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WETLAND DEGRADATION IN GOLAGHAT DISTRICT OF ASSAM: CAUSES AND SOCIO- ECOLOGICAL IMPACTS

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Abstract

Wetlands are among the most productive ecosystems on Earth, providing vital ecological, hydrological, and social services. In Assam, particularly in the Golaghat district within the Kaziranga landscape, wetlands such as Jugibil, Sankar Beel, Mora Diphlu Beel, and Sohola Beel serve as critical habitats for globally threatened species while supporting local community livelihoods. However, these wetlands are undergoing rapid degradation due to growing anthropogenic influences and climatic variability. This paper examines (1) the major causes of wetland degradation in the Golaghat district, and (2) the ecological and social impacts of this degradation, drawing from secondary literature, government reports, and field-based case studies. Findings indicate that encroachment, land-use change, infrastructural expansion, overfishing, siltation, pollution, and invasive species proliferation are the primary drivers of degradation. These pressures lead to significant ecological consequences such as loss of biodiversity, habitat fragmentation, hydrological disruption such as well as socio-economic impacts such as declining fish resources, reduced grazing grounds, loss of traditional livelihoods, and weakening of community resilience. The paper concludes by highlighting the urgent need for community-based conservation, legal protection of vulnerable wetlands, regulation of tourism, and long-term scientific monitoring to ensure sustainable wetland management in Golaghat.

Keywords: Wetland degradation, Golaghat district, Kaziranga landscape, Jugibil, Beels of Assam, Biodiversity loss

Introduction

Wetlands represent ecologically dynamic zones where terrestrial and aquatic systems intersect, leading to high productivity and biodiversity. They regulate hydrological cycles, filter pollutants, control floods, store carbon, recharge groundwater, support fish populations, and provide habitat for numerous species (Mitsch & Gosselink, 2015). Globally, wetlands are recognized as indispensable components of ecological health and human well-being. Yet, they remain among the most threatened ecosystems.

Assam, lying in the floodplains of the Brahmaputra and Barak rivers, contains a dense network of wetlands including beels (oxbow lakes), marshes, floodplain lakes, and seasonal water bodies. In Golaghat district, wetlands form an integral part of the larger Kaziranga landscape, which is globally acclaimed for its biodiversity. Kaziranga's beels and peripheral wetlands support the world's largest population of the greater one-horned rhinoceros, along with wild buffalo, swamp deer, elephants, and a rich assemblage of resident and migratory birds (Forest Department of Assam, 2023). Wetlands such as Jugibil, Mora Diphlu, Sankar Beel, and Sohola Beel not only serve ecological functions but also sustain the socio-economic fabric of local communities by providing fish, fodder, water for agriculture, and spaces for cultural practices (Bora & Deka, 2020). However, this delicate wetland network is increasingly under threat. Across Golaghat district, rapid alterations in land use, encroachment for agriculture and tourism infrastructure, unregulated fishing, silt deposition from Brahmaputra floods, invasive plant species, and pollution pose significant risks. Climate change-driven extreme rainfall and flooding amplify this deterioration. The degradation of wetlands has profound consequences not only for biodiversity but also for community livelihoods.

This paper is structured around two core objectives:

(1) To examine the major causes of wetland degradation in Golaghat district, and

(2) To analyse the ecological and social impacts arising from this loss.

Focusing on these objectives facilitates a detailed and focused understanding of the crisis affecting the wetlands of Golaghat and the broader implications for ecological and human systems.

Methodology

This study adopts a qualitative research design supported by secondary data analysis to investigate the major causes of wetland degradation in Golaghat district of Assam and to assess its ecological and social impacts. The methodological approach is structured into three interconnected components: sampling, data collection, and data analysis.

Sampling

A purposive sampling strategy was used to select the wetlands, documents, and data sources relevant to the study objectives. Purposive sampling was chosen because it allows the researcher to focus specifically on wetlands experiencing significant ecological stress and human pressure. Wetlands such as Jugibil, Sankar Beel, Mora Diphlu Beel, and other beels of the Kaziranga landscape were selected based on their ecological importance, documented environmental changes, and availability of prior studies. In addition, literature and official reports were screened based on criteria such as geographic relevance to Golaghat district, focus on wetland ecology, documentation of human-induced changes, and reliability of the publishing organization. This sampling approach ensured that the study captured diverse but contextually interconnected sources that collectively reflect the ecological and socio-economic dynamics of wetland degradation in the region.

Data Collection

Data collection relied exclusively on secondary sources due to the study's qualitative and descriptive nature. Academic books, peer-reviewed journal articles, government reports, and NGO publications were systematically reviewed to gather information on wetland ecology, patterns of degradation, and socio-economic dependencies. Key reports from the Ministry of Environment, Forest and Climate Change (MoEFCC), the Assam Forest Department, the Zoological Survey of India, and regional research institutions provided authoritative scientific data on biodiversity trends, hydrological changes, and land-use patterns. Satellite imagery, remote sensing studies, and wetland mapping reports were used to understand changes in wetland area over time. Annual waterbird census data, environmental impact assessments, and district gazetteers were examined to assess ecological impacts. Newspaper articles, field-based case studies, and community-focused NGO reports provided additional perspectives on

livelihood impacts, tourism pressures, and community interactions with wetlands. All documents were collected using academic databases such as Google Scholar, ResearchGate, JSTOR, and official government portals.

Data Analysis

The analysis followed a qualitative, thematic approach to synthesize information from diverse sources. First, all collected data were organized into thematic categories that aligned with the study objectives: causes of degradation and ecological-social impacts. Recurring patterns such as encroachment, pollution, siltation, invasive species, overfishing, and tourism pressure were identified and consolidated to form a coherent understanding of the major drivers of degradation. Ecological impacts were analyzed through biodiversity indicators, hydrological studies, and habitat change assessments, while social impacts were evaluated using livelihood studies, economic reports, and demographic data. Triangulation of information from multiple sources ensured the reliability and validity of findings, reducing bias associated with single-data dependency. Through this analytical framework, the study constructed a comprehensive interpretation of how human activities and natural processes collectively contribute to wetland degradation in Golaghat and how these ecological changes affect local communities.

Causes of Wetland Degradation in Golaghat District

The degradation of wetlands in the Golaghat district is the outcome of a complex interaction between human interventions and natural stressors. These wetlands, which form critical ecological components of the Kaziranga landscape, are increasingly threatened by expanding human populations, changing land-use patterns, and intensifying environmental pressures. Current literature, government reports, and regional case studies indicate that the primary drivers of degradation include human encroachment, unsustainable resource use, pollution, siltation, invasive species, tourism-related disturbances, and climate variability (Phukan, 2013; Kutum et al., 2022). Each of these factors operates at multiple scales and collectively contributes to the accelerated decline of wetland health and ecological integrity in the district.

Human Encroachment and Land-Use Transformation

Human encroachment remains the most pervasive and immediate cause of wetland degradation in Golaghat. As population density has increased over the years, wetlands traditionally used for fishing, grazing, or ecological functions have been converted into

agricultural fields, residential settlements, brick kilns, commercial establishments, and tourism-related infrastructure. This process is evident in wetlands such as Jugibil and Sankar Beel, where the expansion of paddy cultivation and settlement boundaries has significantly reduced open-water areas (Kutum et al., 2022). The construction of markets, houses, and roads along wetland margins further alters natural drainage channels, often leading to either excessive waterlogging or complete drying out of certain sections. In the Kaziranga periphery, the proliferation of hotels, resorts, and safari-related structures near ecologically sensitive wetlands has intensified habitat fragmentation and hydrological disruption (Phukan, 2013). As a result, these transformations undermine essential wetland functions such as flood buffering, groundwater recharge, and habitat connectivity.

Overfishing and Unsustainable Resource Extraction

Overfishing presents another critical threat to wetland sustainability in Golaghat district. Many rural households rely on wetland-based fisheries for income, nutrition, and subsistence, making fishing a culturally embedded livelihood practice. However, increasing economic pressures have led to the adoption of unsustainable fishing methods, including the use of fine-mesh nets that trap juvenile fish, dewatering of wetlands during the dry season to maximize catches, and nighttime fishing using artificial lights, which disrupts natural breeding cycles (Sarmah et al., 2023). In some undocumented cases, poisoning agents and other destructive techniques have been reported informally. Such practices have caused a rapid decline in fish diversity and overall biomass, undermining the ecological balance of the wetland food web. The reduction in fish availability also affects waterbirds, otters, and other aquatic animals dependent on fish as a primary food source, thereby contributing to wider biodiversity loss across the region.

Pollution from Agricultural Runoff and Tourism

Another major driver of wetland degradation in Golaghat is pollution, largely originating from agricultural intensification and unregulated tourism. The widespread use of synthetic fertilizers, pesticides, and herbicides in farmlands surrounding wetlands leads to nutrient-rich runoff entering these water bodies during the monsoon season. This runoff accelerates eutrophication, promoting algal blooms that deplete dissolved oxygen and degrade water quality, making conditions unsuitable for fish, amphibians, and native vegetation (Borah & Saikia, 2021). Tourism near Kaziranga, although economically beneficial, has contributed significantly to pollution through waste disposal, sewage leakage,

and increasing plastic accumulation along riverbanks and wetland margins. The cumulative effect of agricultural and tourism-related pollution has been a noticeable decline in aquatic vegetation, fish breeding habitats, and avifaunal feeding grounds. In several wetlands, deteriorating water quality has surpassed ecological thresholds, posing long-term consequences for both biodiversity and local livelihoods.

Siltation and Hydrological Changes

Siltation is a natural process in floodplain ecosystems but has been exacerbated by increased soil erosion and changes in river hydrology. The Brahmaputra River and its tributaries bring enormous quantities of sediment during annual floods, depositing sand and silt into adjacent wetlands. Over time, this sediment accumulation has reduced the depth and water-holding capacity of wetlands throughout Golaghat district (Times of India, 2024). As water bodies become shallower, open-water habitats shrink, leading to the replacement of aquatic areas with marshy vegetation a process known as terrestrialization. This affects species such as deep-water fish and migratory birds that rely on open-water habitats for feeding and nesting. Human-made embankments, road construction, and drainage alterations further disrupt natural hydrological flows, causing water stagnation in some areas and rapid drying in others. These hydrological inconsistencies reduce wetland resilience and compromise their ecological functions.

Invasive Aquatic Weeds

The proliferation of invasive aquatic weeds, particularly water hyacinth (Eichhornia crassipes) and Salvinia molesta, poses a significant ecological challenge to wetlands in Golaghat. These species thrive in nutrient-rich environments and spread rapidly, forming dense mats across the water surface. Their expansion reduces sunlight penetration, lowers dissolved oxygen levels, and prevents the growth of native aquatic plants, thereby disrupting the ecological balance of the wetlands (Kutum et al., 2022). Invasive weeds also restrict fish movement, hinder small-scale fishing practices, and limit open-water areas essential for migratory birds. Wetlands like Jugibil experience seasonal but heavy infestations, especially during winter, when reduced water levels allow invasive species to dominate the landscape. Over time, such infestations accelerate the deterioration of aquatic ecosystems and reduce wetland productivity.

Tourism and Infrastructure Development in Kaziranga

Kaziranga National Park, a UNESCO World Heritage Site, attracts hundreds of thousands of tourists annually, resulting in substantial infrastructure development around the park and its adjoining wetlands. While tourism supports local economies, unplanned and rapid growth of resorts, hotels, and safari-related facilities has intensified ecological pressure on wetlands. The construction of accommodations near beels interrupts wildlife movement, particularly for species like elephants and rhinoceroses that depend on wetlands for water and grazing (Borah & Saikia, 2021). Safari routes often traverse near sensitive wetland habitats, causing noise disturbances that affect bird breeding and feeding activities. Waste mismanagement, including untreated sewage discharge, further contributes to wetland pollution. Additionally, rising land prices in tourist zones encourage further wetland conversion for commercial purposes, accelerating habitat loss.

Climate Change and Extreme Weather Events

Climate change acts as a multiplier of existing threats by altering rainfall patterns, intensifying floods, and creating unpredictable hydrological cycles. Increased frequency of extreme rainfall leads to flash floods that deposit large volumes of sediment in wetlands, while prolonged dry spells during winter result in drastically reduced water levels (Geethanjali, 2019). These changes affect species composition by altering breeding cycles, water temperatures, and oxygen availability. Hydrological connectivity between wetlands is also disrupted, affecting fish migration and the movement of large mammals. Climate change therefore amplifies the impacts of anthropogenic pressures, accelerating the pace of wetland degradation and reducing ecological stability in the region.

Ecological Impacts of Wetland Degradation

The ecological consequences of wetland degradation in Golaghat are far-reaching, influencing not only wetland-dependent flora and fauna but also the broader functioning of the Kaziranga landscape. As wetlands shrink, become polluted, or lose hydrological integrity, their ability to support biodiversity, regulate water flows, and maintain ecological balance is significantly diminished.

Decline in Biodiversity

Wetlands in Golaghat serve as critical habitats for numerous species, including migratory waterbirds, freshwater fish, reptiles, amphibians, and mammals such as the greater one-horned rhinoceros. Degradation leads to declines in fish diversity, reduction in resident

and migratory bird populations, and the loss of amphibian breeding sites due to pollution and habitat conversion (Forest Department of Assam, 2023). Shrinking wetlands particularly affect species that depend on open-water habitats for feeding, nesting, or migration. The 2023 waterbird census reported more than 112,000 birds in Kaziranga's wetlands, yet certain species have shown localized declines due to habitat loss and fragmentation. As wetlands lose their ecological integrity, food availability decreases, predator–prey relationships weaken, and species become more vulnerable to disease and predation.

Habitat Fragmentation

Athropogenic activities such as land conversion, road construction, and hydrological alterations fragment wetland ecosystems, reducing habitat connectivity among water bodies. Fragmentation restricts the movement of fish, birds, and other species that require interconnected wetland systems for feeding, breeding, or seasonal migration (Kutum et al., 2022). Migratory bird routes are disrupted when wetlands become isolated, and fish species that depend on seasonal flooding to move between habitats face increased mortality. Fragmented wetlands are less capable of recovering from environmental disturbances and exhibit diminished ecological resilience.

Disruption of Hydrological Processes

Wetlands naturally regulate water cycles by storing excess rainfall during floods and releasing water gradually during dry periods. When wetlands degrade, their water retention capacity declines, contributing to intensified flooding during monsoons and water scarcity in dry months (Mitsch & Gosselink, 2015). Reduced groundwater recharge affects nearby agricultural fields and drinking water sources, while altered drainage patterns increase erosion and sedimentation. Hydrological instability also influences the survival of aquatic species that depend on consistent water availability for breeding, feeding, and movement.

Loss of Ecological Functions

Wetlands perform a wide array of ecological services such as carbon sequestration, water purification, nutrient cycling, and local climate regulation. Their degradation significantly reduces these functions. Polluted wetlands release methane and nitrous oxide due to anaerobic decomposition of organic matter, contributing to greenhouse gas emissions. Loss of vegetation decreases the wetland's capacity to filter pollutants, resulting in contaminated water entering rivers and agricultural fields (Geethanjali, 2019). Similarly, the

loss of native plant species affects nutrient cycling, reducing soil fertility and altering the ecological balance within and beyond wetland boundaries.

Social Impacts of Wetland Loss

Wetland degradation in Golaghat poses substantial social and economic challenges, particularly for communities that rely on wetlands for fishing, agriculture, livestock grazing, and cultural practices. As ecological health declines, so too does the capacity of wetlands to support local livelihoods and traditional lifestyles.

Decline in Fisheries and Livelihood Loss

Fishing communities around Jugibil, Sankar Beel, and Mora Diphlu are among the most directly affected by wetland degradation. Reduced fish populations caused by overfishing, pollution, and invasive species have led to lower daily catches, declining household income, and increasing livelihood insecurity (Sarmah et al., 2023). In some cases, fishers are forced to migrate seasonally to other regions in search of employment. The diminishing reliability of fisheries undermines nutrition and food security, disproportionately affecting economically vulnerable households.

Reduced Agricultural Productivity

Wetlands contribute significantly to regional agriculture by supporting irrigation, soil moisture retention, and nutrient deposition. As wetlands become shallower or dry out due to siltation and hydrological alterations, farmers experience reduced access to irrigation water, leading to lower crop yields and decreased agricultural productivity (Phukan, 2013). Sediment deposition alters soil fertility, sometimes creating areas unsuitable for cultivation. These changes compel farmers to adopt costly irrigation mechanisms or shift to low-yield crop varieties.

Loss of Grazing Grounds

Communities that depend on livestock grazing are also affected by wetland degradation. Wetland margins traditionally serve as important grazing grounds, especially during winter when other areas dry out. As wetlands shrink, the availability of fodder decreases, forcing pastoralists to travel longer distances or encroach into forested areas, often leading to human–wildlife conflict near Kaziranga National Park (Bora & Deka, 2020). Reduced grazing areas increase economic strain on livestock-rearing households.

Erosion of Cultural and Traditional Practices

Wetlands in Assam hold cultural significance, serving as sites for traditional fishing festivals, ritual ceremonies, and community gatherings. Degradation leads to the erosion of these cultural practices, as shrinking or polluted wetlands are no longer suitable venues for traditional activities. The diminished ecological health of wetlands disrupts intergenerational knowledge transfer related to fishing, water management, and wetland stewardship (Kutum et al., 2022). This cultural loss not only affects community identity but also weakens traditional conservation practices historically embedded in local customs.

Impact on Eco-Tourism and Local Economy

Wetlands attract birdwatchers, researchers, and tourists interested in the natural beauty of the Kaziranga landscape. As wetland biodiversity declines, these areas become less appealing to visitors, resulting in decreased tourism-generated income for local guides, homestays, and crafts persons (Borah & Saikia, 2021). Additionally, the loss of charismatic bird species reduces the overall tourism value of the region. The economic implications extend to local markets and service providers dependent on the tourism sector, further affecting community livelihoods.

Conclusion

Wetland degradation in Golaghat district of Assam presents both ecological and social challenges. The major causes are encroachment, overfishing, pollution, invasive species, siltation, tourism expansion, and climate change collectively undermine the health of wetlands such as Jugibil and the Kaziranga beels. The ecological impacts include biodiversity loss, habitat fragmentation, hydrological disruption, and reduced ecological functioning. The social impacts are equally severe, affecting fisheries, agriculture, livestock rearing, cultural practices, and local economies.

Given the importance of wetlands in maintaining ecological balance and community livelihoods, urgent conservation actions are required. Sustainable management must address both the drivers of degradation and the needs of communities who depend on wetlands. Only through coordinated efforts among government agencies, local communities, scientists, and conservation organizations can the wetlands of Golaghat be protected for future generations.

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