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SIGNIFICANCE OF RAMSAR SITE AND ITS CONSERVATION: AN ANALYSIS OF DEEPOR BEEL IN ASSAM, INDIA

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ABSTRACT

Deepor Beel is one of the most important wetlands in the Brahmaputra Valley. It was designated as a Ramsar Site in 2002 under the Ramsar Convention, which identifies wetlands of international importance. This designation highlights Deepor Beel's critical role in biodiversity conservation, ecosystem services, and its function as a wetland of significant ecological value. Deepor Beel covers an area of about 40 square kilometers and is a natural, permanent freshwater lake, forming part of the Brahmaputra River's floodplain. It supports a wide variety of flora and fauna. This study mainly focused on the present status of the wetlands, its significance and conservations measures of the Deepor Beel. As a Ramsar Site, Deepor Beel holds international recognition for its ecological importance. Its preservation is critical not only for maintaining biodiversity and the ecosystem's integrity but also for supporting the livelihoods of local communities. Continued conservation efforts are essential to mitigate the threats and ensure the long-term sustainability of this vital wetland.

Key words: Deepor Beel, Biodiversity, Ramsar Site, Migratory bird, Conservation

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1. INTRODUCTION

The area of wetlands worldwide is estimated to be between 5.3 and 12.8 million sq. km. The Ramsar Convention of 1971 has assisted 144 countries in protecting the most important wetlands that exist, even though around half of the world's wetland land has been lost (Zedler & Kercher 2005). A **wetland** is an area of land that is permanently or seasonally flooded with water, creating environments where soil and plants are adapted to wet conditions, serving important ecological functions such as supporting biodiversity, controlling floods, and filtering pollutants from water. Wetland may be freshwater, saltwater, or a mix of both. Of all the ecosystems on earth, wetlands are among the most productive (Bassi et al, 2014). Wetlands are also closely related to human livelihoods as well as abundant economic benefits and food security. Wetlands play a crucial role in natural rainwater harvesting by collecting and storing rainwater. These ecosystems act like sponges, absorbing rainfall and reducing runoff. This helps to replenish groundwater supplies and maintains the flow of rivers and streams during dry periods. Wetlands also improve water quality by filtering pollutants and sediments, promoting biodiversity, and preventing floods by slowing down the movement of water. Wetlands additionally play very important in controlling the local climate, especially in terms of moisture and temperature. Compared to terrestrial plants, the phytoplankton population is a far better sequesters of carbon dioxide, absorbing it considerably more quickly. Thus, wetlands are regarded as local carbon sinks as well. Wetlands, the most productive habitat, are home to a wide range of flora and fauna. For bird lovers, it is a paradise, and wetlands everywhere in the world are home to numerous captive species (Pandit, 2016). Deepor Beel is a freshwater lake located southwest of Guwahati city recognized as a significant riverine wetland of Brahmaputra basin in Assam. It is one of the largest and most important wetlands in Assam, India. The Deepor Beel is a Ramsar site and it is a highly biodiverse wetland.

2. STUDY AREA

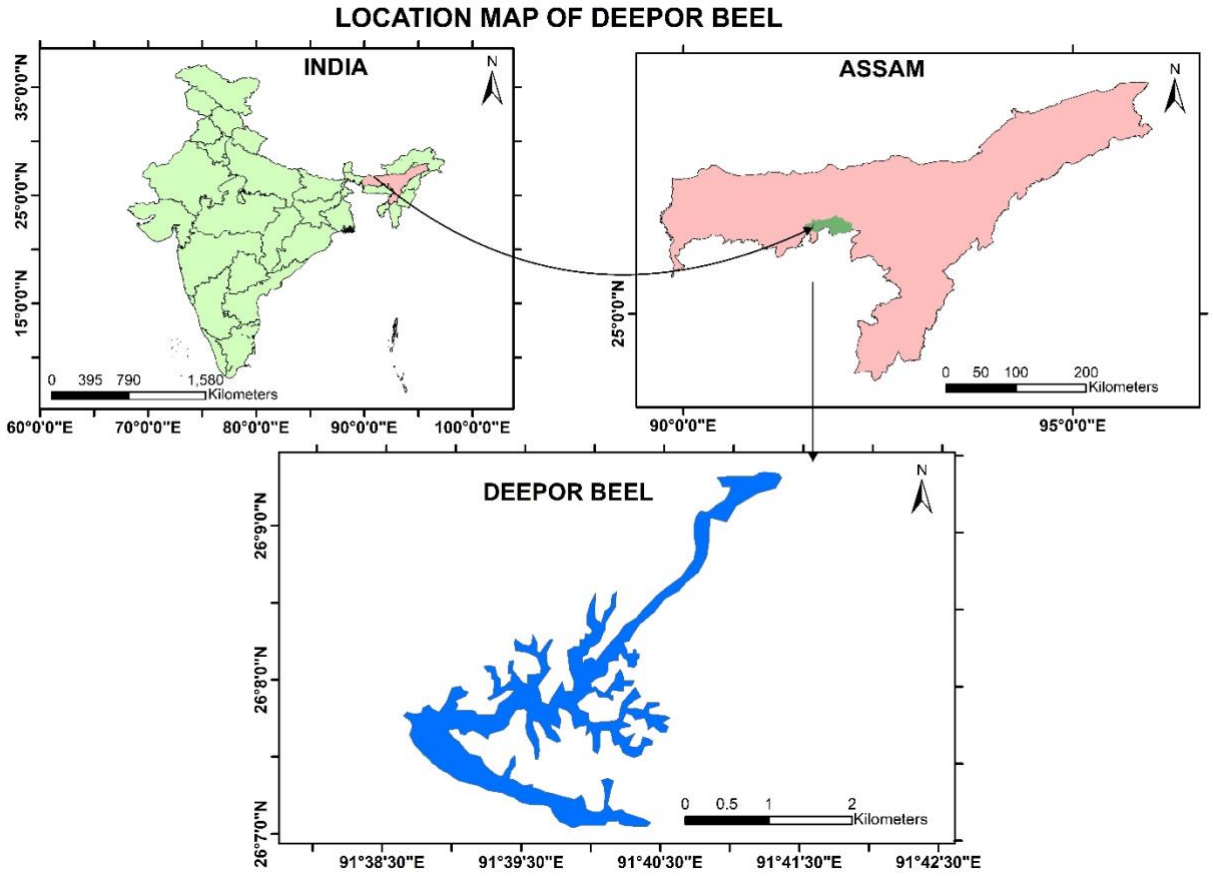

Figure 1. Location map of the study area

Deepor Beel is one of the largest and most important wetlands in Assam and has been designated as a **Ramsar site** due to its ecological significance. It is located between 90º36'39"E to 90º41'25"E and 6º05'26"N to 26º05'52"N. It is surrounded by the Bharalu River on the east, the Kalmoni River on the west, the Rani Garbhanga Reserve Forest on the south, and the Jalukbari hill on the north all encircle it. Because of the abundance of migratory and permanent birds that inhabit the area around the Beel, the wetland has gained significance as a bird sanctuary. Birdlife International has also recognized it as an Important Bird Area. Deepor Beel was designated as a Ramsar Site in 2002 by the Ramsar Convention, in recognition of its biodiversity and importance within the metropolitan area. Deepor Beel is a significant riverine wetland situated southwest of Guwahati. During the wet season, the area of Deepor Beel was measured to be 40.14 sq. km, with an encroached area of about 30.8 sq. km. The present area of the marsh is roughly 9.27 sq. km. However, it was subsequently discovered that the true area was 4.1 sq. km. Depending on the season, the Beel's depth varies from roughly 6 m to 1.5 m. (Pandit, 2016). In addition to being a

wildlife sanctuary, Deepor Beel is home to 200 different species of birds, including 70 migratory species (Rajkumari et al, 2024). Over 800 households in Deepor Beel directly depend on fishing for their livelihood, with an annual fishing value estimated at INR 11,64,69,375 (Dutta & Sharma, 2020). A number of densely inhabited settlements border the northeastern portion of the Beel, which extends to the east to a major highway (NH37). There is also a sizable human habitat on the southern edges. In the low-lying terrain next to the Deepor Beel, the people grow Boro paddy, a winter variety of rice. Roads, businesses, and populated areas are located at the outer periphery; these are primarily found on the eastern, northeastern, and northwest portions. In the northern and eastern edges of the Beel are several significant research and educational facilities. The Beel harbors a large number of migratory aquatic birds, especially in winter (Bhattacharyya & Kapil, 2009). The wetland receives **subtropical monsoon climate**.

3. METHODOLOGY AND DATA COLLECTION

This study is mainly based on both primary and secondary sources of data. Primary data was collected by field observation and interacting with local people. Secondary data are collected from different journals, books and reports. In our study three satellite images of Landsat 5 (TM) 1988, 2005 and Landsat 8 (OLI) 2024 were downloaded from USGS (United State Geological Survey) website which was used for mapping the Deepor Beel shrinkage. The map from Survey of India also used to prepare the location map of the study area. All the map was prepared using the Arc GIS environment. The study is mainly descriptive type of study. Our study is mainly focusing on the understanding the significance of the Deepor Beel wetland, its present status and its conservation.

4. PRESENT STATUS OF THE DEEPOR BEEL

Wetlands are essential to human well-being because they promote economic development and aid in climate adaptation and mitigation. They are home to innumerable plant and animal species that rely on wetlands to survive (Saikia, 2019).

Deepor Beel is one of Assam's most important freshwater wetlands. The majority of the water in the wetlands is supplied by the rivers Basistha and Kalmani during the monsoon season. The Khanajan stream is then used to descend to the Brahmaputra, which serves as Guwahati's natural storm-runoff basin. The biodiversity of Deepor Beel and the water body are in danger due to urban development. The Borsola Beel and other low-lying areas of Pandu, which are located in the

northeast, connected the wetland to the Brahmaputra basin. But, with the development of the National Highway-37 and, other urban infrastructure projects in the surroundings, this link has been shallowed down and, even cut altogether in certain areas. Nowadays the wetland and its ecology are in danger of shrinking due to a number of recent urban developments, which may also result in the extinction of species and a change in the land use pattern in the surrounding area. When the southern railway track was built by Indian Railways in 2001, the Deepor Beel was gradually split into different sections, which had an impact on both the environment and the wetland specifically. In addition to endangering metropolitan areas, illegal settlements, the establishment of factories, the building of highways, and other projects have hindered the wetland in numerous ways. Meanwhile, a large number of companies and factories expanded their operations into the neighborhood and dumped their waste and trash into the Beel. These actions put the wetland's biodiversity at risk and started to contaminate it. The creation of the city's garbage center in the Boragoan area at the eastern boundary has additionally contributed to significant pollution of the Deepor Beel's waters, which in turn has facilitated the spread of disease vectors and water-borne infectious diseases. The natural Elephant Corridor that is currently located close to the Rani-Garbhanga Reserve Forest was also hindered by the construction of the Northeast Frontier Railway. Elephants of the endangered species (Elephas maximus) will become less in number as a result of this move, as many of them died while trying to cross the railway line. The second effect is that the nearby villages, which are located on the land where their ancestral home previously stood, are overrun by wild elephants who emerge from the forest and demolish all forms of agriculture as well as agricultural fields (Pandit, 2016). One of the at risk Ramsar sites is Deepor Beel, which has undergone degradation in terms of biological characteristics, water quality, quantity, and spatial extent (RIS, 2002). One of the most pressing issues facing Deepor Beel is the dumping of solid waste from Guwahati city. The **Boragaon landfill,** located near the wetland, is a significant source of pollution. The waste, including plastics and other hazardous materials, contaminates the water and negatively impacts the ecosystem. Effluents from nearby industries, including chemical pollutants, further degrade the quality of the water in the wetland. Untreated or poorly treated sewage from nearby residential areas is also discharged into the wetland, further polluting the water and threatening biodiversity. Rapid urbanization and population growth in Guwahati have led to the encroachment of land around Deepor Beel. This has reduced the size of the wetland, disrupting its ecological balance and threatening the habitats of many species. There is also pressure from agricultural activities, which further reduces the natural area of the wetland and leads to changes in land use. The wetland, once a haven for a wide variety of bird species and

aquatic life, is seeing a decline in biodiversity. Pollution, habitat destruction, and human activities are driving many species away.

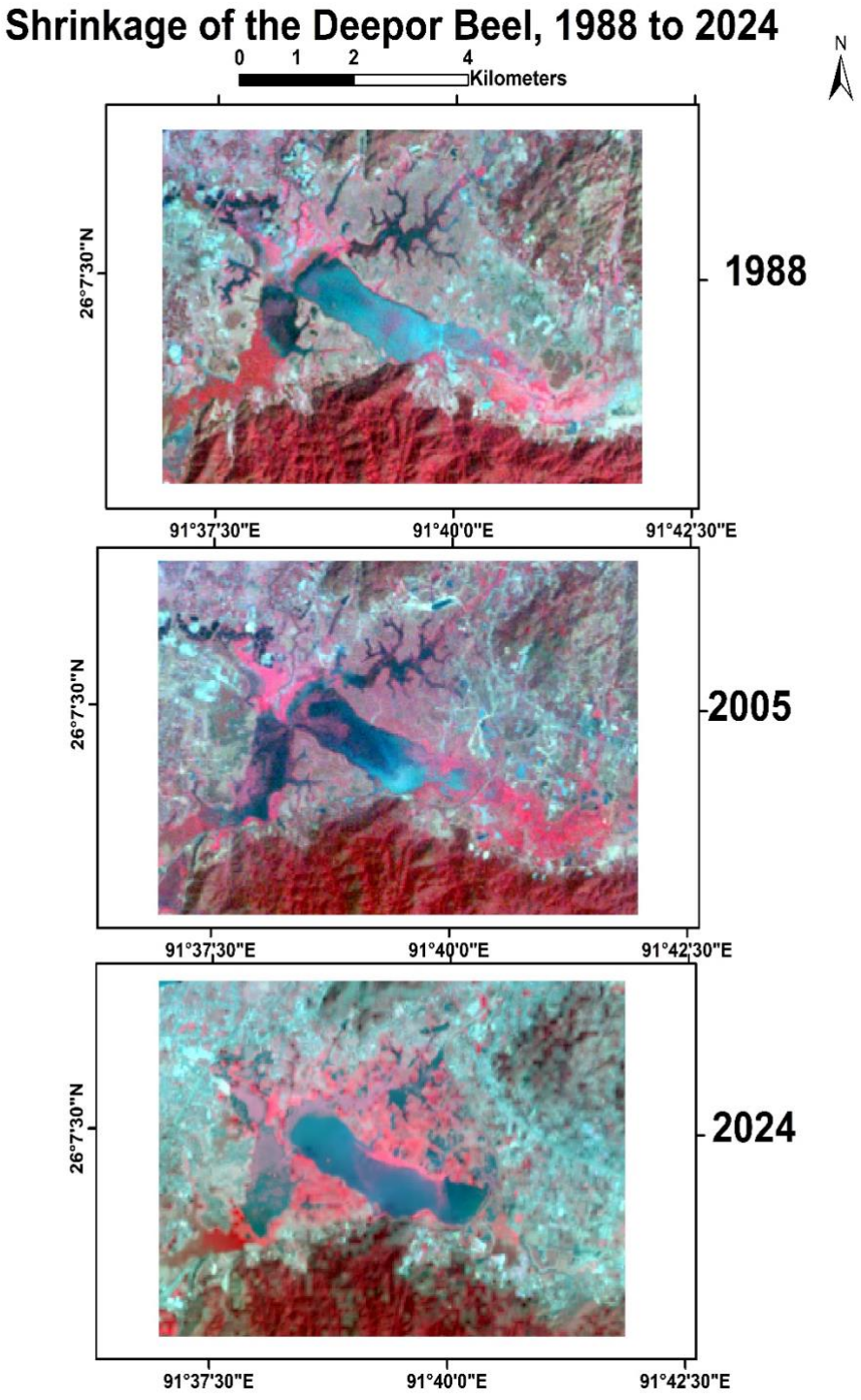

Figure 2. Map showing the shrinkage of Deepor Beel from 1988 to 2024

5. SIGNIFICANCE OF DEEPOR BEEL

Northeastern India's Deepor Beel is a prospective wetland that consistently supports a significant amount of the wetland biota, which includes 232 bird species, 24 mammals, 61 fish, 32 reptile species, and 11 amphibian species (Saikia, 2005). The major significance of the wetland is discussed below.

5.1 Biodiversity hotspot: Deepor Beel is home to a rich diversity of species, including endangered and rare ones. It serves as a habitat for various fish, amphibians, reptiles, and mammals. The wetland supports **over 220 species of birds**, including globally threatened species like the **spot-billed pelican**, **white-rumped vulture**, and **greater adjutant stork**. It is a crucial stopover for migratory birds during the winter months, making it a vital part of the migratory route for birds across South and Southeast Asia. Many different plant and animal species are supported by the area's high land, partly deep water, and partially shallow water.

5.2 Ecological Values: The Deepor Beel ecosystem is a self-sufficient and self-sustaining ecosystem with both biotic and abiotic components that constantly interact with the adjacent population. It's an evolving setting where the yearly energy subsidy and outflow occur. During the monsoon, runoff and hill streams of water from the wetland's catchments area continuously restore the soil reservoir with phosphorus and other nutrient elements to the Beel.

5.3 Cultural and Tourism Value: The wetland holds cultural significance for the local communities, who have traditional practices tied to the water body. Deepor Beel's scenic beauty and rich biodiversity, especially its bird population, attract eco-tourists, birdwatchers, and photographers. This offers opportunities for local communities to engage in guiding, offering homestays, and selling handicrafts, food, and other products to visitors.

5.4 Livelihoods: Deepor Beel is a vital source of livelihood for local communities, particularly those engaged in fishing. The wetland supports a variety of fish species, making it a crucial resource for local fishermen. Many of the local communities engage in traditional, sustainable fishing practices that have been passed down through generations. This ensures a continuous supply of fish for both consumption and sale in local markets. More than a thousand families make fishing their only source of income (FTR, 2003).

The local communities harvest aquatic plants and other wetland vegetation for multiple uses, such as fodder for livestock, fuel, and raw materials for making traditional crafts. Communities around

Deepor Beel collect wild edible plants, medicinal herbs, and other useful forest products, which either supplement their diets or are sold in local markets.

5.5 Livestock Grazing: The surrounding grasslands of Deepor Beel serve as grazing grounds for livestock, particularly during the dry season when other sources of fodder are scarce. They mainly rear cows, goats and buffaloes. This contributes to the livelihoods of pastoralists and livestock owners. The aquatic plants and grasses from the wetland are used as fodder, ensuring the health and productivity of cattle and other livestock, which are key assets for local households.

5.6 Disaster Mitigation: The wetland helps mitigate the effects of floods, protecting surrounding farmlands and human settlements. Deepor Beel plays a significant role in flood control for Guwahati city. The wetland acts as a natural reservoir, absorbing rainwater and runoff during the monsoon. This prevents the immediate overflow of water into the city, reducing the risk of urban flooding. It also receives floodwaters from local streams, acting as a buffer.

6. CONSERVATION MEASURES

Conserving **Deepor Beel,** a vital wetland ecosystem, is crucial not only for maintaining its ecological balance but also for the wellbeing of Guwahati city, especially in terms of flood control. The following are some important conservation measures that can be adopted to protect and restore Deepor Beel.

6.1 Protection from encroachments: Prevent illegal encroachments and construction activities in and around the wetland is important for conservation of the Deepor Beel. It is also necessary to establish a State-level Wetland Regulatory Board to control development near wetlands and to devise plans for promoting the preservation of traditional livelihoods. Designate and protect buffer zones around the wetland where no construction or development can take place. Use satellite imagery and geographic information systems (GIS) to regularly monitor changes in the land use around Deepor Beel helps in detecting illegal constructions or land use changes quickly.

6.2 Sustainable urban planning: Need to ensure that urban planning in Guwahati considers the importance of Deepor Beel and its ecological functions. Urban expansion should be planned in a manner that avoids encroachment on wetlands and their buffer zones. Manage storm water and urban runoff effectively through proper drainage systems to avoid dependence on the wetland for dumping wastewater.

6.3 Pollution control: It is strictly prohibited to dump industrial, municipal, and domestic waste into the Beel and establish waste management plants and ensure the surrounding villages and industries follow proper waste disposal methods. Install and upgrade sewage treatment facilities to prevent untreated sewage from entering the wetland is very important.

6.4 Sustainable fisheries and livelihoods: Sustainable fisheries and livelihoods in **Deepor Beel** are crucial for ensuring the wetland's ecological health and maintaining the socio-economic well-being of the local communities. Promote traditional fishing methods and prevent overfishing by implementing sustainable fishery practices can help protect the wetland's biodiversity while providing local people with a steady source of income involve local communities in the conservation efforts by providing alternative livelihoods, such as eco-tourism, to reduce their dependence on the Beel's resources

6.5 Public awareness: For public awareness there is need to conduct mass awareness campaigns through social media, local newspapers, radio, and TV channels to educate the general public about the ecological and social importance of Deepor Beel. Educate students and youth about the need to protect Deepor Beel by incorporating environmental education into school curriculums and organizing workshops or natural walks

By implementing these measures, the long-term ecological health of **Deepor Beel** can be preserved, ensuring it continues to provide critical ecosystem services, including flood control, for the city of Guwahati.

CONCLUSION

Deepor Beel, designated as a **Ramsar Site,** holds significant ecological, hydrological, and socio-economic importance. Being part of the **Ramsar Convention**, an international treaty for the conservation and sustainable use of wetlands, Deepor Beel is recognized as a wetland of international importance. Wetlands are among the most productive ecosystems in the world, and Deepor Beel plays a crucial role in maintaining biodiversity. Protecting it ensures the conservation of its rich flora and fauna, which are vital for the overall health of the region's ecosystem. Deepor Beel Wetland is not only an ecological treasure but also an essential component of the local economy and culture. Its protection is crucial for biodiversity conservation, flood mitigation, and sustaining the livelihoods of local communities. **Deepor Beel provides direct and indirect livelihood benefits** to the local communities, ranging from **fisheries and agriculture** to eco-tourism, natural resource harvesting, and conservation-related employment. Its sustainable

management is critical for maintaining these livelihoods, supporting the local economy, and promoting long-term socio-economic development.

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