



Meghna Research Collaborators Meeting (Bangladesh and India)

Data and strategy for basin wide land use and socio-ecological change analysis

11-12 June, Shillong, India



Building River Dialogue and Governance (BRIDGE)



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1 INTRODUCTION AND BACKGROUND

1.1 About the meeting

IUCN and the North Eastern Space Applications Centre (NESAC) jointly facilitated the Meghna Research Collaborators Meeting from 11 to 12 June 2019 in Conference Hall, NESAC, Shillong, India. The meeting aimed to identify priority areas for collaborative research initiatives that can support the sustainable and cooperative management of the Meghna basin. The specific objectives of the meeting are as follows:

- Provide a platform for dialogue and networking between researchers and Civil Society Organisations (CSOs) from Bangladesh and India;
- Identify collaborative research outputs or planning tools that can support the development and implementation of a benefit-sharing strategy for the Meghna basin; and,
- Discuss work plans and timelines for the delivery of identified collaborative research outputs.

The meeting was facilitated under the project, [Building River Dialogue and Governance \(BRIDGE\)](#) in the Ganga-Brahmaputra-Meghna (GBM) basin, or BRIDGE GBM facilitated by IUCN and funded by the [Transboundary Rivers of South Asia \(TROSAs\)](#) programme under Oxfam. The goal of the initiative is to create an enabling environment for the cooperative governance of shared rivers in the GBM region for poverty alleviation, as well as conservation of the ecological integrity of the river basins.

In the Meghna river basin, shared by Bangladesh and India, the BRIDGE GBM project has initiated multi-stakeholder dialogue process to develop a [benefit sharing strategy for the cooperative development of the basin](#). Unlike the traditional river basin negotiation and management approaches, which focus on allocation of water, the negotiations based on benefit sharing aims to identify and equitably share variety of social and ecosystem benefits from a basin in a sustainable manner. The benefit sharing approach requires identification of trade-offs and consensus among stakeholders to develop and effectively operationalise a benefit sharing agreement.

Since January 2019, IUCN initiated an Advisory Group (AG) with representatives from Bangladesh and India, representing the government, academe and civil society organisations to support the development and implementation of the Meghna benefit sharing strategy. The North-Eastern Hill University (NEHU) Shillong hosted the first meeting of the Meghna AG which was conducted from 17 to 19 January 2019. The meeting identified a number of knowledge gaps and issues for investigations and areas of collaborative research in the Meghna basin (Annex 3). Land use change analysis in the Meghna basin was identified as one of the priority research areas to support the benefit sharing dialogue and sustainable planning process in the Meghna basin.

1.2 Participants

More than 20 scientists and professionals from eight different organisations from Bangladesh and India participated in the meeting. From India, these included the North-Eastern Space Applications Centre (NESAC), Institute of Economic growth (IEG), Gauhati University, North-Eastern Hill University (NEHU), and Meghna basin Development Authority (MBDA) and Asian Confluence. From Bangladesh, organisations such as the Centre for Environmental and Geographic Information Services (CEGIS), East West University, Dhaka and Oxfam Bangladesh attended the meeting. See Annex 2 for the full list of participants.

2 PROCEEDING OF THE MEETING

The two-day meeting was divided into different sessions, which discussed the profile of Meghna basin and ongoing activities of the BRIDGE GBM, NESAC and CEGIS in the basin. Discussions were made to identify availability of secondary data that can support specific land use analysis at the basin level. During the last session, the participants were divided into two working groups as follows: (1) land use change analysis and (2) socio-ecological analysis. Each group discussed and identified specific outputs, as well as the methodology, work plan and timelines for delivering the intended outputs. Below is a summary of the discussions and inputs received at each session. See Annex 1 for the detailed agenda of the meeting.

2.1 Introduction of ongoing activities of NESAC in the Meghna basin

Shri P.L.N Raju, Director, NESAC, Shillong welcomed the participants and shared information on the activities of the organisation in the region. The mandate of NESAC is aligned with the Act East Policy of India. NESAC is working with many institutions in the Northeast India on a variety of space technology applications such as inputs for forest working plans, site suitability mapping for sericulture, horticulture, master plan preparation for AMRUT city (Shillong), mining activity mapping, river atlas for Brahmaputra and Barak, infrastructure development, etc.

In addition, NESAC has facilitated the development of geoportals to support the planning and management of natural resources, and mobile apps for improving governance such as North Eastern District Resource Plan (NEDRP) and North Eastern Spatial Data Repository (NeSDR), among others.

NESAC is also working on the development of early warning system to minimise the loss of life from thunderstorm, forest fires and floods. More than 2500 people die of lightning every year in the north-eastern part of India and many more are vulnerable to flood and other types of natural disasters. NESAC is working with Earth Networks, a US based agency, on lightning vulnerability issues. NESAC has also developed early flood warning system while working closely with the Assam Disaster Management Authority. The maps updating flood situation are produced every four hours and these are disseminated to the relevant agencies and communities. NESAC is working with partners to extend the programme to other north-eastern states of India.

Capacity building is one of the key objectives of NESAC. The Ministry of Development of North Eastern Region (MDoNER) and Ministry of External Affairs (MEA) India have designated NESAC as the nodal centre for providing GIS and space technology-related capacity building for the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) countries.

Shri Raju emphasised the role of communication in populations, who live in rural areas and villages without proper education and health. Tele Education and Tele Medicine will be the only alternative link to serve the rural areas' last mile connectivity for important services.

2.2 Data and research on land use changes in the Meghna basin

2.2.1 Land use land cover monitoring and change analysis, India

Mr K. Sreenivas, Senior scientist, National Remote Sensing Centre, Hyderabad, shared information on the ongoing studies and initiatives on land use change analysis in India. The Natural Resources Census project in India has generated a set of thematic maps through systematic inventory and mapping from space-based images and creation of a geospatial database for the whole country. The project uses satellite data at different spatial resolutions to prepare natural resources information layers, such as land use/land cover, land degradation, wetlands, vegetation, snow and glaciers and geomorphology maps at 1:50,000 scale in periodic manner. For the north-eastern states of India, five cycles of land use and land cover analysis have been completed, including land degradation mapping and soil database.

Also, the land use/land cover (LU/LC) at 1:250,000 scale is being monitored as part of natural resources census on an annual basis. Since 2004, 14 cycles of analysis have been completed and the data is hosted on 'Bhuvan' web portal of NRSC/ISRO. Annual LU/LC of Northeast region provides information on different land use types, including the land cover mapping using multi-temporal Advanced Wide Field Sensor (AWiFS) including data on *kharif* and *rabi* cropping patterns and annual net sown area at the end of agricultural year.

NRSC, Hyderabad is also supporting studies on the estimation of soil loss from the catchment area using Morgan-Morgan-Finney (MMF) methodology. It shows the transport capacity of catchment and generated information can be used for modelling the siltation load of the Meghna river.

Change summary (2005-2012) based on outcomes of the LU/LC analysis in the north-eastern states of India are listed below:

- A concurrent change in forest cover and shifting cultivation in the forest of North-eastern States indicates that the *Jhum* (slash and burn) cycle have been reduced mainly due to reduced forest cover and increased population pressure. There is a general trend of decrease in area under current shifting cultivation. This indicates the tendency of practising settled (non-shifting) way of cultivation in the area. However, still a significant land area is under this category in the states of Nagaland and Mizoram located in the Meghna basin.
- Maximum areas under agricultural plantation is observed in the Assam state, mainly for tea gardens, followed by Tripura, for rubber plantation. Highest increase in the area under industries are observed in Meghalaya with 7.95 to 14.96 sq. km., followed by Assam with 29.33 to 34.91 sq. km.

2.2.2 CEGIS activities and data availability in the Meghna basin

Mr Shahidul Islam, Director, Remote Sensing Division and Mr Ahmmed Zulfikar Rahaman, Hydrologist and Climate Change Expert from the Centre for Environmental and Geographic Information Services (CEGIS) jointly presented the activities of CEGIS and the variety of LU/LC data available in Bangladesh.

CEGIS is a public trust under the Ministry of Water Resources of Bangladesh. The focus work areas of the organisation include integrated natural resources management, environmental and social analysis, and modelling using GIS and remote sensing tool. CEGIS has 14 different divisions and highly dedicated and knowledgeable professionals who have expertise in diversified fields, such as water resources management, flood forecasting, land use change analysis, river morphology and erosion prediction, environmental and agricultural modelling, ecology and fisheries, forestry and biodiversity, geo-informatics and space technology and information and communication technology. CEGIS also provides capacity building support and training on integrated water resource management (IWRM), climate change, modelling, GIS and remote sensing. Furthermore, CEGIS is implementing various programmes on natural resources management funded by World Bank (WB), Asian Development Bank (ADB) and Japan International Cooperation Agency (JICA). CEGIS has recently prepared the National Land Cover Map using SPOT satellite images of 2015 under "Strengthening National Forest Inventory and Satellite Land Monitoring System in support of REDD+ in Bangladesh" project of the Forest Department. The historical land cover datasets of 2000, 2005 and 2010 were also prepared using LANDSAT images.

The presentation shared the metadata of the available LU/LC analysis in Bangladesh. One of the challenges is that different data sets are available from different agencies. The historical agricultural land use change is available with 1975 as base data with the Soil Resource Development Institute (SRDI) of Bangladesh. The land use map prepared using RapidEye satellite data of 2012, 2013, 2014 and 2015 are available with the Ministry of Land in Bangladesh.

However, there are challenges in comparing the data due to differences in the methodologies and land cover classification system. For example, the agricultural land use data of 1975, 1996 and 2005 prepared using different methodologies and land cover classification system, making it difficult to compare those data. To address this issue, CEGIS developed the legend for the land cover maps using Land Cover Classification System (LCCS) of FAO. This approach has the advantage of facilitating the integration of time series land cover data in a consistent way.

CEGIS has been working in the Meghna basin and has supported the development of *Haor* master plan, preparation of eco-friendly guidelines in *Haor* area and hydro-morphological analysis of *Haor* basin. The CEGIS has also conducted studies on the impact of water availability assessment at basin-level due to climate change, impact assessment of structural interventions and risk assessments for agriculture sector due to climate change. Current studies on fisheries sector are ongoing.

For better understanding of the basin-level interdependencies in the Meghna basin, CEGIS identified the following studies as important:

- Standardising relevant data and information for common and consensus hydrological model development for Barak-Meghna river system from both countries;
- E-flow assessments of Barak-Surma-Kushiyara rivers;
- Impact assessment on flash floods pattern in *Haor* area due to change in land use in Meghna basin; and,
- Management plan of Karimganj-Jakiganj Indo-Bangladesh Navigation Protocol

2.2.3 Engaging river basin communities through participatory approaches

The presentation by Enamul Mazid Khan Siddique, Project Coordinator-Water Governance, Oxfam Bangladesh, highlighted the need and ways to engage communities in the research process. For Oxfam, community and poverty reduction are at the core of any activity. Oxfam Bangladesh through TROSA programme support has initiated participatory socio-ecological systems' analysis by following the five steps framework:

- a) Systems component and boundaries (stakeholders, ecosystems services, political systems);
- b) Social ecological history (to understand the changes over time in the socio-ecological systems);
- c) Understanding present relationships between the stakeholders;
- d) Predicting future scenarios; and,
- e) Strategies for achieving desired scenarios.

The communities living on the Jinjiram river in Bangladesh, one of the 54 transboundary rivers shared by Bangladesh and India, were selected as data gathering sites for socio-ecological analysis. Using the socio-ecological analysis toolbox, various activities were conducted to generate data on different aspects of community interactions with the social and ecological systems. The specific activities included key informant interviews (KIIs), focused group discussions (FGDs) and schematic mapping of different stakeholder groups based on the level of trust. The participants at the meeting appreciated the approach and it was suggested that the stories and information collected through the activity could be used to generate data on temporal changes.

Use the link below to download the presentations and photos from the meeting:

<https://drive.google.com/open?id=1GWPnHVletCza7lCdECTAs6-76ZdUeTVZ>

Discussions:

Benefit enhancing opportunities and payment for the ecosystem services (PES)

- Participants discussed about the benefits of cooperation between Bangladesh and India in the Meghna basin. Considering that the main watersheds of the Meghna basin is located in India, participants argued that benefits of improved forest management in India will accrue to Bangladesh, such as improved water flow regulation and enhanced downstream ecosystem services. However, forest-dependent communities such as the Garo hill tribes in the Meghalaya in India will also benefit from improved forest management. Furthermore, there are opportunities for sharing the benefits resulting from improved fisheries and agriculture production in the *Haor* regions of Bangladesh located in the downstream of the Meghalaya plateau. Improved livelihood situation and reduction of flood-related vulnerabilities in Bangladesh will also address the issue of increasing immigration from Bangladesh to the north-eastern states of India.
- Inland navigation is another example of benefit sharing between Bangladesh and India; wherein the two countries have signed a protocol to promote transboundary navigation and trade. As part of this agreement, the dredging cost for river maintenance in Bangladesh is borne by India. Improved navigation of Bangladesh river provides easy connectivity between north and north-eastern states of India. This indicates the need for data or information that can support the development of scenarios on economic benefits resulting from the cooperative governance of the Meghna basin.

Data availability and harmonisation:

- The meeting identified that data is available on different aspects of natural resources management in both countries. However, these are collected using different methodologies and data sets.
- Data sets are with different institutions and are generally not available for public consumption, one example is the data on forest cover in Bangladesh.
- There is a need to develop a common definition for land use classification. For example, in India many organisations are using Anderson classification of land cover, whereas, Bangladesh is using FAO classification since 2015.
- Targeted studies on specific aspects of river use include: a) river characteristics and changes over time, b) fisheries - characteristics and changes, and c) navigational characteristics and changes were suggested for the Meghna basin. On navigation, there is a need to identify new routes, which will benefit communities on both sides of the border. Thus, the navigation study should include more than protocol routes.

2.3 Methodology, work plan and timeline for joint activities

Participants were divided into two groups, a) Land use change analysis group, with representatives from NESAC, CEGIS, NEHU and IUCN and b) Socio-ecological group, with representatives from IEG, MBDA, Gauhati University, Oxfam Bangladesh and IUCN. Each group discussed specific joint research outputs and work plan to deliver.

The discussions and outcomes from each group are summarised below:

2.3.1 Outcomes of Group 1: Land Use Change Analysis in Meghna basin

It was proposed that CEGIS and NESAC will work together to produce **Atlas for the Meghna basin** using 1:50000 scale. The atlas will cover full basin and take a catchment area approach, and thus, will include thematic maps of sub-basins in Meghna without any administrative and international boundaries.

Steps and timeline involved in the development of the atlas:

1. **Legend development for land cover/land use classification system for the Meghna basin (Q1):** Considering Bangladesh and India used different systems to generate their respective LU/LC data, the first step is to develop a common legend or land cover classes for analysis, with common

definition. Classification should be relevant for the Meghna basin and linked to the knowledge gaps identified by Meghna Advisory Group meeting in January 2019, in Shillong, India (See Annex 3).

The projection system needs to be agreed by Bangladesh and India. Furthermore, to ensure consistency of the land cover classes and edge matching along the international border line, a buffer zone (as small as possible) along the international border will be delineated. The land cover classes within the buffer zone will be checked together (experts from both countries) using visual assessment without any exchange of physical data. If there is any inconsistency, the land cover classes within the buffer zone will be edited and updated to ensure consistency and yield harmonised land cover classes between the two countries.

2. **Harmonisation of basin and sub-basin boundary (Q1):** As the atlas will cover full Meghna basin, thematic maps will also be prepared for sub-basin boundary, therefore, harmonisation of basin and sub-basin boundary will be done based on the consensus of Bangladesh and Indian experts from CEGIS and NESAC, respectively.
3. **Change analysis (Q2-Q3):** Land use change analysis for six different time durations, starting from year 2005 to 2019 (A to D): 2005 – 2010 (A), 2005 – 2015 (B), 2005 – 2019 (C), 2010 – 2015 (D), 2010 – 2019 (E) and 2015 – 2019 (D).

On the selection of base year, although CEGIS has land cover data from 2000, the year 2005 was selected as the base year for analysis considering that the first land use change analysis for Northeast India was done in 2005. Furthermore, as LULC data for the year 2019 is not yet available, NESAC and CEGIS will have to generate the data for 2019.

4. **Identification of the drivers of change (Q4):** This step will use socio-ecological data and information from the sectors such as fisheries and navigation. The research and analysis undertaken by the TROSA partners, for example the socio-ecological systems analysis done by Oxfam Bangladesh, provides useful inputs for the identification of the drivers of changes.

NEHU, Shillong offered to support with the generation of primary data on socio-ecological aspects of the Meghna basin. More than 10 research scholars are working in the Meghna basin from NEHU (India part) and can potentially support with the surveys and analysis of socio-ecological aspects on LU/LC. IUCN will draft questionnaire and coordinate with NEHU Environmental Science Department in the conduct of survey. CEGIS can also support in questionnaire development as well as socio-ecological analysis on Bangladesh while working closely with the relevant stakeholders and institutions.

The outcomes of the analysis will help us identify hot spots of land use changes identified within the Meghna basin and better understanding of land use change dynamic to support the planning and sustainable management of the basin.

The draft of the atlas will be presented at the *Meghna Knowledge Forum*, planned in early 2020 and will be revised and finalised after incorporation of comments and feedback received at the forum.

2.3.2 Outcomes of Group 2: Socioecological Group

The socio-ecological group composed of Meghalaya River Basin Development Authority, IEG, Delhi, Gauhati University, East West University, Dhaka and Oxfam Bangladesh. The group was further divided into two working groups – (1) Land Use Change Analysis (NESAC-CEGIS) and (2) Socio-ecological Issues (with Oxfam, MBDA and others).

The socio-ecological group identified three linked topics for data gathering and analysis. The outcomes will be used as inputs supporting the identification/quantification of the drivers for the land use changes in the Meghna basin.

- a) Macro analysis of socio-economic changes over time in the Meghna basin (mostly based on household data available online from government -led surveys);
- b) Analysis on the trade-offs between stone-sand business and tourism in Dawki-Tamabil area (Umngot-Piyain); and,
- c) Cost-benefit and equity analysis of watershed rehabilitation (Umtyngngar watershed) in Meghalaya and wetlands conservation and Haor region (Sunamganj), Bangladesh.

Socioecological Group: Outputs and methodology				
S.no	Outputs	Objectives	Steps and methods	Partners
1	Macro analysis of socio-economic changes over time in Meghna basin (30yrs)	<ol style="list-style-type: none"> 1. Understanding trends and dynamics of occupation over time; 2. Understanding changes in cropping patterns and related water use; 3. Understanding changes in use of fertilizers and pesticides; and, 4. Understanding trends of loss and damages to crops due to water-related disasters 	<ul style="list-style-type: none"> • Gender segregated analysis to the extent possible; • Using published data; and, • basin-wide tabular analysis and maps 	<ul style="list-style-type: none"> • IEG, Delhi • Gauhati University, Department of Economics (DoE) • East-west University Dhaka • CNRS • Oxfam • CEGIS
2	Analysis of trade-offs between stone-sand business and tourism in Dawki-Tamabil area (Umngot-Piyain)	<ol style="list-style-type: none"> 1. Identifying benefits of tourism and its distribution across stakeholders in Bangladesh and India; 2. Identifying activities related with stone business that impacts tourism; and, 3. Identifying the trade-offs and differential impacts on stakeholders 	<ul style="list-style-type: none"> • Travel cost method; • Travellers and stakeholder survey; and, • Tourism index 	<ul style="list-style-type: none"> • NEHU • IEG • Gauhati University, (DoE) • ACD • Oxfam • CNRS • CEGIS

Socioecological Group: Outputs and methodology				
S.no	Outputs	Objectives	Steps and methods	Partners
3	Cost-benefit and equity analysis of watershed rehabilitation (Umtyngngar) in Meghalaya (India) and wetlands conservation in Haor region (Sunamganj, Bangladesh)	<ol style="list-style-type: none"> 1. Cost and benefits to communities from conservation initiatives; 2. Identifying distribution of benefits and costs across stakeholders in different scenarios (with and without conservation); and, 3. Understanding stakeholders' perceptions and reasoning about conservation actions 	<ul style="list-style-type: none"> • Impact evaluation (before-after, with and without); and, • Gender segregated impacts 	<ul style="list-style-type: none"> • MBDA • NEHU • IEG • Gauhati University (Department of Environment) • ACD • Oxfam Bangladesh • Center for Natural Resource Studies (CNRS) • CEGIS

2.3.3 Conclusion and next steps

The meeting developed a strategy for collaborative research among the academic institutions and civil society organisations from Bangladesh and India. This collaborative research strategy aims to generate data and information to fill existing knowledge gaps, including specific tools that can be designed to support decision making and planning in the Meghna basin.

Considering the sensitivity in both countries on data sharing, the Meghna Basin Atlas will be developed without physical data sharing. Both NESAC and CEGIS will initiate the approval process in their respective countries. For NESAC engagement, the approval is required from Indian Space Research Organisation, its parent organisation. IUCN will support in the coordination and approval process with ministries, such as the Ministry of Foreign Affairs in India and the Ministry of Development of North Eastern Region.

The meeting identified collaborative activities between NESAC and CEGIS beyond the development of Meghna Atlas. An example is a joint activity for the Sunamganj district in Bangladesh, one of the most vulnerable to lightning deaths. NESAC is working with Earth Network, a US-based consultancy group, to develop early warning system for the north-eastern region of India and can support CEGIS in developing early warning system for Sunamganj district.

Another is the aligning of research activities with the ongoing work and initiatives of other organisations to derive common benefits for both countries. For example, pre-existing data being built by World Bank through its [spatial agent app](#) that includes transboundary rivers such as those in India.

ANNEX 1: AGENDA

Agenda

Day 1: 11 June, Tuesday	
Time	Sessions
8:45 – 09:00	Registration
Session 1: Objectives of the meeting and introduction to the Meghna basin activities	
09:00– 09:10	Welcoming by NESAC, Shillong and IUCN India Dr P.L.N.Raju, Director, North Eastern Space Applications Centre Ms Archana Chatterjee, Senior Programme Officer, IUCN India
09:10 – 09:20	Presentation of meeting objectives and agenda (IUCN) Ms Archana Chatterjee, Senior Programme Officer, IUCN India
09:20- 10:30	Profile and benefit sharing opportunities in the Meghna basin (IUCN) Mr Vishwa Ranjan Sinha, Programme Officer, Water and Wetlands, IUCN Asia
10:30 – 10:50	<i>Group picture and coffee break</i>
Session 2: Data and research on land use changes in the Meghna basin	
10:50 – 13:00	Applications of space technology in River Basin Management (NESAC) (Presentation on NESAC activities and open discussions)
13:00 – 14:00	Lunch break
14:00 – 14:50	Land use change analysis in Northeast India Dr K Srinivas, Head SLRAD, LRUMG, NRSC, Hyderabad <i>Question and comments in plenary</i>
14:50 – 15:30	Land use change analysis in the Meghna basin, Bangladesh Dr Shahidul Islam, Director, Remote Sensing Division Centre for Environmental and Geographic Information Services (CEGIS), Dhaka <i>Question and comments in plenary</i>
15:30- 16:50	<i>Coffee break</i>
16:50 – 18:00	Participatory methods to understand community perspective on Social Ecological Systems: Perspectives from TROSA activities in Bangladesh Mr Enamul Mazid Khan Siddique, Project Coordinator-Water Governance, Oxfam Bangladesh
18:00 – 18:30	Plenary: Identify collaborative research outputs for the Meghna basin (prioritization of research themes and outputs, geographical or spatial scale)
19:00 – 21:00	Networking Dinner
Day 2: 12 June, Wednesday	
Session 3: Methodology, work plan, and timeline for joint activities	
09:00 – 09:15	Lessons from the Hilsa joint research process: Ecosystems for Life Project
09:15 – 09:30	Outcomes of the Meghna Advisory Group Meeting, January 2019 (ongoing initiatives and their impact on different stakeholder groups)
09:30 – 11:30	Working Group: Participants divided into working groups and discuss scope of study/outputs, methodology (based on the identified priority themes during plenary above) and discuss and agree on the work plan: <ul style="list-style-type: none"> - Who will do what considering the time and resources? - Gaps/missing counterparts, expertise etc.
11:30 – 11:45	<i>Coffee break</i>
11:45 – 13:30	Reporting back on the outcomes of Working Group and open discussions
13:30 – 14:30	End of Meeting with Lunch

ANNEX 2: LIST OF PARTICIPANTS

Sno	Title	Name	Organisation
Bangladesh			
1	Mr	Ahmmmed Zulfiqar Rahaman	Hydrologist and Climate Change Expert Climate Change and Disaster Management Division, CEGIS, Dhaka
2	Mr	A.K. Enamul Haque	Department of Economics East West University, Dhaka
3	Mr	Enamul Mazid Khan Siddique	Project Coordinator-Water Governance, Oxfam Bangladesh
4	Mr	Shahidul Islam	Director, Remote Sensing Division, Centre for Environmental and Geographic Information Services (CEGIS), Dhaka
India			
5	Ms	Saudamini Das	NABARD Chair and Professor, The Institute of Economic Growth (IEG), Delhi
6	Mr	Devesh Walia	Head, Dept of Environment, North-Eastern Hill University (NEHU) Shillong
7	Mr	Ch. Vabeiemo	Project Fellow, NEHU
8	Ms	Jaya Dutta	Program Coordinator, Asian Confluence
9	Ms	Rose Christine Mawlot Khasyantiew	Institute of Natural Resource Management, Meghalaya Basin Development Authority (MBDA), Shillong
10	Ms	Ivory Thabah	Junior Engineer, MBDA, Shillong
11	Mr	Dr. Ratul Mahanta	Associate Professor, Department of Economics, Gauhati University
12	Mr	P L N Raju	Director, NESAC
13	Mr	K K Sarma	Scientist/Engineer 'SG', NESAC
14	Mr	Ranjit Das	Scientist/Engineer 'SF', NESAC
15	Mr	Diganta Burman	Scientist/Engineer 'SF', NESAC
16	Ms	Haobam Suchitra Devi	Scientist/Engineer 'SE', NESAC
17	Mr	Jenita M Nongkynrih	Scientist/Engineer 'SE', NESAC
18	Ms	Pratibha T Das	Scientist/Engineer 'SE', NESAC
19	Mr	M Somorjit Singh	Scientist/Engineer 'SE', NESAC
20	Mr	Arjun B M	Scientist/Engineer 'SD', NESAC
21	Mr	Gopal Sharma	Scientist/Engineer 'SC', NESAC

22	Mr	K Srinivas	Head SLRAD, LRUMG, NRSC
23	Ms	Archana Chaterjee	National Coordinator, IUCN India Country
24	Mr	Vishwa Ranjan Sinha	Programme Officer, NRG, IUCN Asia Regional Office

ANNEX 3: PRIORITY AREAS FOR INVESTIGATION IN THE MEGHNA BASIN

Joint research opportunities identified at Meghna Advisory Group Meeting in Shillong, India from 17 to 19 January 2019. The research outcomes aim to fill the existing knowledge gaps hindering integrated planning in the Meghna basin, as well as the identification of local and basin-level benefit sharing opportunities for specific stakeholder groups and communities:

Priority Area 1: Impact of current planning and infrastructure development in the Meghna basin

- Comparative analysis of relevant national and provincial policies – to support the identification of benefit-enhancing opportunities aligned with government policies;
- Joint research to document threats to habitat quality and variety of pressures contributing to wetland degradation in the Meghna basin. Ex. Land use changes and its impacts on natural disasters, fisheries, agriculture;
- Documentation of environmental and socio-economic impacts of mining industries in Meghalaya and other parts of the Meghna basin. This study will support the development of a framework for inclusive and environmentally sound mining practices in the Meghna basin;
- Joint environmental and social impact assessments for hydropower projects (planned and ongoing) in the Meghna basin. It will inform and strengthen ongoing cooperation in the Energy sector and opportunities for joint hydro power development; and,
- Effectiveness of current flood embankment infrastructure and strategies (design, use of construction materials, etc.) in the Meghna basin, particularly in boarder zones

Priority Area 2: Sustainable management of ecosystem for livelihoods and DRR

- Study on the hydrological interdependencies between and among the sectors in the basin;
- Joint research on land use changes and its impact on the ecology, community livelihoods and delta development process;
- Joint research on common themes such as the impact of Climate Change and Aquaculture development on capture fisheries in the Meghna basin. The research will support the identification of specific intervention to minimise the impact in these two sectors on capture fisheries which is still the main livelihood for local communities in the basin;
- Joint research projects to feed the development of management plans for Haor ecosystems. Target both conservation and development issues and highlight the linkages with upstream catchment management in the Meghna basin (Ex. Meghalaya, Tripura); and,
- Joint field survey to identify ecologically sensitive areas for conservation by both countries;

Priority Area 3: Modelling, scenario-building and economic integration in the basin

- Nexus between food, energy and water security - identification of trade-offs for the development of agreements;
- Data for modelling of flood-related vulnerabilities and climate change impacts, with focus on water-dependent economic sectors and community and livelihoods;
- Impacts and benefits of inland waterways development on local communities, biodiversity and ecology. Business cases and scenarios on community benefits and women empowerment opportunities created through the development of navigation-based tourism in the Meghna basin, especially in the border areas;
- Consultation and research to identify localised opportunities for the economic integration and people-to-people interaction along the border areas. Ex, Dawki-Tamabil border zone, there are opportunities for cooperation on watershed management and joint development of fisheries, tourism and inland navigation;
- Understanding and quantifying roles of rainwater harvesting and other conservation measures in improving flow characteristics and water availability within the Meghna basin. This will help identify ways to simultaneously maximise benefits from the basin and ensure sustainable development; and,

- Data and information on hydro morphological factors – understanding flow characteristics, its linkages with seismicity and discharge in selected transboundary tributaries of the Meghna basin.

Priority Area 4: Re-establishing the past economic glory of the region

- Before 1947, Meghalaya, Assam and Bangladesh were part of the Bengal presidency and one of the most prosperous regions, with highest per capita income compared to any other parts of British-ruled India. Joint research and cooperation between Bangladesh and India (represented by states) to trace and re-establish historical connectivity and trade routes. This will help revive cultural ties and will feed the integrated management of the Meghna basin. It will also help change existing narrative for Bhutan and North East region of India – from a ‘land-locked’ to ‘water-linked’ regions.

Priority Area 5: Seismotectonics Framework for the basin

- The Meghna basin lies in a tectonic convergence zone and thus prone to earthquakes. This has implications for water governance in the region, such as the occurrence of flash floods, location and design of hydropower dams, waterways and other public utilities.