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## **Rapporteur's Report on Issues in Wetland Ecosystems Conservation and Management in the Context of North East Hill Region**

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### I

#### INTRODUCTION

Wetlands of North East (NE) India are one of the important sources of livelihood for the inhabitants. Rivers, streams, lakes, ponds etc. are different types of wetlands found in the region. Assam leads in terms of the number of identified wetlands in the region, followed by Arunachal Pradesh, Tripura, Nagaland, Meghalaya and Manipur. These wetlands help the local communities to adapt to climate change effects in the hill ecology through carbon sequestration which is evident from the fact it has maximum carbon density among the terrestrial ecosystems. The dense vegetation of wetlands plays significant role in carbon sequestration through regulation of process like decomposition, capture and storing greenhouse gasses (GHGs). Wetlands act as natural protection against the extreme weather events like storms and floods. They are also important source of water supply during dry periods which is more common now a day. These wetlands sustain the livelihood of local folks through fisheries, agriculture, livestock, forestry, fuel production and are part of the solution to the food security issues. Many of these sites are centre of eco-tourism in NE states of India which also creates employment and income opportunities for the locals.

Though the wetland ecosystem is a productive eco-system which acts as the source of livelihoods to its inhabitants through provisions of various goods and services, but the system is also sensitive and vulnerable to climate change, population growth and rapid urbanization. High altitude wetlands and coastal wetlands are considered as the ecosystems very sensitive to climate change in India as well as globally. All these are the reasons for decline in wetland areas, and the hydrological, economic and ecological functions they perform. The global total wetland areas shrunken by 35 per cent which is three times faster rate than the forest which is affecting the ecological and species balance dependent on these wetlands. Agriculture is one of the key drivers of wetland degradation; hence the future of sustainable food production is dependent on healthy wetlands and wise use of it.

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We have received total 6 papers relevant to Theme IV. The papers are categorised into two, i.e., (i) ecosystem services and livelihood issues and (ii) strategies for wetland conservation, management and development.

## II

### ECOSYSTEM SERVICES AND LIVELIHOOD ISSUES

The researchers studied the ecosystem services provided by the wetlands, livelihood options for the people dependent on these wetlands, production and consumption pattern etc. Geographically the riverine basin of Assam, i.e., Upper Brahmaputra Basin, Deepor Beel of Guwahati and floating Loktak lake of Manipur were covered.

S.P. Biswas and Santoshkumar Singh dealt with ecosystem services of riverine wetlands by studying the Upper Brahmaputra Basin (UBB). They reviewed the status of the floodplain wetlands in UBB, their bioresources as well as the economic and ecological services rendered by them. They have considered fisheries as the major ecosystem service provided by wetlands of UBB. and reported that floodplain wetlands in the UBB are locally known as *beel* which are biologically rich and highly productive ecosystems supporting aquatic flora and fauna. The wetlands of the area are of five major types - (a) oxbow lakes, (b) tectonic lakes, c) man-made tanks, (d) low-lying paddy fields, and (e) seasonal pools. High fishing pressure and climatic variability of the region have led to reduction in the wetland bioresources. Deforestation in the catchments, construction of roads and embankments and blockage of feeder channels of floodplain lakes added to the reduction of habitat complexity. They felt water quality deteriorated and biodiversity has shrunk due to rapid urbanisation and industrialisation. The aquatic life suffers due to improper disposal of solid waste and non-biodegradable materials and contamination of natural water bodies by agricultural pesticide and injudicious mining from river bed.

Nazneen Ara Hoque and Archana Singh conducted a case study on farmers' dependence on Deepor Beel, Assam vis-a-vis provisioning service of the wetland. They collected primary data from 80 farmers of a village name Mikirpara Chakardoe which is adjacent to the Deepor Beel. They estimated the cost of paddy cultivation and estimated the return in order to identify the farmer's dependence level on cultivation. They found that cost of cultivation is higher in *kharif* season as compared to *rabi* season. The farmers are withdrawing from farming activities due to shortfall in expected returns and better income opportunities outside the farm sector. They felt despite being a Ramsar site proper protection measures have not been undertaken which exorbitantly leads to pollution, industrial waste dump, construction activities, etc. They suggested that proper support to the farmers in the area is required so that the environmental quality of the beel remains intact. Policymakers can also refer to some of the successfully managed Ramsar sites for agricultural practices in the world viz., Kabukuri-numa (Japan), Laguna de la Cocha (Colombia), Hawizeh Marsh

(Iraq), etc. As the beel is located near Guwahati city where ample opportunities for other livelihood options are available, this could have been a positive factor as other livelihood options can pull pressure from the beel. A holistically taken approach can help us understand the complex ecological system of the wetlands that would benefit both the wetland and the people depending on it.

Diksha Samant and S.K. Srivastava studied production and consumption pattern of fish in India. They reported that India is still way behind in reaching self-sufficiency in many states, especially in NE states where the overall per capita fish consumption in the region is 12.29 kg which is quite high as compared to 9.57 kg in India during the year 2019-20. This excess demand indicates scope of increase in inland fish production in NE states. Inland fish production has shown impressive growth rate of 6.85 per cent which indicates its scope in achieving food and nutritional security. All the NE states have been found to be struggling to reach the state of self-sufficiency. The lowest self-sufficiency has been observed in Meghalaya (33.80 per cent), followed by Sikkim (55.04 per cent) and Nagaland (64.99 per cent). They felt India needs to formulate appropriate policies measures to increase the production, especially in major fish consuming states like NE states to cope up with this increasing fish consumption demand as well as to provide livelihood opportunities to the fish supply chains.

People of Manipur are socially, economically, culturally and ecologically linked with the Loktak lake. It is the source of water for domestic uses, generation of hydro-electric power, irrigation, habitat for several plants used as food, fishing ground for local people, fodder, fuel, medicines, biodiversity, recreation, *etc.* S. Basanta Singh *et al.* assessed the livelihood of households dependent on the Loktak lake of Manipur by surveying four villages under Moirang block of Bishnupur district. They calculated that majority of the households has moderate human (44.44 per cent), financial (44.44 per cent) and social assets (39.68 per cent). About, 42.86 per cent of the households have low physical assets. The study also identified the determinants of livelihood strategies on the basis of livelihood assets. Financial assets were the most important asset in adopting the livelihood strategies whereas; social assets could increase the chance of adopting other livelihood strategies apart from fishing in the study area. The authors concluded that this lake is a base for ecological and economic security, thus payments for ecosystem services for sustainable water management has to be encouraged and implemented.

### III

#### STRATEGIES FOR WETLAND CONSERVATION, MANAGEMENT AND DEVELOPMENT

A.D Upadhyay and Abhujam Anuradha Devi presented the status of wetlands in Tripura and proposed development strategies. The number of natural wetlands particularly pond/ lake and cut-off meander and oxbow lake declined from 74 and 84 in year 1997 to 60 and 78 during year 2010-11. These declines in wetland areas

adversely affected the fish biodiversity and livelihood of the fishermen in Tripura. The authors suggested policy measures such as promotion of local functional institutions for the management of the fisheries resources, strict compliance of provisions made under Indian Fisheries Acts and proper valuation of wetland ecosystems and scientific interventions for the restoration and management.

Occurrences of floods in Assam are common phenomena which affect the farmers tremendously as they suffer crop and livestock losses during floods. The challenges of floods in the state are dealt with differently by different stakeholders. Udeshna Talukdar *et al.* have identified different flood management strategies adopted by the farmers using the data from 150 households representing all five flood-prone agro-climatic zones of the state. The sampled farmers adopted diversification (varieties, crops and enterprises), green manuring for increasing yield, and alteration in date of sowing were the most common strategies. Nearly 77 per cent of the area under rice is either traditional or high-yielding flood-tolerant rice varieties. Adopting deep water rice and high-yielding varieties (Swarna Sub1 and Ranjit Sub1) was more common among the large farmers. In contrast, small and marginal farmers resorted to traditional flood-tolerant rice varieties (mainly *baodhan*) because of low input and management practices requirements. The variety is rich in iron, protein and anti-oxidant elements and mostly grown organic, has high potential in the international market. Linkages with global markets by strengthening the value chain will not only help in coping with a flood but also increase the income of the farmers in the State.

The entire theme is not properly covered as we have not received papers on valuation of wetlands, methodological issues or paper covering the impact of climatic change on wetlands as well as on the livelihood of the inhabitants. The papers received are restricted geographically only to NE Himalayan wetlands. Nevertheless, the papers primarily provided an overview of the status of wetlands in NE region, and strategies and policy measures necessary to arrest the decline of wetlands which may be useful to the authorities involved in wetland management.

The following issues may be discussed in the session.

1. The papers have considered only fisheries and agriculture as goods provided by the wetland ecosystem. Discussion can be held which of these are remunerative and have future scope for scaling up without disturbing the ecosystem. What are the values of other goods provided by the system? Papers have not dealt with services so how to incorporate the value of those into total value of the system?
2. Which type of fisheries and crops (varieties) can generate higher income to the inhabitants sustainably?
3. We have not received any paper on methodological issues including sampling procedure, data collection or analytical techniques. This can be discussed at the session.

4. The climate change part is not much dealt with by the authors, except a paper on adaptation. So discussion can be held on what will be estimated economic effect of climate change on their existence, on biodiversity, human-animal conflict, tourism, and livelihood of people directly dependent on these wetlands.

5. A plethora of suggestions are given by the paper writers. These suggestions may be debated and a countable number of suggestions can be prioritised through brainstorming.

6. Among the five types of wetlands in UBB one can assess which of those contribute more to livelihood? Which of those are facing relatively higher threat from climate change? What could be the remedy for that?

7. Since farmers are found to be withdrawing from farming in the surrounding of Deepor Bill one can find out ways to arrest this withdrawal? Whether the withdrawal can contribute positively to the ecosystem? They referred to successful cases of ecosystem management in different parts of the globe. Is it possible to replicate in India considering the economic and political ecosystem prevailing in the country?

8. Another issue raised is about increasing the fish production from wetlands. How it could be materialised without disturbing the wetland ecosystems.

9. The studies have focused on the livelihood security for the people dependent on the Loktak lake. There is a need to analyse what could be the best livelihood options for them? How the income can be maximised sustainably? Whether the government policies to conserve the wetland ecosystem helping to sustain the livelihood?

10. Regarding the issue about problems of flood in Assam one can assess, analyse and understand on which of the adaptation strategies could reduce the shock better?

11. There is an urgent need to understand the possible strategies for conservation and management of wetlands in the NE region of India and how the strategies can be prioritised? Whether a solution can fit to all the sub-types of wetland eco-system?