

Title : Assessing and predicting the dynamics of land use/land cover in northern Bangladesh using cellular Automata-Markov chain model

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Abstract: Rapid urbanization and land use changes significantly impact environmental sustainability and resource management, particularly in developing regions. Therefore, this study examines the spatiotemporal dynamics of land use and land cover (LULC) in Rangpur, Bangladesh, from 1991 to 2021 and projects future trends to 2041. Using supervised and unsupervised classification techniques, along with cellular automata and Markov-chain models, we assessed historical LULC changes and predicted future scenarios. Results show a 38.86% increase in built-up areas (BAs) and a 49.86% decrease in vegetation land (VL) during the study period, with classification accuracy above 87%. Projections indicate a further loss of over 210 km² of VL and an increase of more than 123 km² in urban areas by 2041. Notably, urban expansion is linked to the development of road networks, with significant growth from 115.06 km² in 2021 to 124.33 km² by 2041 within a 15-kilometer radius around the city center. These findings offer crucial insights for urban planning, emphasizing the need for sustainable strategies to manage urban expansion and protect environmental and socio-economic resilience in Rangpur..

Keywords: LULC Markov chains supervised image sustainable development Bangladesh

- <https://doi.org/10.1080/24749508.2024.2429218>

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