites and policy documents (including *Master Plan of Haor Area in Bangladesh* and *Integrated Basin Development & Livelihood Promotion Programme, Meghalaya*) was conducted to gather information on the local issues and initiatives in the Meghna Basin. The annual reports from key government agencies on forest cover, agriculture, fisheries, and biodiversity were also reviewed to develop the profile of the Meghna Basin. These reports included the *Forest Survey Report, 2017* (India); *Bangladesher Nod Nodi*; *Ichthyodiversity of Meghalaya*; and the *Statistical Handbook of fisheries and agriculture of Assam, Meghalaya and Tripura*.

Primary information was collected through one-on-one interviews with government officials, water experts and CSOs working in Bangladesh and India. The report also draws on the discussions and consensus points that emerged from the BOAD dialogue, *Benefit Sharing to Enhance Multi-level Cooperation for Integrated Management of the Meghna Basin (Dhaka, July 2018).* Annex IV lists the names and organisations of participants.

1 INTRODUCTION TO THE MEGHNA BASIN

1.1 Location and description

The Meghna is a transboundary river shared by India and Bangladesh. With a total area of 82,000 km^2, its basin covers an area equal to almost twice the size of Bhutan or Switzerland,[2] of which 47,000 km^2 (57% of the total area) is located in India and 35,000 km^2 (43% of the total area) is in Bangladesh (JRCB, 2011). The basin includes the Meghalaya Plateau in the north; parts of Assam, Manipur and Nagaland in the northeast; and Mizoram and Tripura in the southeast. In Bangladesh, the Meghna Basin includes the uplands of Sylhet, known for their extensive systems of wetlands and fisheries resources; the Chittagong hills on the south-east; and the Madhupur tract on the west, which marks the boundary between the Brahmaputra and Meghna Basins.

Based on hydrology, the basin can be divided into three regions: a) part of the basin drained by the river **Barak** and its two main distributaries, the Kushiyara and Surma; b) the **Upper Meghna Basin,** formed by the confluence of the Kushiyara and Surma in Bangladesh; and c) the **Lower Meghna Basin** after the Meghna meets the river Padma (formed by the confluence of the Brahmaputra and Ganges rivers).

The Meghna is notable for the number of transboundary tributaries. At least 29 named rivers flow into the Bangladesh part of watershed from India, such as the Umiam River originating from Umiam Lake (also known as Barapani Lake) north of Shillong in the Indian state of Meghalaya; and the Khowai River that originates in the eastern part of the Atharamura Hills of Tripura (see Annex II: Transboundary rivers in the Meghna Basin).

1.2 Population and demography

As indicated by the population density map of the Meghna Basin (figure 1), the lower part of the basin, in Bangladesh, is more densely populated. The population of the seven *haor* districts in the Upper Meghna Basin in Bangladesh is around 19.37 million[3] (2010 census) with an average household size of 5.3 people. The Indian part of the basin has an estimated population of less than 10 million spread across the six states. The Cachar, Karimganj and Hailakandi districts of South Assam, representing the plains of the Barak Valley, have a population of less than 3 million and can be considered the most densely populated part of the Meghna Basin in India. The combined population of the other five states (Manipur, Meghalaya, Mizoram, Nagaland and Tripura) is less than 13 million.

One important aspect of the basin's demography is the low average age of its population and the number of indigenous groups in both Bangladesh and India. More than 60% of the population of Meghalaya in India is under 29 years old, and many indigenous groups live in the states of Assam, Meghalaya, Mizoram, Nagaland, and Tripura in India and Sylhet in the Upper Meghna Basin in Bangladesh. More than 89% of the population of Nagaland, for

[2] http://www.nationmaster.com/country-info/stats/Geography/Land-area/Sq.-km
[3] http://www.iwmbd.org/haorweb/

example, is categorised as indigenous and organised into 16 main groups with distinct cultures and histories (2001 Census). In the state of Meghalaya, 85.9% of people belong to indigenous groups, primarily the Khasi and Garo Tribes. The Khasis are the dominant group in the state, constituting more than half (56.4%) of the total indigenous population, followed by the Garos (34.6%). It may be noted that Khasis are also one of the dominant indigenous groups in Sylhet, forming a cultural continuum with the Indian state of Meghalaya.

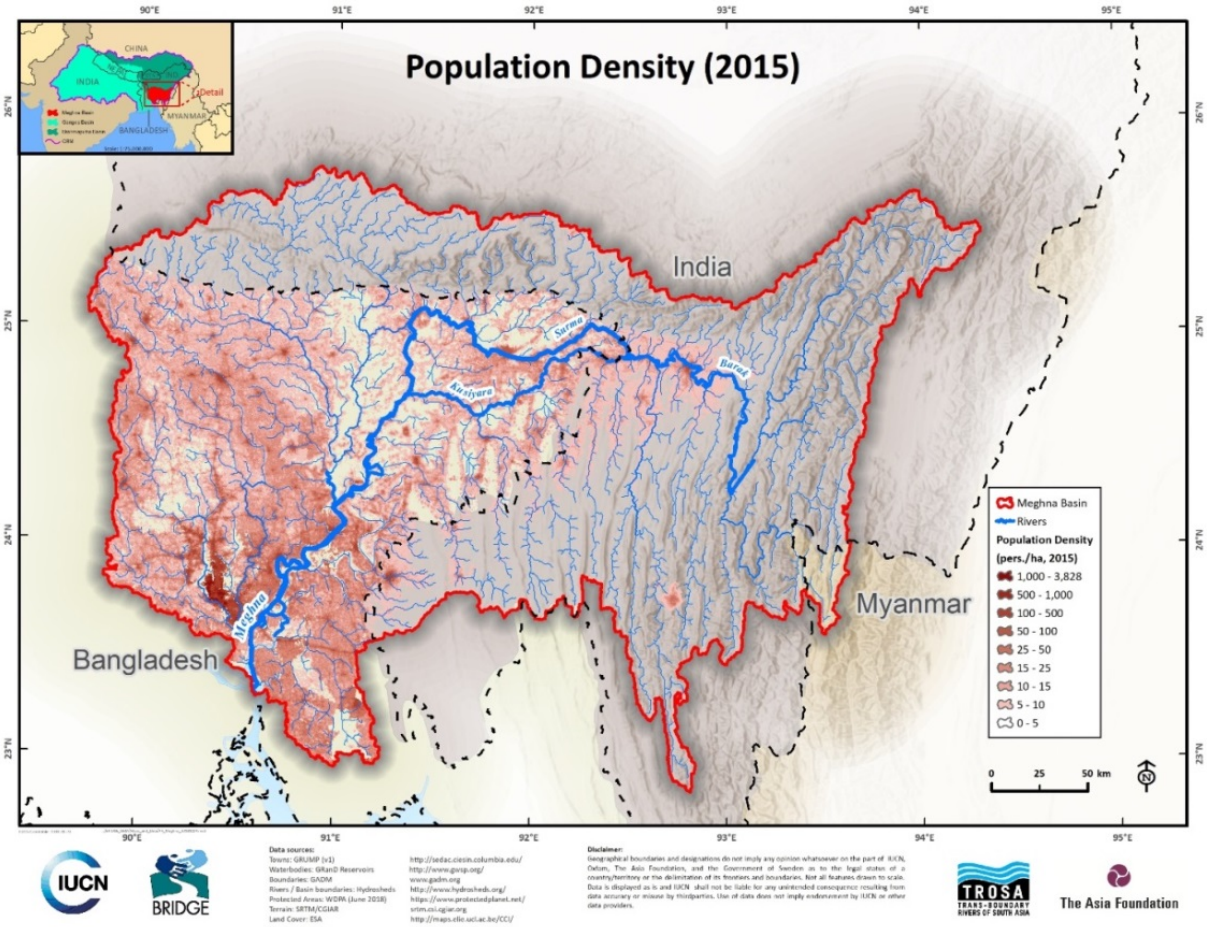

Figure 1: *Population density map, Meghna Basin* (Source IUCN)

1.3 Cities

The Meghna Basin has a number of small towns (fewer than 25,000 people) and few big cities with populations of more than 50,000, the latter mostly located in Bangladesh (figure 2).

Most of the populous cities are located in the south of the basin, and include the capital city of Dhaka and its satellite town Fatulla. Just a few kilometres south of Dhaka, the Padma River meets the Meghna River to form the Lower Meghna Basin. Madhupur is another important town in the south. Located in the middle part of the basin are Bhairab Bazar town, notable for its British colonial-era railway bridge (the Bhairab Bridge) on the Meghna River, and Sylhet on the Surma River, which is an important tourist destination in Bangladesh and is just below the state of Meghalaya in India. Sylhet town is among the top 10 tourist destinations in Bangladesh, and is known for its historical Sufi shrines, like the ornate tombs and mosques of the 14th-century saint Hazrat Shah Jalal and the 17th-century Shahi Eidgah, and an open-air hilltop mosque built by Emperor Aurangzeb. Visitors also come here to enjoy the city's natural

landscapes, including hills, rivers, lakes, tea gardens, rainforests and waterfalls that surround its pleasant urban areas (See Figure 2).

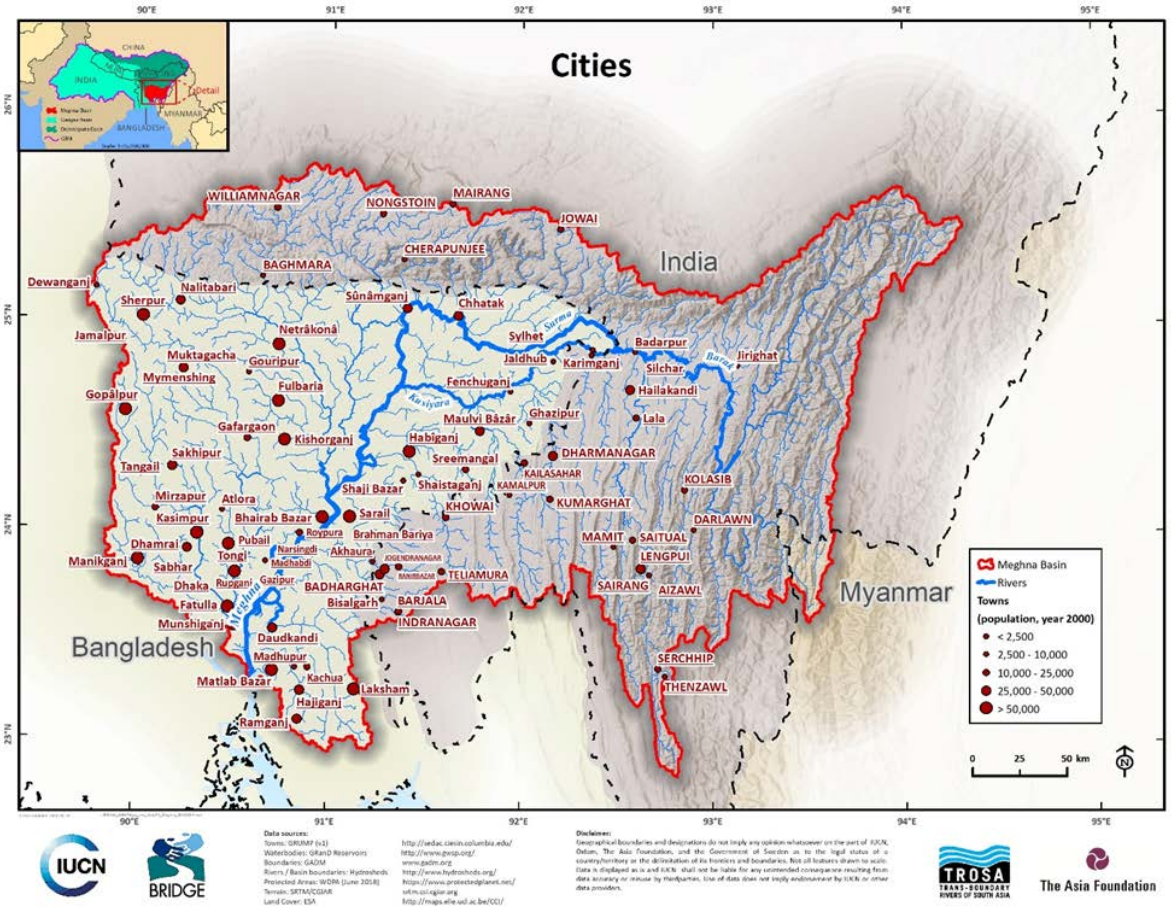

Figure 2: *Major cities in the Meghna Basin (Source IUCN)*

On the Indian side of the basin, the two most populous cities include Aizwal, the capital of Mizoram, and Silchar, the headquarters of Cachar district (Barak Valley, Assam). These two cities have a population of over 200,000 people. Cherrapunjee is a small but well-known tourist destination located in the East Khasi Hills of Meghalaya with a population of 11,722 of which 6,107 are female (Census India 2011).

1.4 Governance of the Meghna Basin: Institutional aspects

The Indo-Bangladesh Joint Rivers Commission (JRC), established in 1972 under the Indo-Bangla Treaty of Friendship, Cooperation and Peace, was set up to coordinate efforts between the two countries to maximise the benefits derived from all common river systems[4] (Article 4, JRC Statutes), including the Meghna. The JRC is chaired by the Ministers of Water Resources of both countries, and includes three ordinary members, two of whom must be engineers. As per the JRC statutes, each participating government may appoint experts and advisers as needed. It is recommended that Commission meets at least four times a year, also special meetings of working groups or *ad-hoc* expert groups (formed within the JRC) can be convened

[4] https://www.internationalwaterlaw.org/documents/regionaldocs/indo-bangladesh.html

as agreed upon by the two governments. However, in reality, politics is the decisive factor in convening meetings of the JRC.

A review of JRC meeting discussions since its formation in 1972 indicates that prior to 1990 the discussions were broad and included smaller rivers like the Teesta and Barak. However, the focus of the JRC seems to have shifted to the Ganges River and related water-sharing issues after 1990 and particularly after the signing of the Ganges treaty in 1996. Furthermore, the JRC meetings are not held regularly, the last record of a meeting available online is of the 37th Meeting in New Delhi in March 2010.

Currently, there is no legal agreement between the two countries on the Meghna River. The existing treaty between Bangladesh and India on the Ganges River (1996) does not cover either the Brahmaputra or the Meghna Rivers or their tributaries. To support data sharing, Bangladesh and India have signed specific bilateral agreements to provide information twice a day but only during the monsoon season (June to October) to help Bangladesh update its flood forecasting systems. As per this agreement, India provides data from two points on the Ganges, five on the Brahmaputra, and one each on the Teesta, Feni and Barak Rivers.

In both Bangladesh and India, the primary decision-making body on shared water governance at national level is the Ministry of Water Resources. However, just after the statutes of the Bangladesh-India Joint River Commission were signed in 1972, Bangladesh established the Joint Rivers Commission of Bangladesh (JRCB) as a permanent body under the Ministry of Water Resources. The JRCB is responsible for holding meetings with India to discuss the issues linked to sharing of water, joint management, transmission of flood-related data and any other pertinent issue linked to the governance of shared rivers. However, the mandate of JRCB goes beyond India; it also works with countries such as Nepal on joint hydropower development and flood mitigation. No comparable institutional mechanism or permanent commission seems to exist in India.

The Water Resources Planning Organization (WAPRO) under the Ministry of Water Resources of Bangladesh is a key organisation for macro-level water resources planning, and the coordination and implementation of the Bangladesh Water Act. The Center for Environmental and Geographic Information Services (CEGIS) and Institute of Water Modelling provide technical and logistics support to WAPRO. The Bangladesh Water Development Board (BWDB) works closely with WAPRO but is specifically responsible for planning and implementing infrastructure projects to improve flood resilience (drainage), navigation, agriculture and fisheries. At the sub-basin level, Bangladesh has established the Bangladesh Haor and Wetland Development Board, which is specifically responsible for facilitating development and implementing master plans for *haor* areas (Volume II, 2012)[5] in the Upper Meghna Basin.

[5]https://dbhwd.portal.gov.bd/sites/default/files/files/dbhwd.portal.gov.bd/publications/baf5341d_f248_4e19_8e6d_e7ab44f7ab65/Haor%20Master%20Plan%20Volume%201.pdf

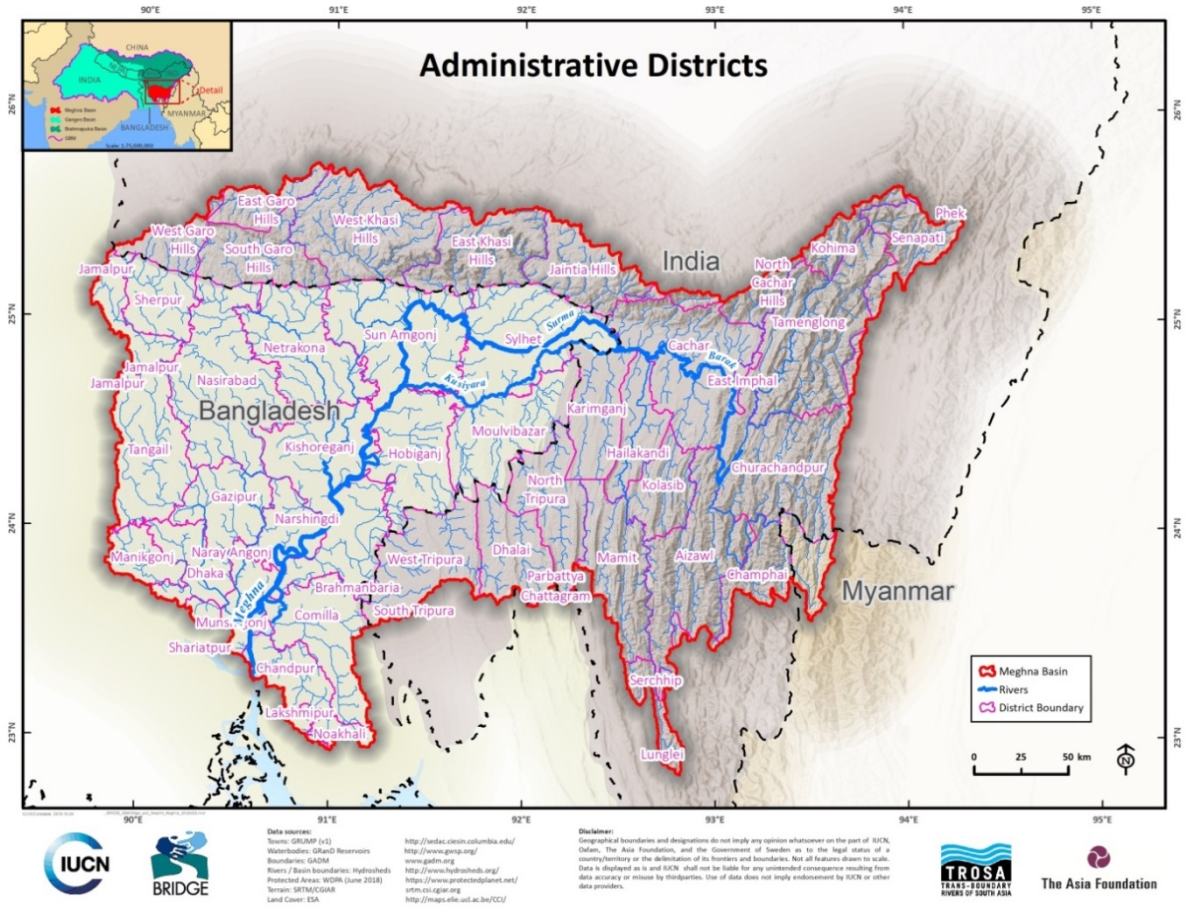

Figure 3: *Administrative districts of Bangladesh and India within the Meghna Basin (Source IUCN)*

In India, basin planning and management is dispersed among the six Indian states located in the Meghna Basin (see Figure 3). To support basin-level coordination and planning among these states, the Indian parliament established the Brahmaputra Board[6] in 1982. Its mandate is to coordinate with state governments on the development of integrated flood control measures and multi-purpose projects in both the Brahmaputra and the Barak River Basins. At the state level, Meghalaya has established the Meghalaya Basin Development Authority (MBSA) to facilitate integrated development of the river basin within the state. The MBSA has mapped all micro-watersheds in the state and is implementing spring rejuvenation and sustainable livelihoods programmes with active engagement of the local communities. Comparable institutions do not exist in other Indian states located in the Meghna Basin.

The Departments of Water Resources, Fisheries and Forests are the main agencies in each state mandated with the development and sustainable use of water resources. For example, in Tripura, the Department of Fisheries is responsible for the scientific utilisation of fisheries resources and intensification of culture fisheries.[7] In Meghalaya the Fish Farmers' Development Agency is facilitated by fisheries departments and headed by the fisheries minister of the state. In Manipur and Mizoram (forests cover >75%) forest departments are implementing afforestation projects for the rehabilitation of '*jumisas'* (areas destroyed by

[6] http://mowr.gov.in/about-us/organisations/brahmaputra-board
[7] https://fisheries.tripura.gov.in/mandate.htm

shifting cultivation) and involving local communities in several social forestry schemes such as rubber plantation and non-timber forest products.

2 GEOPHYSICAL PROFILE

2.1 Topography

The Meghna Basin can be divided into three broad regions based on elevation. The north and northeast of the basin is hilly and represents part of the Eastern Himalayas. In the north are the high-elevation mountains of the Meghalaya Plateau and in the northeast are the Lushia Hills (Mizoram and Tripura) which can reach nearly 2,000 m. Lum Shyllong Peak, located south of the city of Shillong, is 1,968 m (6,457 ft) high.

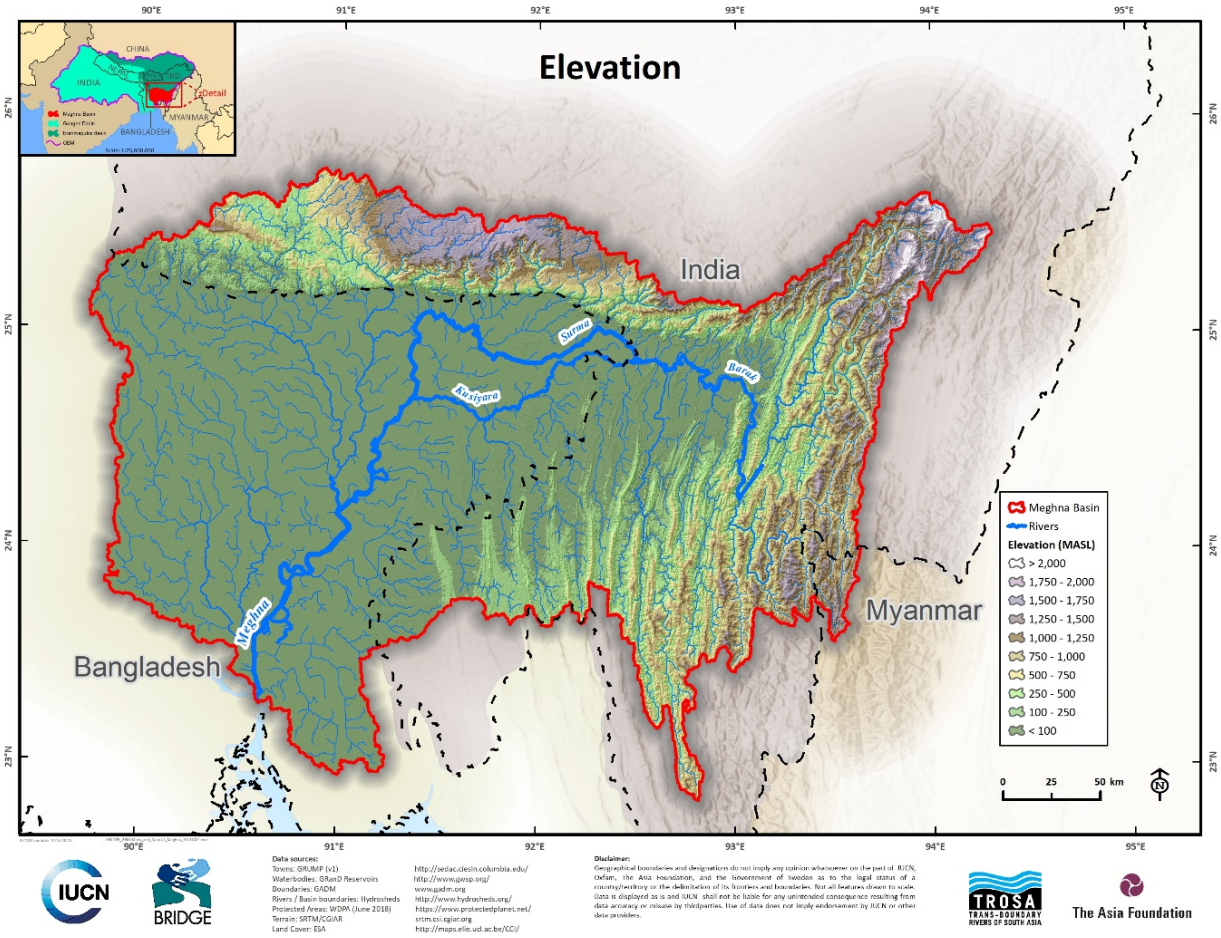

Figure 4: *Elevation map of the Meghna Basin (Source IUCN)*

The Meghalaya Plateau includes the Khasi Hills in the middle, the Jaintia Hills in the east and the Garo Hills in the west. In the northeast of the Meghna Basin are the Lushai Hills, located in the states of Mizoram and Tripura in India. The basin continues downward into broad alluvial valleys with an elevation ranging from 100 m to sea level. The lowest portion of the watershed is at sea level and receives the combined flow of the Brahmaputra and Ganges Rivers, and meets the ocean in the southwest of the basin (figure 4: elevation map of the Meghna Basin).

2.2 River network

The rivers of the Meghna system can be described as a meandering river consisting of a network of small channels separated by small and often temporary river islands called braids or bars. The river system can be classified under three broad groups: a) south-flowing rivers originating from the Meghalaya Plateau, extending from the Garo Hills (Nokrek-Tura range) in

the west to the Khasi and Jaintia Hills in the east and bordering the southern Assam district of Cachar; b) rivers flowing from the North Cachar Hills and hills of Manipur, Mizoram and Nagaland; and c) the rivers of the Tripura Hills.

The total length of the river, from the source of the Barak to the mouth, is 930 km. It is one of the widest rivers in Bangladesh, reaching nearly 12 km across just before it meets the ocean in the Bay of Bengal.

The Barak and its numerous tributaries are the main source of water for the Meghna river system. The Barak River rises in the northern hills of Manipur and is joined by over half a dozen tributaries flowing from the hills in Manipur, Meghalaya, and Mizoram in India. The river then splits in two at the India-Bangladesh border. One branch of the river flows northwest, assuming the name Surma, and is joined by south-flowing tributaries from the Meghalaya Hills in India. The other branch, the Kushiyara, turns south and is joined by tributaries emerging from the hills of Tripura. The two meet again at Bhairab Bazar, Bangladesh. From this point, the river is referred to as the Meghna.

From Bhairab Bazar to Chandpur, the Meghna is referred to as the Upper Meghna and includes the uplands and vast *haors* of Sylhet. After the Padma River joins the Meghna in the Chandpur district of Bangladesh, it is referred to as the Lower Meghna. The Lower Meghna receives the combined waters of the Padma and Brahmaputra rivers near Chandpur. After a course of 160 km it enters the Bay of Bengal by four principal mouths –Bamni, Hatia, Shahbazpur and Tetulia.

2.3 Hydrology

The rivers in the Barak-Meghna fluvial system are essentially fed by the tropical monsoon rains. As many as 29 transboundary rivers drain the hill ranges of Northeast India with an annual discharge of about 150 billion m^3 into the Bay of Bengal. (See figure 5: Transboundary rivers of the Meghna Basin).

The hydrology and topography of the Meghna Basin has led to the development of *haor* ecosystems in the Upper Meghna Basin. *Haors* are low-lying, marshy depressions that turn into a vast expanse of water during the monsoon. The waters of the *haors* recede as the monsoon rains taper down, providing fresh nutrient-rich lands for seasonal cultivation. They also support a wealth of aquatic and avian life. The hydro-meteorological conditions, particularly the seasonal rainfall patterns in the upper catchment areas of Meghalaya, play a critical role in sustaining the unique *haor* ecology.

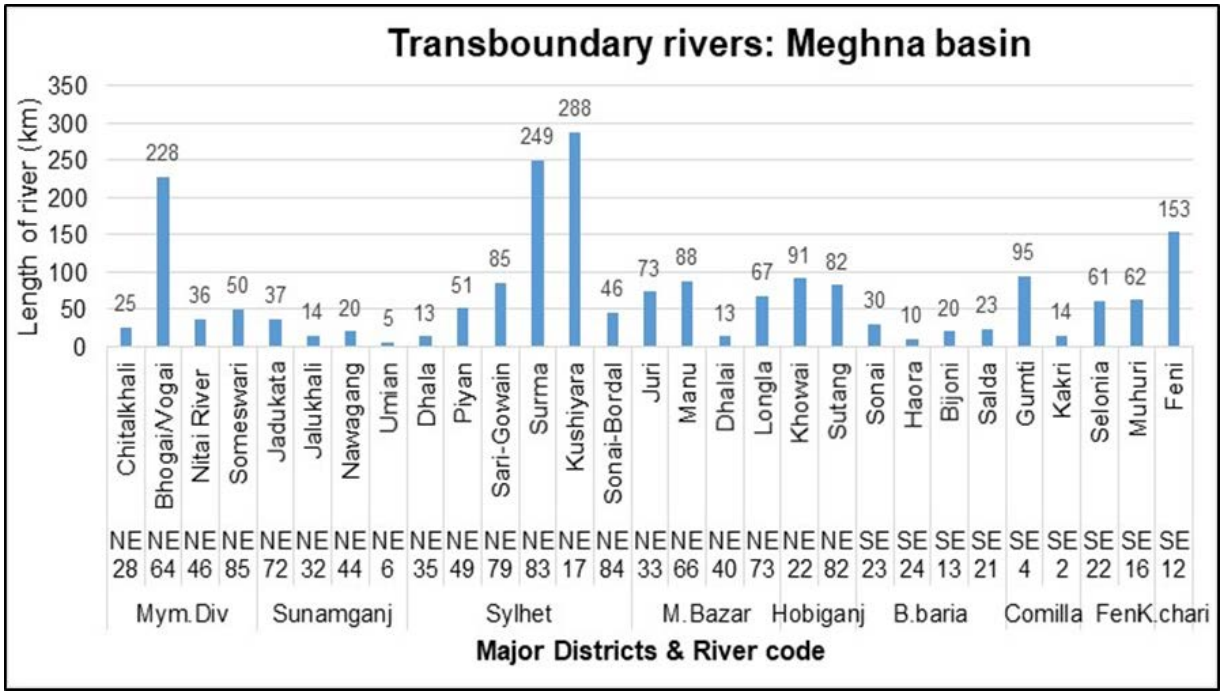

Figure 5: *Transboundary rivers of the Meghna Basin (Source; Joint River Commission Bangladesh)*

The Meghna is a very dynamic river, particularly in its lower parts. The enormous volume of water and sediment received from the combined flow of the Brahmaputra and Ganges, as well as the strong tidal and wind action, wave and cyclonic storm surge in the Bay of Bengal (IWM 2010), have played an enormous role in the morphological development of the Lower Meghna Basin.

The Meghna Estuary represents a fluid frontier between the freshwater flows of the GBM riverine system and saline waters of the Bay of Bengal. The Meghna estuary extends from the Rabnabad Islands of Bangladesh in the east to the Kumira Coast in Chittagong to the west. The maximum width of the estuary is 153 km. This frontier represents a complex interaction between a huge flow of freshwater, sediment, and nutrients from the large rivers, tidal forces, and estuarine circulation. As the river slows down in the estuary, the sediment-laden waters of the river continuously form new islands. The level of salinity in the Meghna Estuary and the central coastal region in Bangladesh remain quite low even during the monsoon, and the saline front moves north as the flows decrease.

2.4 Climate

The Bangladesh part of the basin is characterised by a tropical monsoon climate with significant variations in rainfall and temperature throughout the country. There are four main seasons: i) the pre-monsoon during March through May, which has the highest temperatures and experiences the maximum intensity of cyclonic storms, especially in May; ii) the monsoon from June through September, when the bulk of rainfall occurs; iii) the post-monsoon during October through November which, like the pre-monsoon season, is marked by tropical cyclones on the coast; and iv) the cool and sunny dry season from December through February.

The climate in Meghalaya, the Barak Valley and the Sylhet Region is influenced by the southwest monsoon and the northeast winds which cause extreme rainfall, moderate temperatures and high humidity. The state of Meghalaya in India is described as 'the abode of clouds,' and the city of Cherrapunjee – a well-known destination for nature tourism – is one of the wettest places on the earth, receiving more than 11m of rain annually.

Studies and models indicate that the Meghna Basin will suffer from the impacts of climate change. Hydrological studies[8] on the climate change impacts on the Upper and Lower Meghna Basins suggest a decrease in summer rainfall and higher annual variability. The agricultural system in the Meghna-Surma river system and the delta region of the Lower Meghna Basin are expected to suffer from more frequent droughts and floods. This has direct implications for Bangladesh's food security, since the Meghna Basin is the "rice bowl" of the country.

According to the Indian Meteorological Department, the Indian part of the Meghna Basin is classified as part of the *'South Assam Meteorological Subdivision'* covering the hill states of Manipur, Mizoram, Nagaland, and Tripura. Studies on climate change impacts for this subdivision also point to a 11mm-per-decade decline in summer rainfall (Das 2004, Mirza et al.1998) and high variability in rainfall patterns, intensity, and distribution. This will affect the cropping pattern, as most of the agriculture in the region is rain-fed. Increases in surface temperature and higher frequency of droughts and floods are also forecast for the region. Modelling studies on the impacts of climate change clearly indicate that hill agriculture, for example in Meghalaya, will be most adversely affected, followed by hydrological systems, and forests. There will also be more frequent wildfires as a result of increasing surface and air temperature and less summer rainfall.

2.5 Soil

The Upper and Lower Meghna Basins are formed from the sediment transported by the Barak and its tributaries. This region is known for grey, silty loam; clay loam on the ridges; and grey to dark grey clay and non-calcareous floodplain soils in the lower parts. The general fertility level, including organic matter content, is low in these soil types, and the soil is strongly acidic. In the Indian part of the Meghna Basin, the soil is rich in organic carbon, which is a measure of the nitrogen-supplying potential of the soil. Broadly, three soil types are found in the Indian state of Meghalaya: i) red loam or hill soils, found along the food and sub-mountain fringes of the region; ii) lateritic soils, found in the western part of the central uplands; and iii) new and old alluvia. The soil types of Tripura can be classified under five major groups: i) reddish-yellow brown sandy soil, ii) red loam and sandy loam, iii) older alluvial, iv) young alluvial, and v) lateritic soils. The soils of Assam are very rich in nitrogen and organic matter, and its major soil types can be classified under four groups: i) alluvial, ii) piedmont, iii) hill soil, and iv) lateritic soils. The alluvial soils are extensively distributed over the Barak Plain and are fertile, as their organic matter content of majority soils is medium to low. However, the soil is acidic.

[8] Masood, Muhammad & J.-F. Yeh, P & Hanasaki, Naota & Takeuchi, Kuniyoshi. (2014). Model study of the impacts of future climate change on the hydrology of Ganges–Brahmaputra–Meghna (GBM) basin

3 LAND USE AND ECONOMIC ACIVITIES

The Meghna Basin is primarily forested at higher elevations, especially in the northern and eastern states of India (Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura) and represents the watershed of the basin. The natural vegetation transitions from forest to shrub and grasslands in the Bangladesh part of the basin. Land in the lower alluvial regions is dominated by agriculture and the wetlands of the Upper Meghna Basin are important to the fishing sector. As indicated in Figure 6: Land use/land cover in the Meghna Basin, there are also some large urbanised areas in the southwest part of the basin, indicated in red.

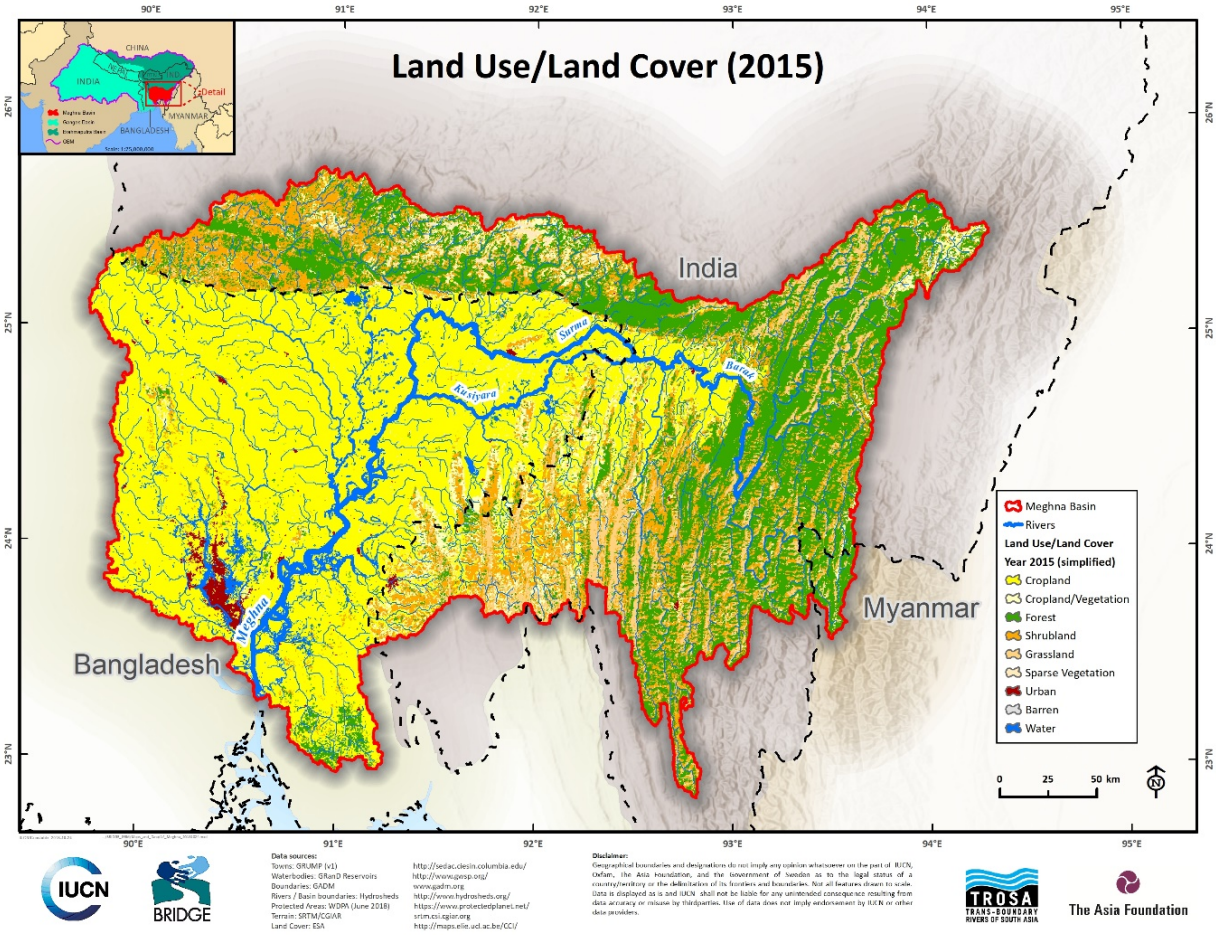

Figure 6: *Land use/land cover in the Meghna Basin (2015). Source: IUCN.*

The 'cropland/vegetation' and 'sparse vegetation' categories in Figure 6 indicate semi-natural, mostly disturbed forest areas with a mix of agriculture and natural vegetation. This land use category is more prevalent in the southeast part of the basin, and overlaps with the zone of "shifting cultivation'' or slash-and-burn agriculture (locally called *tillia* or *jhum*) practiced by indigenous people in states of Manipur, Meghalaya, and Tripura.

3.1 Agriculture

Bangladesh: More than 70% of Bangladesh's population and 77% of its workforce live in rural areas (World Bank 2016) and the agriculture sector is important to local livelihood and food security. The agriculture sector contributes 17% to Bangladesh's GDP and provides employment to 45% its workforce (BBS 2016).

It is estimated that 60% of the working population in the *haor* districts of the Upper Meghna Basin are engaged in agriculture.[9] The *boro* rice variety is the dominant crop for local economic and food security, and other rice types include *amon* and *aus*. The region contributes 14% of the country's total *boro* rice production. Figure 7 below shows rice production in the Meghna Basin.

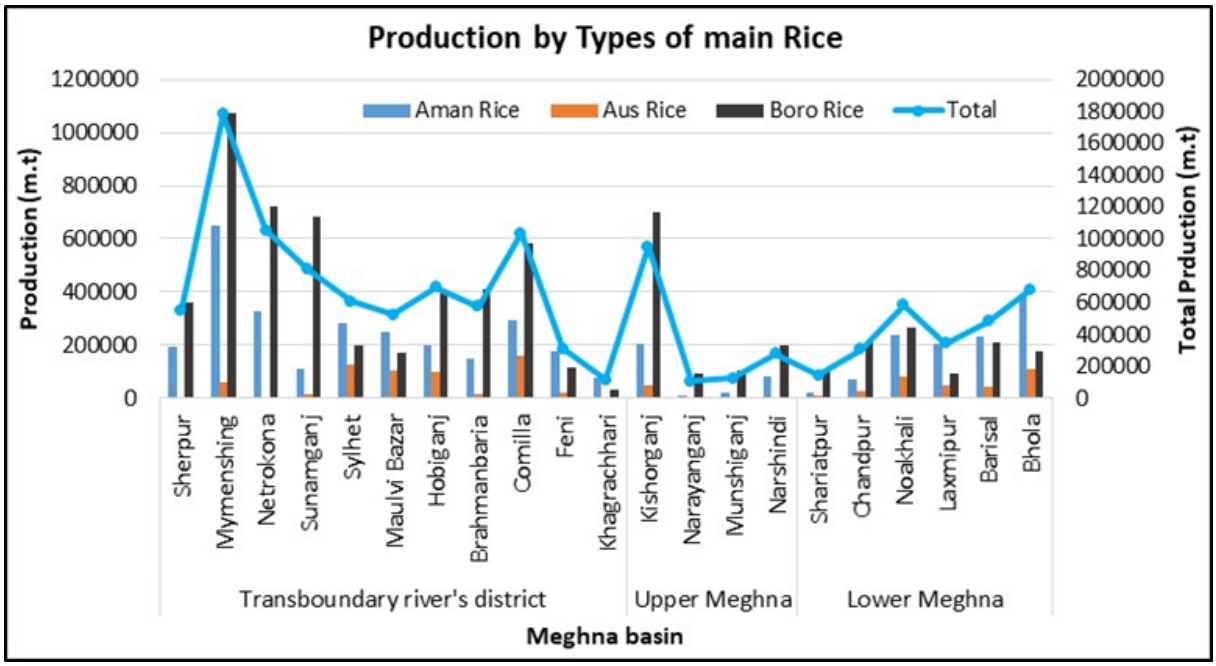

Figure 7: *Estimated yield of rice (m.t) in the Meghna Basin, Bangladesh, in 2015-2016. (Source: BBS Agri Win 2015-2016)*

India: Northeast India has eight states, of which Assam, Meghalaya and Tripura share a boundary with Bangladesh and are located in the Meghna Basin. The cropping pattern in the northeast region of India is dominated by cereals. Rice and maize are the main crops in both hilly regions and plains. The main rice varieties include *ahu* (autumn rice), *sali* (winter rice), and *bao* (deep-water rice).

In Meghalaya and Tripura, over 80% of the population still lives in the countryside and is primarily dependent on agriculture and associated sectors for their livelihood. Overall rice production has been increasing in the region over the past twelve years. Figure 8 provides information on rice production in the Meghna Basin districts of Assam, Meghalaya and Tripura. As seen in figure 8, rice production is highest in Assam, followed by Tripura and Meghalaya in that order.

[9] http://open_jicareport.jica.go.jp/pdf/12023164.pdf

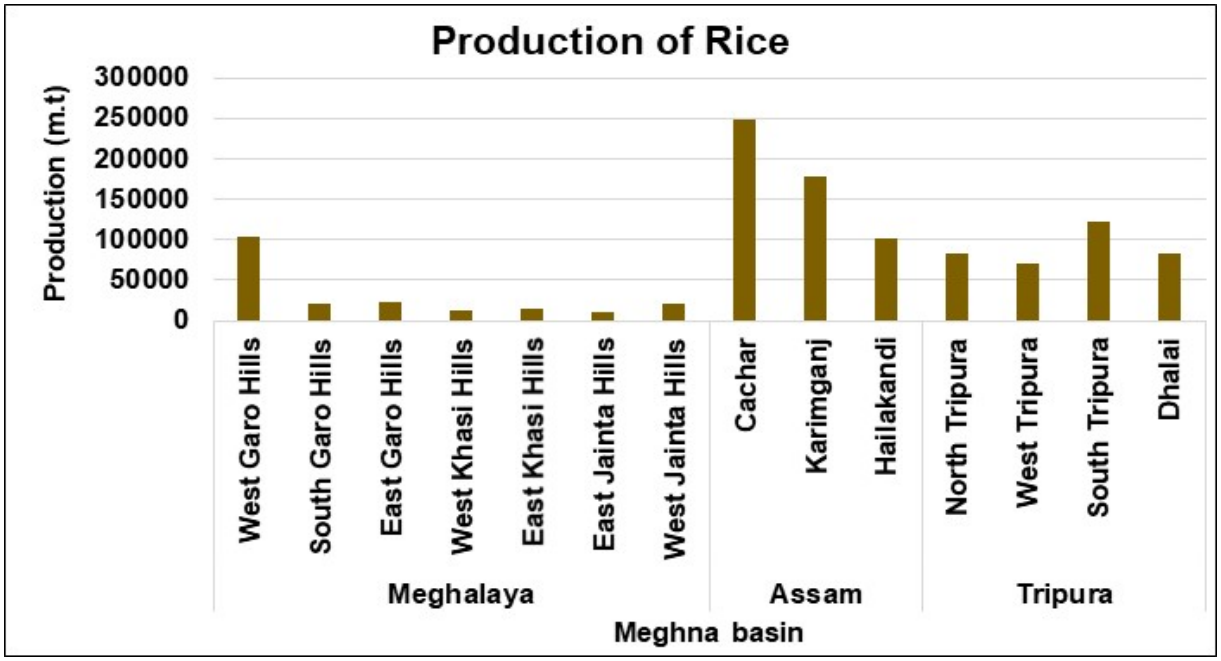

Figure 8: *Estimated yield of rice (tons) in transboundary river influence districts of Assam, Meghalaya and Tripura (Source: NEDFi Databank)*

3.2 Forest

As indicated in the land use map of the Meghna Basin (figure 6), most of the forest cover (green) is located in the Indian part of the basin. The states of Manipur, Meghalaya, Mizoram and Nagaland have more than 75% of their area under forest cover. The forest types are very diverse; Champion and Seth (1968) distinguished 51 types of forests in Northeast India under 13 broad categories, such as 'tropical wet evergreen' (North Cachar Hills), 'montane wet temperate' (Naga Hills) and 'moist deciduous' (Tripura).

The forest is under pressure and fragmentation is visible in the land use map, indicated by several patches of mixed cropland and vegetation (representing disturbed areas) interspersed with natural forest (figure 6). According to the State of Forest Report 2017 (India), of the top five states where forest cover has decreased[10] between 2015 and 2017, four are located in the Meghna Basin: Meghalaya (116 km^2), Mizoram (531 km^2), Nagaland (450 km^2), and Tripura (164 km^2). These are also the states where total forest cover is very high (>70%).

The main reasons for forest cover loss cited by the 2017 report are shifting cultivation, rotational felling, and conversion of forest lands for development activities such as submergence and agriculture expansion. The 2017 forest cover report also highlights the role played by indigenous communities in protecting the forest, as the forest cover in the indigenous community-dominated district increased by 87 km^2 during the period of 2015 to 2017.

[10] http://fsi.nic.in/isfr2017/isfr-forest-cover-2017.pdf

3.3 Protected areas and biodiversity

The Meghna Basin can be defined as a "biogeographical gateway," as it is located in the transition zone between Indian, Indo-Malayan and Indo-Chinese biogeographical regions. The basin is rich in biodiversity, a fact indicated by a number of officially designated protected areas (PAs) and internationally recognised wetland sites and fish conservation zones (see figure 9 below and Annex III for a list of PAs).

The protected areas in the Meghna Basin are hotspots for biodiversity and also provide opportunities for ecotourism development. For example, in Bangladesh, Lawachara National Park is a popular destination for nature lovers and scientists. Surveys continually find species new to the forest and for several species the park is their only refuge. It is known for its primate biodiversity and is home to four globally threatened species as classified by the IUCN Red List of Threatened Species™, including the northern pig-tailed macaque, Phayre's leaf monkey, capped langur, and the western hoolock gibbon. Lawachara National Park is the only place with a significant population of the Phayre's leaf monkey in Bangladesh. More than 240 species of birds have been recorded in the park, including the majestic oriental pied hornbill, Kalij pheasant and many species of flowerpecker, Bangladesh's smallest birds.

On the Indian side of the basin, the state of Meghalaya is known for its rich plant diversity with 3,128 species of flowering plants including 1,237 endemic species[11] and several valuable medicinal plant species. Some highly exploited and endangered species include *Panax pseudoginseng* and *Rouvlfia serpetania*. Reports indicate that many of these medicinal plant species such as *Dipteris wallichii, Cyathea gigantea, Styrax hookerii* and *Fissistigma verrucosum* are facing extinction due to overexploitation, deforestation and habitat destruction, and protected forests and sacred groves are their last refuges.[12]

The protected areas in the Meghna Basin are also significant as many indigenous groups live in and around these protected areas. V.K. Bahuguna (2000) reported that individuals and communities located near protected areas have a high level of dependence on these forests for their livelihoods. For example, two villages belonging to the Khashia ethnic community are located inside Lawachara National Park in Bangladesh. On the Indian side, there are many community-conserved forests in the hills of the Khasi Region, such as the Mawphlang Sacred Forest in Meghalaya which is known for its diversity of orchids and carnivorous, insect-eating pitcher plants.

However, local communities are often not engaged in the management of PAs, which is a source of conflict, as the needs of communities living in or near protected areas do not correlate with conservation planning (Badola 1998, Brosius, Tsing, and Zerner 2005). To address this, the governments of India and Bangladesh are engaging local community members in the management of protected areas through initiatives like the creation of community-based conservation programmes.

[11] http://megbiodiversity.nic.in/floral-diversity
[12] http://www.moef.nic.in/soer/state/SoE%20report%20of%20Meghalaya.pdf

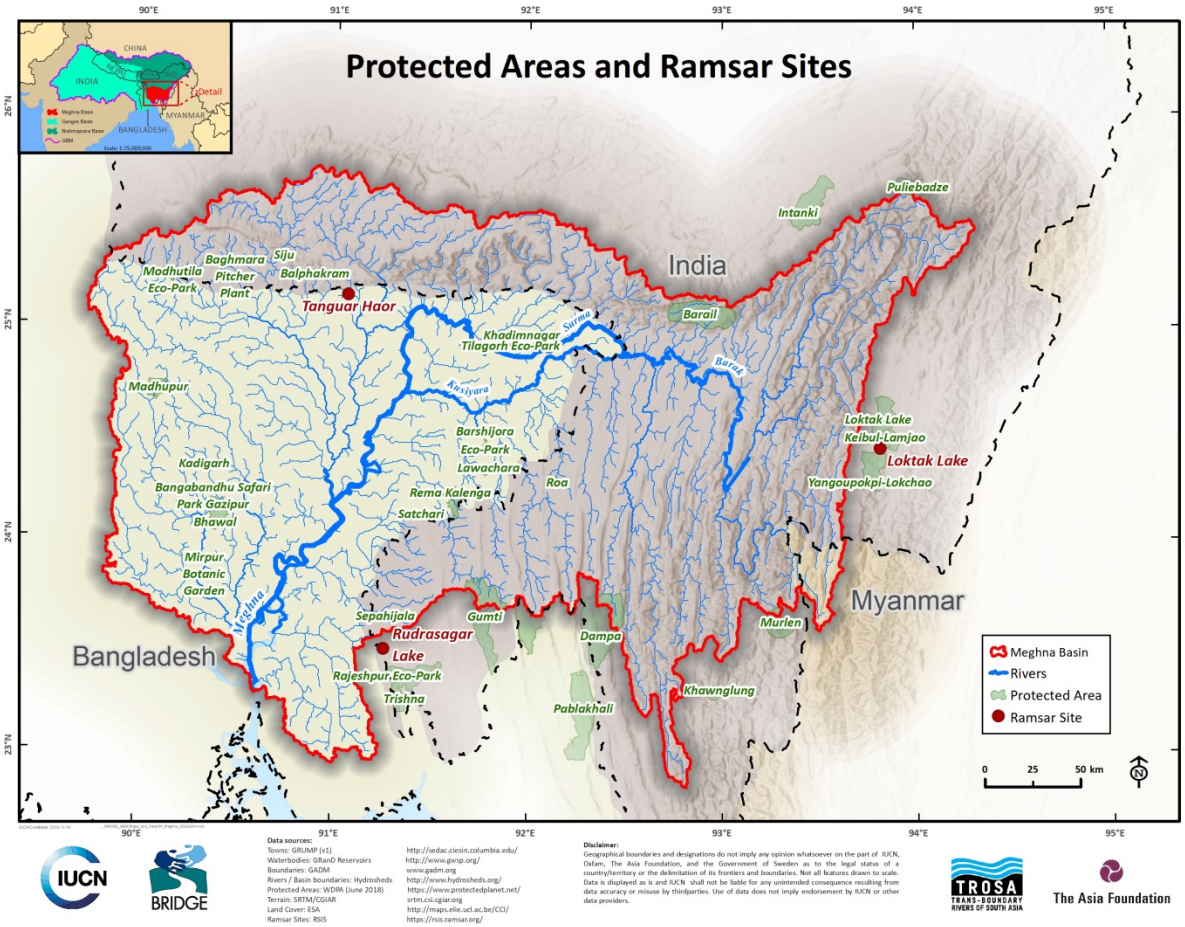

Figure 9: *Protected Areas and Ramsar Sites in the Meghna Basin (Source: IUCN)*

3.4 Wetlands

Wetlands are the distinctive feature of the Meghna Basin and two internationally recognised Ramsar sites – Tanguar Haor[13] (on the Surma River, Bangladesh) and Rudrasagar Lake[14] (on the Gumti River, Tripura, India) – are located in the Meghna Basin.

Three types of wetlands have been identified in the Meghna Basin: a) *beels* (perennial wetlands); b) *haors* (seasonal wetlands or floodplain wetlands); and c) *anua* (ox-bow lakes).

According to the *Master Plan of Haor Areas, Bangladesh (2012)*[15], there are about 373 major *haors* covering an area of 858,000 hectares spread across six districts (Brahmanbari, Habiganj, Mailvibazar, Netrakona, Sunamganj and Sylhet) in the Upper Meghna Basin. These 373 *haors* cover approximately 43% of the total area of the four districts and represent a mosaic of wetlands, rivers, natural streams, canals and floodplains. Some important *haors* include Dakhar, Gungiajuri, Hakaluki, Kaowadighir, Mukhar, Sumir, and Tanguar. These provide critical habitat for aquatic flora and fauna and seasonal homes to migratory birds, and also support the livelihoods of millions of people.

[13] https://rsis.ramsar.org/ris/1031
[14] Ibid.
[15] http://www.bd.undp.org/content/dam/bangladesh/docs/Projects/ncd-for-rio-convention/UNFCCC/National_Legislations/Master%20Plan%20of%20Haor%20Areas%2C%20in%202012%20Volume%20II.pdf

For example, Tanguar Haor sustains the livelihoods of over 100 surrounding villages (60,000 people) and is critical for local food security. IUCN is working in the region to ensure Tanguar Haor's rich natural resources are being conserved and used more sustainably. It is also a wintering ground for 30-40,000 migratory waterfowl, and home to at least 10 IUCN Red-Listed species and 22 CITES-listed species. Threats include over-exploited fishery stocks and uncontrolled taking of waterfowl, and the local community has been denied access to the resources by leaseholders of the fishery, which has led to conflicts. (Watch Video: Tanguar Haor - making the most of its natural treasures[16]).

The Barak Valley in Assam and states of Tripura and Meghalaya are also known for their wetlands. Satellite imagery analysis of the Barak Valley has identified more than 549 wetlands[17] in three districts of Assam (Cachar, Hailakandi and Karimganj). The area of these wetlands fluctuates annually depending on rainfall. The biggest wetland is the Sone *beel* with an area of 1,348 ha during the months of February through March. It is the source of the river Kachua which drains into the Kushiyara, a distributary of the Barak. The Sone *beel* is rich in fish biodiversity, with more than 70 species of fish recorded. However, reports indicate the wetlands of the Barak Valley suffer from ecological degradation and their areas are shrinking[18] or being lost to conversion for other land uses. The other specific example is the Rudrasagar Lake in Tripura where the main threats are increasing silt loads due to deforestation and conversion of wetlands for other land uses such as agriculture and urbanisation. These threats are accentuated by the absence of management plans[19] for this internationally recognised wetland.

The degradation and loss of wetlands have implications both for the wetland ecology and for biodiversity. The conservation of these wetlands will help store excess rainwater which often causes devastating flash floods downstream in the Upper Meghna Basin, the 'rice bowl' of Bangladesh.

3.5 Fisheries

Bangladesh: As per the Bangladesh Foreign Trade Institute's *Sector-based need assessment of business promotion council- fisheries products* study, more than 17 million people including about 1.4 million women depend on the fisheries sector for their livelihoods through fishing, aquaculture, and fish handling and processing. It is also important from the perspective of women's empowerment as more than 80% of labourers engaged in the fish processing industries are women (DoF, Bangladesh 2015).

The inland water fisheries sector in Bangladesh contributes substantially to the economy and to food security. About 15.2 million people (10% of total population) are directly or indirectly associated with various inland water fishery-related livelihoods, mostly capture fisheries. The total production from capture fisheries in the Meghna Basin in Bangladesh was 0.73 million tons in the fiscal year 2016-17. Recent production trends indicate a declining percentage of capture fisheries, with aquaculture gaining prominence. Aquaculture has been strongly promoted by both the public and private sectors as a strategy to ensure food security in

[16] https://www.youtube.com/watch?v=4vXJ0uBPGlw
[17] http://www.moef.nic.in/downloads/public-information/NWIA_Assam_Atlas.pdf
[18] International Journal of Advanced Remote Sensing and GIS; 2018, Volume 7, Issue 1, pp. 2633-2642
[19] https://rsis.ramsar.org/ris/1572

Bangladesh and has contributed 56.4% of the total production in 2016-2017[20] making Bangladesh the fifth largest aquaculture fish producing country in the world (FAO 2016[21]). Fish production from aquaculture in Bangladesh's Meghna Basin was approximately 0.98 million tons in the fiscal year 2016-2017. Despite the declining trend and relatively low level of policy support for capture fisheries, they remain important to local livelihoods. The time series data indicate that capture fisheries are threatened by declining habitat quality and vanishing wetlands. Figure 10 provides an overview of total fish production from different districts in the Meghna Basin in the fiscal year 2016-2017.

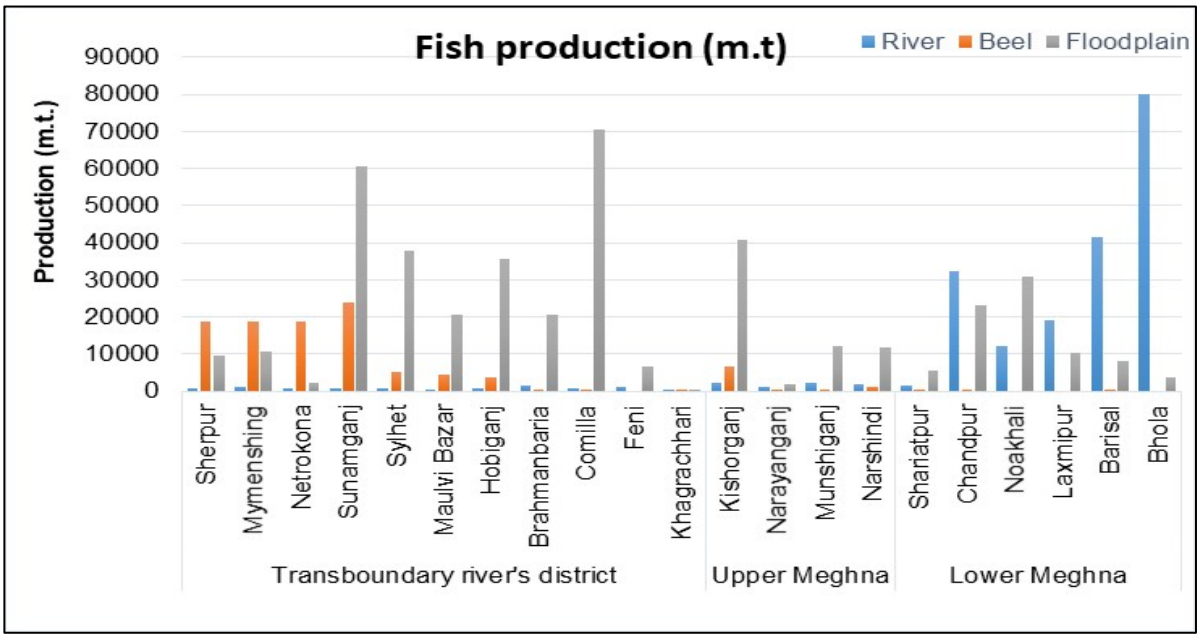

Figure 10: *Fish production from rivers, beels and floodplain areas of the Meghna Basin 2016-2017 (Source: Fisheries Statistical Year book of Bangladesh 2016-17)*

In Bangladesh, the Department of Fisheries (DoF) is the line agency responsible for fisheries management, development, enforcement, data, quality control, and training. The Bangladesh Fisheries Research Institute is involved in fisheries research and operates five research stations and five sub-stations. The Bangladesh Fisheries Development Corporation is concerned with the development of marine fisheries, fish processing and marketing.

India (Assam, Meghalaya and Tripura): Fish is an important constituent of the daily diet of people living in the Barak Valley. In the state of Tripura, fish is the main source of protein for more than 95% of the population. The *per capita* consumption of fish in the state is the highest among India's inland states.

Traditionally, capture fishery has been an important component of the local economy and livelihoods. Both governments and the private sector have recently been strongly promoting aquaculture. Production trends have been increasing; 76.28% of the total fish production area in the state of Tripura is under aquaculture management.[22]

[20] Yearbook of Fisheries Statistics of Bangladesh (2016 – 2017)
[21] http://www.fao.org/figis/pdf/fishery/facp/BGD/en?title=FAO%20Fisheries%20%26%20Aquaculture%20-%20Fishery%20and%20Aquaculture%20Country%20Profiles%20-%20The%20People%27s%20Republic%20of%20Bangladesh
[22] https://fisheries.tripura.gov.in/

Meghalaya is also mainly a fish-consuming state, but the state is not self-sufficient in fisheries resources and imports fish from other parts of India such as Andhra Pradesh. To make the state self-reliant in terms of fish resources, the government of Meghalaya identified fisheries as a key sector and launched the Meghalaya State Aquaculture Mission (MSAM) in 2013. The MSAM promotes development of existing water bodies and creation of additional water areas for large-scale fish production, including reclamation and rehabilitation of marshy and swampy lands; conservation of native, endangered and traditional species in Meghalaya; and development of large-scale breeding farms for commercially promising species.

Despite the recent prominence gained by aquaculture, capture fishery remains important to local livelihoods. In Assam, nearly 50% of the total fish production during 2013 to 2016 was from capture fisheries. In Meghalaya, according to government records, capture fisheries in the state mainly depend on the fish available in rivers, streams and wetlands. The common carp is the dominant alien fish species in both reservoir and pond ecosystems in the state of Meghalaya and is important for local food security and livelihoods. Many of these water bodies, however, are threatened by run-off pollution from coal mining activities and unsustainable fishing practices such as the use of poison to kill fish.

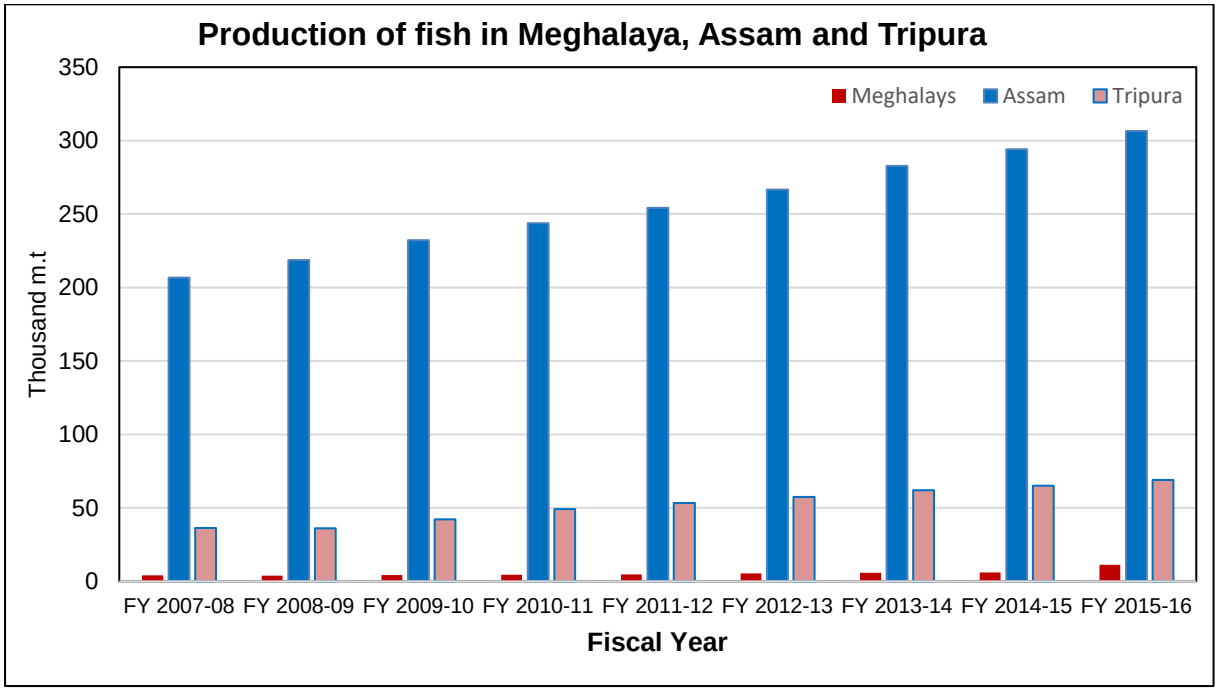

Figure 11: *Capture and aquaculture-based fish production in Assam, Meghalaya and Tripura (Source: Handbook on Fisheries statistics 2014, Government of India)*

In India, the Department of Animal Husbandry, Dairying and Fisheries under the Ministry of Agriculture is the primary policymaking body on matters of fishing and fisheries both for inland and marine habitats. The Central Inland Fisheries Research Institute under the Ministry of Agriculture is an autonomous research institute dedicated to research in fishery science and advises the government on fisheries policy and management. At the state level, the Department of Fisheries under the Ministry of Agriculture is the agency responsible for the development and management of fisheries resources in the state.

Effectiveness of CBFM in Fisheries development: Case study from Bangladesh

Bangladesh has been using community-based fisheries management (CBFM) as a co-management tool since early 2000, which has been effective in reversing these trends. More than 300 community-based organisations (CBOs) for fisheries are operational in Northeast Bangladesh in the Meghna Basin. CBFM has improved fisheries management through increased compliance with existing rules and regulations, supported conflict resolution at different levels, and created an effective network of CBOs by strengthening their voice and negotiating power.

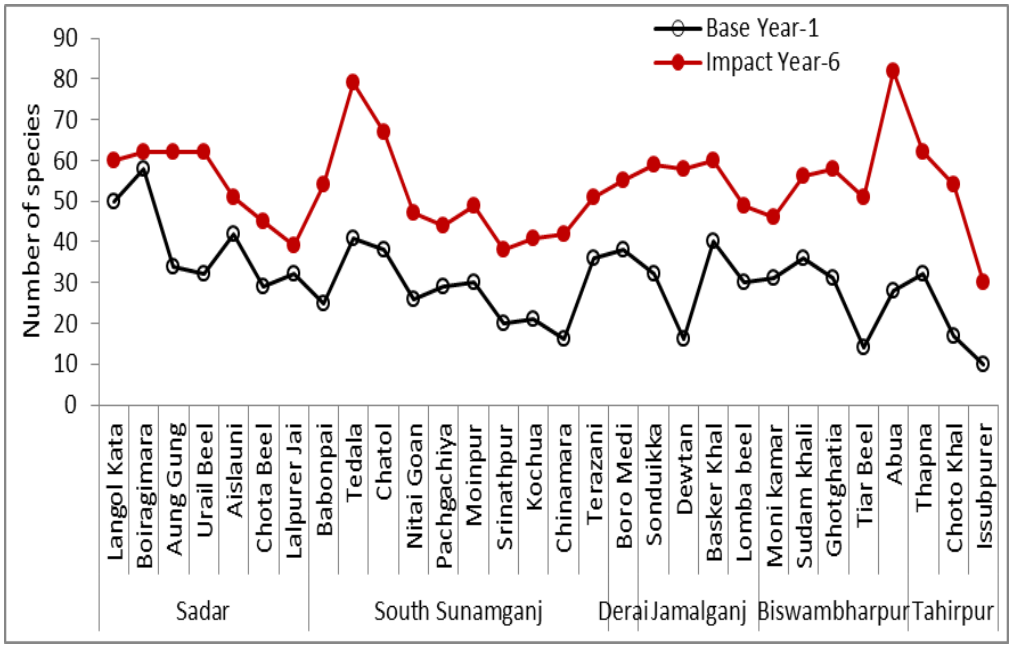

Figure 12: *Fishery management results for biodiversity opportunities; all monitored sites showed increasing trend (Source: FRSP 2013)*

To assess the impact of this initiative, a survey of more than 30 wetlands in north-eastern Bangladesh was initiated in 2008 to document management performance and resource sustainability as a result of CBFM interventions. The fish production (kg/ha) from the selected CBFM sites were monitored for six years and compared to the baseline (year 1) to calculate the impact of the intervention. The relative frequencies of the upward and downward trends indicated that the CBFM activities have significantly ($p<0.01$) benefited fish production, biodiversity, and abundance at the target sites (Figure 12). The study clearly highlighted the effectiveness of CBFM as a potential tool for sustainable fisheries management. The study concluded that the practices implemented through CBFM have improved, or at least sustained, fish abundance and biodiversity benefits in the target areas with opportunities for replication across the transboundary floodplain in both Bangladesh and India.

3.6 Dams and hydropower

Hydropower development has limited potential in Bangladesh with the exception of the Chittagong Hill Tract. However, the many rivers in the north-eastern part of India – including the Barak and its distributaries – are known for their hydropower potential. The policy

documents refer to Northeast India as the 'Power House[23] *[sic]* of India' and one of the most promising regions for hydropower generation in the world today (Handique and Dutta, 2012).

The development of hydropower resources in the Indian part of the basin has downstream implications for flooding in the *haor* region of the Upper Meghna Basin and the delta formation processes in the estuarine part of Lower Meghna Basin. Therefore, any hydropower development should be based on strategic and basin-wide impact assessments of its upstream-downstream implications. The multi-purpose Tipaimukh Dam (Manipur, India), downstream of the confluence of the Barak and Tuivai Rivers near Tipaimukh village in Manipur, is one of the biggest dam projects proposed in the basin. The dam was commissioned in 1983 as a flood control measure for Chachar plains and to generate hydroelectric power (1500 MW). However, the project has been delayed due to protests from indigenous people regarding displacement and ecological concerns. According to the Affected People's Association of Tipaimukh Hydro Electric Project (HEP), twenty villages will be affected in Mizoram and at least 14 villages[24] will be left with no forests and *jhum*lands (land used by indigenous people for shifting cultivation). There are also concerns in Bangladesh regarding the impact[25] of Tipaimukh Dam on regular flood patterns in *haor* areas in the Upper Meghna and the delta development processes which have been shaped by the sedimentation and flow of the river.

The other dam projects in the Meghna Basin are the Umiam HEP in the Meghalaya, which has operated since 1965 and produces 20% of the state's electricity needs, and the Gumti and Khowai multipurpose project in Tripura. These are also not free from controversy; the Gumti Hydroelectric Power Project was commissioned in 1976 despite fierce protests by nearly 40,000[26] indigenous people whose fertile lands were submerged. Furthermore, the project was designed to produce 15 MW of electricity, but in reality produces less than 1 MW due the low water level and heavy silting caused by increased soil erosion in the catchment areas.

3.7 Mineral and mining

At the basin level, coal and limestone are the two most exploited minerals in both Bangladesh and India. Coal is mainly used by thermal power plants and limestone feeds the cement industry.

In Bangladesh, coal, peat and natural gas are the main mineral resources extracted from the *haor* region. Sand extraction is important in floodplain areas and the sand shipped as construction material to Dhaka. The states of Assam, Meghalaya, and Tripura in the Indian part of the basin are endowed with coal, limestone, kaolin, clay, granite, and glass-sand. In the Barak Valley districts of Assam there are oil and gas fields operated by Indian public sector companies.

The basin is also noted for its uranium deposits in the Domiasiat and Wahkyn areas of the West Khasi Hills, discovered in 1984. The Atomic Minerals Directorate (AMD) of India was engaged in the exploration and development of uranium mines, but the work was stopped due to local protests and news of fish deaths in the Kynshi Rivers. Allegedly, locals thought the

[23] http://neepco.co.in/projects/power-potential
[24] http://www.theshillongtimes.com/2013/08/12/tipaimukh-dam-to-affect-20-villages-in-mizoram/
[25] http://indiaenvironmentportal.org.in/files/Impact%20Study%20of%20Tipaimukh_Final%20Report.pdf
[26] https://ejatlas.org/conflict/gumti-hydroelectric-project-tripura-india

fish deaths were linked to AMD uranium exploration activities. The Khasi Hills Students' Union demanded an independent inquiry into the fish deaths, which concluded there is no clear link to uranium exploration; however, the enquiry report did note the negative impacts of rampant coal mining on the ecology of the rivers and wetlands.[27]

[27] http://meghalayatimes.info/index.php/editorial/40-archive/editorial/april-2012/3721-river-water-in-kynshi-and-rilang-is-toxic-await-government-action

4 SCOPING THE BENEFITS OF TRANSBOUNDARY WATER COOPERATION IN THE MEGHNA BASIN

Benefit sharing enables a basin-wide planning perspective, which not only allows for better management of resources but also provides a greater scope for identifying cooperative management arrangements that are acceptable to stakeholders and countries. A focus on sharing benefits rather than water volumes can release countries from a zero-sum competition over a single, finite resource. They can instead focus on a more flexible – and potentially positive-sum – basket of benefits, derived from alternative patterns and partnerships in water use. Furthermore, benefit sharing can bring greater transparency to transboundary water negotiations by improving the access and sharing of information and by providing clarity on trade-offs, which often is a bottleneck to the negotiation process.

As per the 2014 key stakeholder survey in South Asia by Chatham House (UK), and documented in the publication titled *Attitudes of Water in South Asia*[28]*,* many participants identified benefit sharing models as the most effective method for building transboundary cooperation and joint actions for the holistic management of the basin.

The IUCN BRIDGE GBM project is facilitating the development of a transboundary benefit sharing strategy (TBSS) for the Meghna Basin. The section below describes the methodology and a preliminary scoping of benefits provided by the Meghna Basin, and opportunities to enhance these benefits through transboundary water cooperation.

4.1 Benefit sharing in a shared river basin: conceptual framework

4.1.1 From theory to practice

Benefit sharing is based on the principles of International Water Law, such as reasonable and equitable utilisation, not inflicting harm, and achieving win-win outcomes. This makes it a useful instrument for good water governance. The approach accounts for a variety of benefits, stakeholders at multiple levels, and local and national interests. Parties negotiating a benefit sharing agreement are usually not interested in the water itself, but rather in the economic opportunities and ecosystem services that can be obtained and enhanced through the joint management of the basin.

However, it is not easy to negotiate and operationalise benefit sharing agreements. This requires joint identification of the full range of benefits or the 'basket of benefits' provided by the basin, as well as agreement among stakeholders and countries on necessary trade-offs. To help stakeholders move beyond conceptual thinking and operationalise a benefit sharing agreement, the IUCN BRIDGE Programme has developed a tool called the Benefit Opportunity Analysis Tool (BOAT). This six-step process is described in detail in the IUCN publication *SHARE: Managing Water across boundaries*[29]. IUCN has used BOAT in capacity-building workshops across the 15 transboundary basins in Africa, Asia, Mesoamerica and South America where BRIDGE operates.

The real basin application of BOAT has been initiated in the Sio-Malaba-Malakisi (SMM) Basin shared by Kenya and Uganda. In 2015, the Intergovernmental Authority on Development

[28] https://www.chathamhouse.org/sites/default/files/field/field_document/20140627WaterSouthAsia.pdf
[29] https://www.iucn.org/content/share-managing-waters-across-boundaries-0

(IGAD) in the Horn of Africa requested support from IUCN and the United Nations Economic Commission for Europe (UNECE) Water Convention secretariat to strengthen the understanding of and catalyse potential actions on the enhancement of benefits from cooperation in one transboundary basin in the region. In December 2016, the IGAD, IUCN and the UNECE jointly launched the new "Strengthening Transboundary Water Governance and Cooperation in the IGAD Region"[30] project. The project is using the BRIDGE approach of fostering dialogue around benefits enhancement through cooperation, combined with the approach described in the UNECE's Policy Guidance Note: *Identifying, Assessing and Communicating Benefits of Transboundary water Cooperation*[31] developed under the Water Convention. Since its inception, this project has facilitated several BOADs leading to identification of and consensus on priority themes for the development of an SMM basin investment strategy[32]. The process is ongoing and the knowledge gained from the process is being applied by IUCN BRIDGE's work on benefit sharing in the Meghna Basin.

In Asia, an application of the benefit sharing approach for Transboundary Water Cooperation (TWC) can be seen in the Lower Mekong region among countries who are party to the 1995 Mekong River Agreement. With more than 50 operational and planned dams on the Mekong main stream and its tributaries, hydropower development is an important issue and a source of conflict among the riparian countries. The Basin Development Strategy 2016-2020 (BDS 2020)[33] therefore promotes sharing of potential benefits, as well as the social and economic cost of hydropower development, among these countries. The approach to sharing benefits with the hydropower sector is described in the publication titled *Benefit Sharing in Hydropower Development*[34]. This includes the development of monetary and non-monetary mechanisms for sharing of benefits and costs not just between countries, but also with communities living in impacted areas.

4.1.2 Six steps to operationalise benefit sharing agreements

IUCN BOAT identifies a six-step process to operationalise benefit sharing agreements. These steps can be applied at any level, from transboundary to local, to achieve cooperative benefit sharing agreements among stakeholders and to resolve conflict.

The process is explained below and is being applied in the Meghna Basin at the transboundary level. The process is incremental and not necessarily linear, especially when the identification of opportunities is at an early stage and data sets are not complete.

Step 1: Identify benefits provided by the basin

Benefits motivate cooperation, so it is important to identify the full range of benefits (including potential benefits) provided by a shared river basin. Several methods have been proposed to facilitate the identification of benefits, which generally result from cooperative governance of

[30] https://www.iucn.org/news/water/201612/igad-iucn-and-unece-launch-project-support-transboundary-water-cooperation-igad-region
[31]https://www.unece.org/fileadmin/DAM/env/water/publications/WAT_Benefits_of_Transboundary_Cooperation/ECE_MP.WAT_47_PolicyGuidanceNote_BenefitsCooperation_1522750_E_pdf_web.pdf
[32] https://www.unece.org/fileadmin/DAM/env/documents/2017/WAT/05May_16-18_Workshop_Kisumu/8.1_Muli_SMM_proposed_infrastructure_projects.pdf
[33] http://www.mrcmekong.org/assets/Publications/strategies-workprog/MRC-BDP-strategy-complete-final-02.16.pdf
[34] http://www.mrcmekong.org/assets/Publications/leaflet/benefit-sharing-ISH13.pdf

a basin. The benefits listed in table 1: “A typology of potential benefits of transboundary cooperation in the Meghna Basin” are based on a methodology proposed in the UNECE Policy Guidance Note. This model differentiates whether benefits are caused by **improved water management** (brought about by transboundary water cooperation) or whether they are the result of **cooperation in other policy domains** and beyond the basin (made possible by the trust between countries that transboundary water cooperation has enhanced). The report uses this methodology to classify the basket of benefits in the Meghna Basin in section 5.2.1.

Key consideration: Avoid both omission and double counting of the same benefits under different categories. Generally, ecosystem benefits tend to be undervalued or omitted. For example, better forest management will both sustain and regulate flows, providing direct benefits to the ecosystem and biodiversity which is different from the benefits humans get from well-functioning ecosystems, such as clean air, water and food.

Step 2: Identify stakeholders and any potential equity issues

Different stakeholders offer a diversity of knowledge and information about various aspects and impacts of transboundary water cooperation. Thus, including different types of stakeholders helps ensure the identification of benefits that may otherwise be overlooked.

The first step in identifying stakeholders is to create an analysis framework that identifies stakeholder categories and maps their relative power, influence, interests, potential contribution, and role in different management stages. Figure 13 below provides such a framework for grouping stakeholders and their influence into three categories: a) internal (decision-makers); b) external primary; and c) external secondary. Internal stakeholders are those with direct responsibility for designing, financing and implementing basin management. It could be both governments and/or the private sector, such as financers and mining and hydropower companies. All other stakeholders can be considered external, and can be either primary or secondary. Primary stakeholders are those who are impacted by a project. Secondary stakeholders often represent the primary stakeholders who make the engagement process easier. These could be individual experts, pressure group or CSOs working with the affected communities. They may also be public agencies with an interest in water management from a policy perspective.

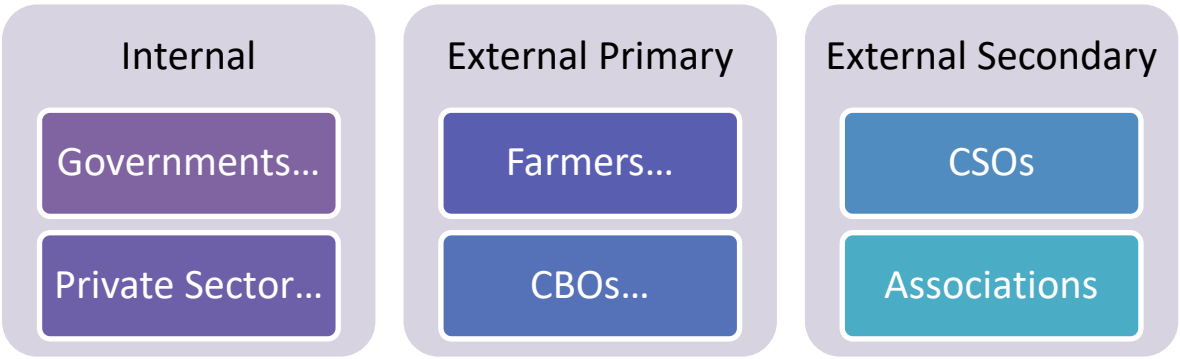

Figure 13: Typology for classification of the stakeholders (Source: IUCN)

Key consideration: While transboundary water, in most cases, is the responsibility of national authorities, it is important to include local governments and other local stakeholders in dialogues. Furthermore, a range of disciplines should be represented in the process of

identifying benefits – ideally this would include hydrology, engineering, microeconomics, macroeconomics, sociology, anthropology and politics.

Step 3: Identify and build benefit-enhancing scenarios

The benefits of transboundary water cooperation vary from basin to basin according to their economic, social, environmental and geopolitical characteristics. Cooperation allows the joint identification of scenarios which enhance existing benefits from a basin. Cooperation is a continuous process, and can be initiated around a small number of clear benefits depending on the basin context and local to national priorities. As the cooperation deepens, it will lead to additional opportunities to enhance benefits.

To help stakeholders identify and build benefit enhancing scenarios, IUCN has designed a BOAT exercise that allows the costs and benefits to a variety of stakeholders to be assessed under non-cooperation (unilateral basin development) vs. cooperation scenarios. Based on the analysis, stakeholders can identify scenarios which will lead to win-win solutions compared to non-cooperation scenarios, providing further support for transboundary cooperation.

For example, in the case of the SMM Basin in Africa, the stakeholders from Kenya and Uganda are working on the development of joint basin investment strategy to enhance benefits from the cooperation process. In the Meghna Basin, IUCN has initiated the same process. A preliminary analysis of benefit enhancing opportunities is discussed in section 4.2.

Key consideration**:** Take into account the interests of multiple stakeholders and prioritise benefit-enhancing scenarios that create win-win scenarios for most stakeholders while also contributing to sustainable governance of the basin, and consider national priorities and policies, available information, and the status of cooperation in the basin.

Step 4: Assess and distribute benefits and costs

Based on benefit-enhancing scenarios, a qualitative assessment of all identified benefits should be undertaken. Many – but not all – benefits can undergo a quantitative assessment depending on the ambition of the cooperation process and the available budget and expertise.

Key consideration: Inaction has a cost; building scenarios that help calculate the net benefit of cooperation will also help identify the actual cost of non-cooperation.

Step 5: Negotiate a benefit sharing agreement

Benefit sharing agreements are about achieving an equitable distribution of benefits through successful negotiation. Therefore, equitable distribution of benefits and costs should be at the heart of negotiations between stakeholders and countries discussing transboundary agreements. Principles of international water law such as equitable and reasonable utilisation, ‘no significant harm’ and compensation mechanisms such as Payments for Ecosystem Services (PES) are useful tools for negotiation.

It is important to note that cooperation in a shared river basin is a multi-level process, so negotiations should engage all relevant stakeholders. However, to maximise the effectiveness

of stakeholder engagement, mapping different stages in the negotiation process is suggested for the second, stakeholder identification stage. Different stages that could be identified in the negotiation process are a) identification of benefits and benefit enhancing scenarios, b) designing projects to implement these scenarios, c) financial planning, e) benefit sharing agreements, and d) implementation.

Key consideration: Perceived equity, and the feeling that all parties are better off with their current agreement, are important criteria for determining the success of negotiations. Where negotiations are difficult, support from a third and neutral party can help create consensus.

Step 6: Strengthen the institutional arrangement for the implementation of the agreement

Once an agreement between countries and stakeholders has been developed, an institutional arrangement should be established to implement it. Water governance institutions exist at multiple levels and a functional institutional setup is needed to take full advantage of opportunities identified through the negotiation process and any benefit sharing agreement.

The purpose of an institution depends on its scale, legal status and expertise. For example, the function of transboundary institutions can range from data and information sharing to construction of joint infrastructure projects such as dams and inland navigation waterways. In case of the Meghna Basin, there is no transboundary-level river basin organisation.

Section 1.4 of this report (Governance of the Meghna Basin: Institutions) provides an overview of the existing institutional arrangement established by governments in the Meghna Basin (or formal institutions). The first Meghna BOAD workshop in Dhaka, July 2018, also identified a number of institutions (both formal and informal) currently working in the Meghna Basin, which is presented in table 2 in section 4.2.2.

Key consideration: Having a clear definition of the mission, mandate and goals of each institution can build capacity and mobilise finances to make these institutions effective and sustainable.

4.2 Application of the six step process in the Meghna Basin

The IUCN BRIDGE GBM project has initiated this six step process in the Meghna Basin. This report, along with the First Meghna BOAD, contributes to steps 1 to 3 (Identify benefits provided by the basin, identify stakeholders and potential equity issues, and identify and build benefit-enhancing scenarios). The report also provides information on key formal and informal institutions in the Meghna Basin that negotiations could leverage in order to operationalise any benefit sharing agreements in the Meghna Basin (step 6).

4.2.1 The benefits from TWC in the Meghna Basin

A number of benefits are provided by the Meghna Basin. These can be broadly categorised into food (agriculture and fisheries), energy (coal and hydropower opportunities), minerals (coal, limestone and strategic elements such as uranium), regulation of climate and hydrology (flood and erosion control) and opportunities for diversification of economic activities (ecotourism development and inland navigation).

The table below uses a typology developed jointly by IUCN and UNECE to describe the potential benefits of transboundary cooperation in the Meghna Basin. The benefits are categorised based on whether benefits are due to enhanced cooperation in the basin (from improved water management) or beyond the basin (due to improved trust between countries).

Table 1: *A typology of potential benefits of transboundary cooperation in the Meghna Basin*

<table>
<tr><td>From improved water management in the basin</td><td>Ecosystem benefits

• Preservation of aquatic and Forest Ecosystems
• Preservation of key bio-physical processes, e.g. e-flows, rainfall pattern
• Better carbon management due to improved forest conservation (REDD++)
• Inter-generational sustainability of ecosystems and natural infrastructure</td><td>Social benefits

• Reduced risk of water-related disasters
• Social welfare from increased employment and reduced poverty
• Improved satisfaction due to preservation of cultural resources or access to recreational opportunities</td><td>Economic benefits

• Increased activity, productivity and long-term sustainability in economic sectors (aquaculture, irrigated agriculture, mining, energy generation, industrial production, nature-based tourism)
• Enhanced livelihoods and increased household incomes
• Reduced economic impacts of water-related hazards (floods, droughts, climate change)</td></tr>
<tr><td>From enhanced trust in and beyond the basin</td><td>Regional economic cooperation benefits

• Development of markets for goods, services and labour within the basin
• Increase in cross-border investments
• Development of transnational infrastructure networks (navigation, energy)
• More diversified economies of the north eastern states in India and Bangladesh</td><td colspan="2">Peace and security benefits

• Development of shared basin identity and rejuvenation of cultural and historical connections. For example, between the Khasi tribes living in the Meghalaya and Sylhet region, or the fish eating culture across the Meghna Basin
• Reduced risk and avoided cost of conflicts between water users due to improved understanding of the basket of benefits and trade-off contributing to the win-win outcomes for a range of stakeholders
• Increased geopolitical stability and strengthened diplomatic relations. Currently the Bangladesh and India relationship is strong and trust is high.</td></tr>
</table>

4.2.2 Key stakeholders in the Meghna Basin

Table 2 below includes a list of key water governance stakeholders identified during the Meghna BOAD (July 2018) and institutional analysis described in section 1.4 of this report. These are classified as ‘formal’ and ‘informal,’ and categorised based on their influence.

The Joint River Commission (1972) is the only transboundary mechanism that currently exists between Bangladesh and India. They are therefore a major stakeholder in the Meghna Basin management. At the national level, the Ministry of Water Resources is the highest-level decision-making body on transboundary water issues in both countries. At the provincial level in India, mechanisms vary from state to state. The Ministries of Water Resources are key stakeholders, but the Departments of Forestry, Fisheries and Agriculture are also important, as they are engaged in the implementation of projects at the ground level and in many cases very closely involved with communities.

More work is required to identify the stakeholders in the informal sector, which include CSOs and CBOs, working particularly at the local level in the Meghna basin. Also, research is needed to map the relative influence of each stakeholder both in the formal and informal sectors.

Table 2: *Key stakeholders (formal and informal)*

Level	**Formal (government)**	**Informal (Civil society-led)**
Transboundary	Bangladesh and India Joint River Commission (JRC)	GBM CSO Network
National	**Bangladesh**: Ministry of Water Resources (MoWR); Water Resources Planning Organization (WAPRO**);** Bangladesh Water Development Board (BWDB); Bangladesh Inland Water Transport Authority (BIWTA); Department of *Haor* and Wetland Development, Bangladesh; Department of Fisheries; Department of Environment; Bangladesh Export Processing Zone Authority; Flood Forecasting and Warning Centre (FFWC); Institute of Water Modeling (IWM); Center for Environmental and Geographic Information Services (CEGIS); Bangladesh Institute of Engineering Technology (BUET)	Members of the GBM CSO Network active in the Meghna Basin: Actionaid Bangladesh, Bangladesh Paribesh Andolon (BAPA); Brotee; Center for Natural Resource Studies (CNRS); Oxfam Bangladesh; Riverine People

Level	Formal (government)	Informal (Civil society-led)
	India: Ministry of Water Resources; Ministry of Environment, Forest and Climate Change; Central Water Commission; Ministry of Development of North Eastern Region; Inland Waterways Authority of India (IWAI); Indian Institute of Water Management (IIWM); ICAR-Central Inland Fisheries; National Institute of Hydrology; IIT Rorkee	Members of GBM CSOs network active in the Meghna Basin in India: Asian Confluence, CUTS International (Consumer Unity & Trust Society)
Provincial	**Bangladesh:** Local Government and Engineering Department (LGED); Department of Agricultural Extension (DAE); Department of Fisheries (DoF); Department of Environment (DoE); Bangladesh Forest Department; Ministry of Commerce; Local Government and Engineering Department (LEGD); Sylhet University	Community-based organisations (Fisheries, agriculture); Religious Institutions
	India: Brahmaputra Development Board; Ministry of water resources of the six states of Assam, Meghalaya, Manipur, Mizoram, Nagaland and Tripura; Department of Forest, Fisheries and Agriculture; Meghalaya Basin Development Authority; Indian Institute of Technology, Guwahati; Indian Institute of Management, Shillong	

4.2.3 Benefit enhancing opportunities in the Meghna basin

Based on the profile of the Meghna Basin and input received at the Meghna BOAD, the following are opportunity areas to enhance the existing benefits provided by the Meghna Basin. These benefits are classified as ecological, social and economic, and result from transboundary cooperation and improved management of the Meghna Basin. Cooperation in these areas will contribute to benefits beyond the basin as highlighted in Table 1.

I. **Ecological benefits**

- **Flood and erosion control**: Floods are a recurring phenomenon in the Meghna Basin and cause substantial damage to local economy, particularly the agriculture and fishery sectors. As indicated by the land use map of the Meghna Basin (Figure 6), most of the forest areas, which constitute important watersheds of the Meghna Basin, are located in the Indian part of the basin. These are important for flow and sediment regulation, particularly during the monsoon when flash floods are common. Increasing the rate of deforestation in the watershed areas results in low water retention capacity and contributes to more devastating floods in the Upper Meghna Basin. Climate change is expected to worsen the impacts of floods and droughts.

  Joint data and model generation by Bangladesh and India will improve the understanding of basin-level hydrological interdependencies and the implications for different sectors, and will both build trust and support the development of strategy to reduce flooding. This report indicates the need for a joint study to understand the nexus between sedimentation, flooding and land use changes (forest cover and wetland).

  The outcomes of such a study will support quantitative analysis of the potential economic benefits to the agriculture and fisheries sectors in the Upper Meghna Basin as a result of improved watershed management in the Indian part. This could also help facilitate the establishment of benefit sharing agreements between Bangladesh and India. Improved trust resulting from a joint study and improved information base may contribute to the development of agreements on joint strategies for the conservation of wetlands or the development of physical infrastructure to enhance the storage potential of the basin in flood season.

- **Transboundary protected areas and conservation of biodiversity**: There are many transboundary forest landscapes in the Meghna Basin. These provide opportunities for joint forest management such as between the Sylhet region of Bangladesh and the Indian state of Meghalaya. The Khasi Hills are home to the Endangered Phayre's leaf monkey, and the two countries could collaborate to secure the species' habitat for its long-term survival.

II. Social benefits

- **Improved food security:** Agriculture and fisheries are two important economic sectors in the Meghna Basin for local food security. The *Haor* region of the Upper Meghna Basin is the "rice bowl" of Bangladesh and contributes 20% of the country's total rice production. Furthermore, the numerous river system and wetlands of the Meghna Basin are important for the millions who depend on the fisheries sector for their livelihoods.

  There are signs of water quality degradation with clear implications for both agriculture and fisheries. *Haor* agriculture in Bangladesh is threatened by flash floods, which cause severe damage to *boro* rice. Furthermore, in both Bangladesh and India the wetlands are vanishing due to pressure from urbanisation and agriculture expansion. There is a policy push for aquaculture as a major food security strategy without much understanding of its implications for the local ecology and culture. Transboundary cooperation for the joint management of Meghna Basin could contribute to long-term food self-sufficiency within the basin.

III. Economic benefits

- **Tourism:** Tourism is currently a marginal activity in the Meghna Basin. There are opportunities to develop ecotourism circuits between the Upper Meghna Basin and its adjoining Northeast Indian states (Assam, Meghalaya and Tripura). These could include circuits between Dawki (Meghalaya) on the Umgot River and the Sylhet region in Bangladesh, or inland navigation-based tourism on the Khowai River between the Brahmanbaria District (Bangladesh) and Tripura (India). This will help enhance the economic status of local communities, as they will benefit from the associated livelihood opportunities that tourism can create.

  In 2017, Bangladesh and India signed a memorandum of understanding (MoU) to start the regular movement of passengers and tourists across the water between the two countries. The MoU allows passenger cruise services on the coastal and protocol routes between India and Bangladesh. However, the Bangladesh-India protocol routes do not extend to the Meghna Basin. The Kolkata-Karimganj routes need to be extended to link the important cities and trading centres in the Meghna Basin. Also, the non-tariff barriers linked to visas, passports, and border security need to be adapted to support easy movement of tourists across the international boundary.

- **Industrial development and trade diversification:** There is the potential for the agriculture and fishery sectors to support trade diversification between Bangladesh and India in the Meghna Basin. Currently, there is not much trade between the northeast states of India and Bangladesh despite cultural similarities, an improved socio-political relationship, and economic ties between the two countries. In Assam, Meghalaya, and Tripura, fish is one of the most important sources of food security, but Meghalaya imports fish from the southern states of India, such as Andhra Pradesh. There are opportunities to develop local markets within the Meghna Basin, and the northeastern states of India can benefit from the improved productivity of the fisheries sector in The Upper Meghna Basin in Bangladesh.

  There are also opportunities to cooperate on energy security issues and engage in joint development of the hydropower sector. Bangladesh is a low lying country with very limited hydropower potential, whereas in India the Barak and its distributaries (particularly the Surma and Kushiyara) are known for their potential. India has commissioned a dam on the Barak River, which is a source of mistrust between the two countries. Opportunities could be explored to jointly develop and own hydropower projects. India and Nepal have collaborated on the development of the Pancheshwar Multipurpose Project (PMP) and signed the Mahakali Treaty in 1966, giving precedent to such collaboration.

  The Indian part of the basin is rich in limestone and other raw materials required by the cement and energy sector in Bangladesh. Currently the cement industry in Bangladesh depends on raw materials imported from Thailand and Myanmar, despite the fact that a lot of these resources are mined in the Indian part of the basin and can be sourced from within the basin.

4.3 Next steps in the development of the Meghna TBSS

The previous analysis highlights emerging areas for joint research and cooperative governance of the Meghna Basin. However, more research and dialogue is required to further build on these opportunities and create information and data to support the stakeholder

agreement on necessary trade-offs. For example, during the Meghna BOAD, participants identified a trade-off scenario where improved production from the agriculture and fisheries sector in Bangladesh due to better forest management in India could be quantified in economic terms. The two countries could then share the benefits as well as the costs.

Some areas for research to support the development of Meghna TBSS are:

- A comparative analysis of relevant national and provincial policies, targets, and plans in Bangladesh and India to document synergies and points of divergence. This would support the identification of benefit enhancing scenarios which are aligned with national and sectorial priorities, which have a better chance of being operationalised through formal agreements.
- Joint studies to understand the nexus between food, energy and water security would facilitate the identification of trade-offs for the development of transboundary benefit sharing agreements.
- Improved understanding of hydrological interdependencies in the Meghna Basin and the impact of current land use changes in the delta development process.

To guide the process of further development of a Meghna TBSS in an inclusive and transparent manner, IUCN has established a multi-disciplinary advisory group (AG) with representatives from governments, research institutions and civil society organisations (members of the GBM CSOs Network) working in the Meghna Basin.

The AG includes 8-10 representatives (33% women) from Bangladesh and India with the following responsibilities:

- Support, advise, and guide the design and implementation of the Meghna Benefit Sharing Strategy, including identification of data sources. In particular, the AG will provide guidance to ensure that the assessment builds on existing knowledge to provide practical decision-oriented analysis to policy makers and planners in the Meghna Basin.

- Share information and update IUCN and other AG Members on the existing and upcoming opportunities to link the strategy with policy and planning decisions and processes, and facilitate the realisation of those opportunities whenever possible.

- Act as ambassadors to present, disseminate and support the implementation of the final strategy within their own countries, organisations and peer groups.

The first draft of the full Meghna TBSS is expected to be ready by mid-2019 and will subsequently be shared with stakeholders. Based on improved understanding of the Meghna Basin after the framework is developed, a revised version of this document will be published by IUCN. It will provide updated information and analysis of the Meghna Basin profile, its challenges, and strategies for enhancing the benefits provided by the basin.

ANNEX I: KEY WATER GOVERNANCE INSTITUTIONS IN BANGLADESH AND INDIA

Institutions	Mandate
Bangladesh	
National Water Resources Council (NWRC)	Highest national body with the responsibility to formulate policy on different aspects of water resources management. The NWRC is chaired by the Prime Minister and consist of 47 members. Also provide directions for optimal development and utilization of Water Resources; Oversee the preparation and implementation of the NWMP
Ministry of Water Resources	Mandate includes the regulation and development of rivers and river valleys; General policy and technical assistance in the field of irrigation, flood control, anti-water-logging, drainage and anti-erosions; All matters relating to irrigation, flood forecasting and warring, flood control, flood control works, causes off floods and damage caused by floods to irrigation projects, embankments, etc; International commissions and conferences relating to irrigation, flood control and water resource management
Water Resources Planning Organization[35] (WARPO), MoWR	Under Ministry of Water Resources, responsible for macro level water planning in the country. It is also Secretariat to Executive committee to National Water Resources Council (ECNWRC) which is headed by the Prime Minister; The Mission of WARPO is to achieve sustainable water resources development in Bangladesh by pursuing Integrated Water Resources Management (IWRM)
Bangladesh Water Development Board (BWDB), MoWR	Leading government engineering organization under Ministry of Water Resources (MoWR). Responsible for executing flood control, drainage and irrigation projects to increase productivity in agriculture and fisheries
Center for Environmental and Geographic Information Services (CEGIS)	"Not-for-Profit" organisation guided by a Board of Trustees headed by the Secretary of the MoWR; provides technical assistance and material support to WARPO in development of the National Water Resources Database
Institute of Water Modelling (IWM)	A government owned-national research institute and think tank to carry out research, planning and technology transfer related to water management projects in Bangladesh
Local Government Engineering Department (LGED)	One of the largest public sector organizations in Bangladesh under the Ministry of Local Government, Rural Development & Cooperatives. Responsible for planning and implementation of rural, urban and small-scale infrastructure development programs. It works closely with local stakeholders to alleviate poverty and improve socioeconomic conditions by helping to build and improve the nation's infrastructure at the local level

[35] http://warpo.gov.bd/index.php/home/mandate

India	
Ministry of Water Resources, River Development and Ganga Rejuvenation	Apex body for formulation and administration of rules and regulations relating to the development and regulation of the water resources in India
Brahmaputra Board, India	Under the Ministry water Resources, it is responsible for planning and integrated implementation of measures for control of floods and bank erosion in Brahmaputra and Barak Valley and for matters connected therewith
Central Ground Water Board (CGWB)	Scientific studies, exploration and drilling, monitoring of ground water regime, assessment, augmentation, management and regulation of country's ground water resources
Central Soil and Materials Research Station (CSMRS), New Delhi	Responsible for field and laboratory investigations, basic and applied research on problems in geo-mechanics, concrete technology, construction materials and associated environmental issues
Central Water and Power Research Station Pune	Provide hydraulically sound and economically viable solutions to various problems associated with projects on water resources, energy and water-borne transport including coastal and harbour engineering
Meghalaya Basin Development Authority (MBDA)	Sustainable development of the Meghalaya river basin resources as a strategy to ensure the sustainable livelihoods and gainful employment opportunities for the residents of the river basins. It is implementing state wide Integrated Basin Development & Livelihood Promotion Programme
Fish Farmers' Development Agency, Meghalaya	Promote the implementation of Meghalaya State Aquaculture Mission; Minister of Fisheries, Meghalaya is the Chairman; the Agency with two-tier organisational structure, one at the State level and the other at the district level

ANNEX II. TRANSBOUNDARY RIVERS IN THE MEGHNA BASIN

Sl no	Sl no. as of Fig. 1	River ID - JRC B	Transboundary Rivers	Key District, Bangladesh	Notes: Area of application
1	26	NE 28	Chitalkhali	Sherpur	The river Chitalkhali is a 25 km long seasonal river. The river flows through Sherpur district. Off take India and out fall Maliji River. A switch gate constructed at Baghber to control water. Therefore, scarcity of water is the main issues at downstream of the river within Bangladesh during winter and excess water during monsoon as gate is open.
2	27	NE 64	Bhogai/Vogai	Sherpur	The river Bhogai is a 228 long seasonal river. The river flows through Sherpur, Mymenshing, Netrokona and Sunamganj districts. Off take India and out fall Bauli River. **A switch gate constructed at Zaria to control water for reservoir i.e., fisheries and agricultural purposes.**
3	28	NE 46	Nitai River	Mymenshing	Nitai river is a 36 km long seasonal river. The river flows through Mymenshing and Netrokona districts. Off take India and out fall Bhogai River**. A rubber dam constructed for agriculture purposes. Additionally an Irrigation canal also constructed for agricultural purposes**.
4	29	NE 85	Someswari	Netrokona	Excellent Eco-tourism on both sides of the river. The river Someswari is 50 km long and flows round the year. The river flows through Netrokona district. Off take India and out fall Bhogai-Kangsho Rivers.

Sl no	Sl no. as of Fig. 1	River ID - JRC B	Transboundary Rivers	Key District, Bangladesh	Notes: Area of application
5	30	NE 72	Jadukata	Sunamganj	Excellent Eco-tourism in both parts of the river and River transport opportunities. The Jadukata is a 37 km long perennial river which flows round the year. The river flows through Tahirpur, Bishombopur, Sunamganj Sadar and Jamalpur Upazilas. Off take India and out fall Surma River.
6	31	NE 32	Jalukhali	Sunamganj	The Jalukhati is a 14 km long seasonal river. The river flows through Bishombopur and Sunamganj Sadar Upazilas. Off take India and out fall Surma. Communication and silt collection. Water flow opposite to Surma – may be future ecotourism place.
7	32	NE 44	Nawagang	Sunamganj	The Nawagang is a 20 km long seasonal river. It flows through Dewra Bazar Upazila, Sunamganj district. Off take India and out fall Surma River**. A rubber dam constructed for irrigation and other agricultural purposes. Nearly 18000 ha land benefited from the dam.**
8	33	NE 6	Umian	Sunamganj	The river Umian is a 5 km long which flows round the year. The river flows through Dewra bazar and Chattk Upazilas. Off take India (Khasia Jainta Hills) and out fall Jaliachara River
9	34	NE 35	Dhala	Sylhet	It is a 13 km long seasonal river. The river flows through Companiganj Upazila, Sylhet district. Off take India and out fall Piyan River. Communication and

Sl no	Sl no. as of Fig. 1	River ID - JRC B	Transboundary Rivers	Key District, Bangladesh	Notes: Area of application
					trade. Water not used for agriculture.
10	35	NE 49	Piyan	Sylhet	Seasonal flow, 51 km long, flowing through Sylhet and Sunamganj districts. Off take India and out fall Surma River. **Flood protection embankment constructed on the left side of the river. Very important for stone trade between India and Bangladesh, and river way transport used. Besides, future Ecotourism opportunities.**
11	36	NE 79	Sari-Gowain	Sylhet	The river Sari-Gowain is a perennial river which flows round the year. The river flows through Zointapur, Goainghat, Sylhet Sadar, Kompaniganj Upazilas of Sylhet district. Off take India and out fall Surma River. Presently used for communication and trade. Mid-level vessels can pass through the river**. Higher possibilities to established ecotourism into the River tributaries – Jaflong-Dawki**
12	37	NE 83	Surma	Sylhet	The river Surma is a 249 km long perennial river which flows round the year. The river flows through Sylhet and Sunamganj districts. Off take Barak River, India and out fall Bawlai River. **Huge communication and trade. Very important for waterway communication and goods transfer. Many tributaries and distributaries connected with the river.**
13	38	NE 17	Kushiyara	Sylhet	The Kushiyara River is a perennial distributary river and a

Sl no	Sl no. as of Fig. 1	River ID - JRC B	Transboundary Rivers	Key District, Bangladesh	Notes: Area of application
					branch of the Barak River. The river runs about 288 km and water is available round the year. The river flows through Sylhet, Molvi Bazar, Sunamganj, Hobiganj and Kishoreganj districts. Off take Barak River, India and out fall Meghna upper. Communication and trade.
14	39	NE 84	Sonai-Bordal	Sylhet	The river Sonai-Bordal is a 46 km long seasonal river which flows through Sylhet and Molvi Bazar districts. Off take Kushiyara River and enter in India and out fall Zuri River. Communication, trade and agricultural purposes.
15	40	NE 33	Juri	Maulvi Bazar	The river Juri is a 73 km long river which flows round the year. The river flows through Molvi Bazar and Sylhet districts. Off take India and out fall Kushiyara River. Communication and trade.
16	41	NE 66	Manu	Maulvi Bazar	The river Manu is an 88 km long river which flows throughout the year. The river flows through Moulvi Bazar and Sylhet districts. Off take India and out fall Kushiyara River. **Constructed Manu Barrage project constructed for <u>agricultural purposes and about 12000 ha land under the barrage project.</u>**
17	42	NE 40	Dhalai	Maulvi Bazar	The river Dhalai is a 13 km long seasonal river. The river flows through Kamolganj, Molvi Bazar Sadar, Rajnagar Upazilas of Molvi Bazar district. Off take India and out fall Manu River. Water used for agriculture**. Flood**

Sl no	Sl no. as of Fig. 1	River ID - JRC B	Transboundary Rivers	Key District, Bangladesh	Notes: Area of application
					protection structure build in the right site of the river.
18	43	NE 73	Longla	Maulvi Bazar	The river Longla is a 67 km long seasonal river. The river flows through Molvi Bazar and Hobiganj districts. Off take India and out fall Bijona River**. Lower part of the river used as seedbed for agricultural support.**
19	44	NE 22	Khowai	Hobiganj	Khowai River is the third longest river of Tripura with a length of 133 km (in Tripura). Its total catchment area is 1,328km^2. It has its source in the Longtarai Range and flows north-westwards up to Teliamura town after crossing the Atharamura Range and then into Bangladesh. It drains the Khowai valley, situated between the Atharamura Range and the Barmura Range. Round the year water availability, and 91 km long in Bangladesh.
20	45	NE 82	Sutang	Hobiganj	Seasonal flow, 82 km long, flowing through Hobiganj district. Off take India and out fall upper Meghna. Seasonally water used for agricultural support.
21	46	SE 23	Sonai	Brahmanbaria	The river Sonai is a 30 km long river which flows round the year. The river flows through Madabpur, Nasirnagar, Brahmanbaria Sadar Upazilas and Hobiganj district. Off take India and out fall Titas River
22	47	SE 24	Haora	Brahmanbaria	Water flows throughout the year. It is about 10 km long and flows through Akhaura Upazila. Off

Sl no	Sl no. as of Fig. 1	River ID - JRC B	Transboundary Rivers	Key District, Bangladesh	Notes: Area of application
					take India and out fall Titas River.
23	48	SE 13	Bijoni	Brahmanbaria	The Bijoni river is a 20 km long seasonal river. The river flows through Kasba and Akhaura upazilas. Off take India and out fall Titas River.
24	49	SE 21	Salda	Brahmanbaria	The Salda is a 23 km long perennial river and flows throughout the year. The river flows through Kasba, Brahmanpara, Kasba upazilas. Off take India and out fall Buri Nodi, Muradnagar, Comilla
25	50	SE 4	Gumti	Comilla	Gumti flows round the year and is 93 km long. The river flows through Comilla, Burichang, Dabidar, Brahmanpara, Muradnagar, Titas, Daudkandi Upazilas. Off take India and out fall Meghna upper**. A dam has been constructed near Dumbur on the river that has formed a lake covering 40 sq. km.**
26	51	SE 2	Kakri	Comilla	The Kakri is a 14 km long seasonal river. It flows through Chottogram Upazila. Off take Tripura, India and Our fall Small Fini Nodi, Choddogram, Comilla. **Flood protection embankment constructed.**
27	52	SE 22	Selonia/Silonia	Feni	The Selonia is a 61 km long perennial river and flows throughout the year. The river flows through Pashuram, Fulgazi, Sagolnaiya, Sonagazi, Feni Sadar Upazilas. Off take India and out fall Fani Nodi

Sl no	Sl no. as of Fig. 1	River ID - JRCB	Transboundary Rivers	Key District, Bangladesh	Notes: Area of application
28	53	SE 16	Muhuri	Feni	The Muhuri is a 62 km long perennial river and flows round the year. The river flows through Pashuram, Fulgazi, Feni sadar, Sagolnaiya Upazilas. Off take India and out fall Fani Nodi
29	54	SE 12	Feni	Khagrachhari	It is a 153 km long river and water flows round the year. The river flows through Matiranga, Fatikchari, Mirashori, Sagolnaiya, Feni sadar, Sonagizi, Khagra chari, Feni Upazilas. Off take India and out fall Sandip channel**. Limited agreement on sharing of water of Feni River where water is being used only for drinking.**
Source: Joint River Commission of Bangladesh					

ANNEX III: LIST OF PROTECTED AREAS IN THE MEGHNA BASIN

Sl. No.	Name of PA	Habitat type	District	Year Establishment	Area (ha)
Bangladesh					
National Parks (NP)					
1	Madhupur	Moist deciduous in hillocks	Tangail and Mymensingh	1962	8,436
2	Bhawl	Moist deciduous in hillocks	Gazipur	1974	5,022
3	Lawachara	Mixed-evergreen forest in hills	Moulvibazar	1996	1,250
4	Nijhum Dweep	Mangrove forest on coastal island	Noakhali	2001	16,352
5	Satchari	Mixed-evergreen forest in hills	Habiganj	2006	242
6	Rema Kalenga	Mixed-evergreen forest in hills	Habiganj	1996	1,795
7	Pablakhali	Mixed-evergreen forest in hills	Rangamati	1962	42,087
Eco-Park					
8	Madhutila	Moist deciduous forest in hillrocks	Sherpur	1999	100
9	Madhabkunda	Mixed-evergreen forest in hills	Moulvibazar	2000	253
India					
National Parks (NP) in Meghalaya and Tripura					
10	Balphakram NP	Hillocks, Meghalaya	South Garo Hills	1985	352.00
11	Nokrek Ridge NP	Hillocks, Meghalaya	East, West and South Garo Hills	1986	47.48
12	Clouded Leopard NP	Green throughout the year	West Tripura	2007	5.08
13	Rajbari NP	Natural Landscapes	South Tripura	2007	31.63
Wildlife Sanctuary (WLS)					
14	Baghmara Pitcher Pland WLS	Hillocks, Meghalaya	South Garo Hills	1984	0.02
15	Nongkhyllem WLS	Hillocks, Meghalaya	Ri Bhoi	1981	29.00

16	Siju WLS	Hillocks, Meghalaya	South Garo Hills	1979	5.18
17	Gumti WLS	Bush clad landscapes	South Tripura	1988	389.54
18	Rowa WLS	Regenerated secondary forest	North Tripura	1988	0.86
19	Sepahijala WLS	Amazingly diverse vegetation	West Tripura	1987	13.45
20	Trishna WLS	Vegetation-rich	South Tripura	1988	163.08

Source: India, List complied on Jan 24, 2011 by Dr. J. S. Kathayat using National Wildlife Database Cell; Bangladesh, Protected Area Co-Management Where People and Poverty Intersect: Lessons from Nishorgo in Bangladesh, 2012.

ANNEX IV: PARTICIPANTS OF THE FIRST MEGHNA BOAD, JULY 2018, DHAKA

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