Examining Landscape Ecological Dynamics Amid Climate Change in the GBM Delta Region of the Indian Sundarbans

Anirban Mukhopadhyay\(^1\), Indrajit Pal\(^1\), Mashfiqus Salehin\(^2\), Ahmed Ishtiaque Amin Chowdhury\(^2\), Nilay Pramanick\(^1\), Jyoti Prakash Hati\(^4\), Subhajit Ghosh\(^1\), Ayush Baskota\(^1\), Subha Chakraborty\(^3\), and Manas Sanyal\(^3\)

\(^1\)Asian Institute of Technology, Disaster Preparedness, Mitigation, and Management, Pathum Thani, Thailand (anirbanatju@gmail.com)
\(^2\)Bangladesh University of Engineering and Technology (BUET) Dhaka.
\(^3\)Indian Institute of Engineering Science and Technology, Shibpur, India
\(^4\)Science For Sustainability. Kolkata, West Bengal, India

The GBM delta stands as one of the world's most densely populated areas, where human activities have profoundly reshaped the landscape amid the challenges posed by recurring climatic disasters. The region, prone to tropical cyclones and flooding, faces a future where these natural hazards are expected to intensify, making the understanding of landscape ecological dynamics imperative for effective environmental management. This study scrutinizes the transformations in land use and land cover (LULC) dynamics within the GBM delta spanning three decades through integrating remote sensing and geographic information systems (GIS). Leveraging Landsat TM and OLI data, the research aims to discern anthropogenic alterations in land use patterns over the study period. Grey-level co-occurrence matrix (GLCM) analysis on Landsat datasets facilitates the identification of land use changes, employing the Support Vector Machine (SVM) as the classifying algorithm. In tandem, the study will document the influence of climatic disasters, assessing the impacts of tropical cyclones and floods in the delta. Rainfall and temperature anomalies will be calculated, while flooded areas will be delineated using Sentinel-1 Synthetic Aperture Radar (SAR) data. Climatic anomalies will be detected by analyzing TRMM, PERSIAN, and MODIS datasets. This research aims to unveil the intricate dynamics of the GBM delta’s landscape over time by comprehensively understanding the interplay between anthropogenic activities and climatic events. The insights garnered, including the interests and livelihood operations of local communities, will be instrumental in informing government policies geared towards mitigating the escalating impacts of climatic disasters in the GBM delta.

**Key Words:** Sundarbans, LULC, livelihood, GBM Delta, Policies.