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Application of GIS Techniques for Analysing Urban Built-Up Growth of Class-I Indian Cities: A Case Study of Surat

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Abstract : Worldwide rapid urbanisation has accelerated city expansion in both developed and developing nations. This unprecedented urbanisation trend due to the increasing population and economic growth has caused challenges for the decision-makers in city planning and urban management. Metropolitan cities, class-I towns, and major urban centres undergo a continuous process of evolution due to interaction between socio-cultural and economic attributes. This constant evolution leads to urban expansion in all directions. Understanding the patterns and dynamics of urban built-up growth is crucial for policymakers, urban planners, and researchers, as it aids in resource management, decision-making, and the development of sustainable strategies to address the complexities associated with rapid urbanisation. Identifying spatio-temporal patterns of urban growth has emerged as a crucial challenge in monitoring and assessing present and future trends in urban development. Analysing urban growth patterns and tracking changes in land use is an important aspect of urban studies. This study analyses spatio-temporal urban transformations and land-use and land cover changes using remote sensing and GIS techniques. Built-up growth analysis has been done for the city of Surat as a case example, using the GIS tools of NDBI and GIS models of the Built-up Urban Density Index and Shannon Entropy Index to identify trends and the geographical direction of transformation from 2005 to 2020. Surat is one of the fastest-growing urban centres in both the state and the nation, ranking as the 4th fastest-growing city globally. This study analyses the dynamics of urban built-up area transformations both zone-wise and geographical direction-wise, in which their trend, rate, and magnitude were calculated for the period of 15 years. This study also highlights the need for analysing and monitoring the urban growth pattern of class-I cities in India using spatio-temporal and quantitative techniques like GIS for improved urban management.

Keywords : urban expansion, built-up, geographic information system, remote sensing, Shannon’s entropy
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