Estimating the urban expansion and heterogeneity of a metropolitan region: a case of Kolkata metropolitan area

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Urban planners study development patterns along with the rate and type of urban expansion to formulate policies and schemes for planned and integrated future development of the cities. This study aimed to explore the dynamics of urban sprawl in the metropolitan region of Kolkata by using Gini–Simpson's diversity index. It was used on the generated decadal maps to understand the degree of spatial concentration or dispersion of the built areas. It revealed that the urban sprawl was increasing in the outskirts of the Kolkata metropolitan area (KMA) with gradual dispersion and increased heterogeneity. A better understanding of the spatial and temporal dynamics of the city's growth, provided by this study, forms the basis for better planning and effective spatial organization of urban activities for the future development of KMA.

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the methodology for detecting sprawl revolves around Shannon entropy and landscape metrics[9]. Out of these, the maximum number of research uses the traditional method of Arc GIS plugin of patch density to calculate the landscape metrics, and the calculation of Shannon entropy is done statistically for the given cities[10].

This research explores the gap in existing literature for calculating urban sprawl, considering both spatial and statistical approaches. The modified spectral index was used to make the impervious surface area map to detect the presence of sprawl. The modified impervious surface built index and the Simpson diversity index, were never used before to detect urban sprawl using the Landsat 9 imagery. Kolkata metropolitan area (KMA) was selected as the case for the study to understand the impact of urban expansion and growth from a regional perspective.

Some literature that discusses the sprawl of Kolkata, either talks about the municipal boundary of Kolkata city or it emphasizes the urban agglomeration of Kolkata, highlight-