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**Topic:** Landscape Ecological and Socio-Economic Vulnerability to Riverbank Erosion in the Middle Brahmaputra Floodplains of Assam

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### **Findings**

The Middle Brahmaputra River has shown a differential rate of erosion and deposition over the last three decades. Continuous bank-line migration and the consequent erosion and deposition along the river have made the floodplains extremely vulnerable. The river was observed to be migrating southwards making the south-bank districts more vulnerable to bank erosion. This included the districts of Morigaon, Golaghat and Nagaon. The south bank was found to be more prone to bank-line migration due to the south-westerly gradient of the floodplains and the direction of flow of the river. Bank line migration was observed to affect bank erosion. Thus, the hypothesis formulated earlier that 'bank line migration has caused riverbank erosion in the Middle Brahmaputra floodplains' has been accepted here. The study predicted that the river would continue to erode its banks in the next 10 to 20 years if left unchecked.

The Middle Brahmaputra River demonstrated dynamic attributes with varying degree of channel stability during 1990-2020. Z3 was identified as the most stable channel zone whereas Z4 and Z5 were moderately stable. The most unstable reaches of the channel were Z1 and Z2. Thus, Z1, Z2, Z4 and Z5 were recognized as the priority zones that require immediate attention for river and erosion management strategies. The presence of easily erodible silty and sandy soils, high discharge, high sediment load and low gradient which reduced stream power caused channel instability and bank erosion. The field survey undertaken to identify the mechanisms of riverbank erosion revealed that bank failures in the floodplains occurred primarily due to liquefaction (drainage of sediments into the channel) and shearing (soil masses being cut off from the bank).

The assessment of landscape ecological vulnerability (LEV) to riverbank erosion revealed that the largest area of the floodplains based on B-MLP was found under the very high vulnerability zone (28%) followed by very low (23%), low (17%), high (17%) and moderate (14%) vulnerability zones. The western part of the study area was more vulnerable to riverbank erosion than the eastern region. Moreover, the southern bank of the river was relatively more prone to bank erosion compared to the northern bank.

The SeVI-based analysis indicated varying levels of socio-economic vulnerability to riverbank erosion in the Middle Brahmaputra floodplains of Assam. The vulnerability assessment revealed that the villages of Balidunga, Pambori, Katahguri, Bogamukh No. 5, Beloguri, Bonkowal, Chereng Chapari and Komolia No. 4 were highly vulnerable due to high exposure to bank erosion and the poor status of health, education, economy, infrastructure and agriculture. Moderate vulnerability was observed in Kamar Suti, Hatimura, Parangania Ati No. 2, Kherani NC, Sitolmari No. 3, Nepali Bari and Lohitmukh because of lower levels of education, lack of health insurance and earnings being primarily agriculture-based. Baralimari NC, Teliagaon and Bhomoraguri encountered low vulnerability owing to better adaptive capacities. The multiple regression analysis showed that exposure had the highest impact on vulnerability followed by sensitivity. In terms of the sub-components, losses exerted the highest influence on the level of vulnerability followed by landscape changes and agricultural status. Thus, the hypothesis formulated earlier that 'high exposure and sensitivity and low adaptive capacity have affected the level of socio-economic vulnerability to riverbank erosion in the floodplains' has been accepted here.

The government has undertaken several anti-erosion measures over the years. Policies like the National Flood Policy and rehabilitation policies were announced for the erosion-affected population. The National Flood Policy initiated various structural projects in the Brahmaputra valley including the construction of dykes and flood walls, the installation of pro-siltation structures and sluices and the establishment of flood forecasting and warning systems. The rehabilitation policies aimed at relocation and provision of compensation for the erosion-affected families. Compensation was usually provided for the loss of homesteads, agricultural land or both. Various structural anti-erosion works were also implemented by the government with assistance from national and international agencies. Embankments, spurs and sluices have been built along the river channel. Geobags and gabions were also laid along some stretches of the river. Moreover, the government has proposed different projects to be executed in the future. This includes the construction of more embankments, refurbishing old dykes, installation of porcupine screens and lining the banks with geosynthetics. Collaboration among the government, local communities and other non-governmental stakeholders is essential to ensure coordinated efforts to address the multifaceted challenges posed by bank erosion in the Middle Brahmaputra floodplains of Assam.