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## Spatio-temporal analysis of urban sprawl in Multan using remotesensing techniques

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Globally, over the past few decades, urbanization is being considered an exponentially increasing phenomenon. In the context of developing countries for instance Pakistan, it is generally unpredictable and unplanned urbanization across the urban areas. This study aimed to analyse the spatio temporal trends of population and urban extent in Multan, which is the fifth largest city of Pakistan. The research performed fractal analysis by integrating GIS and remote sensing techniques on landsat images of last four decades. Spectral classification technique was used to map the urban sprawl at different time frames. The analysis provided an increase in built up area from 47.8 to 141.12 square km from 1972 to 2015. In a time span of last 12 years, the city has experienced an increase of 38 sq. km in its size which is highest growth rate amongst all time frames of the study. Directional sprawl analysis revealed that the haphazard growth in south direction was limited due the railway line and its related installations. The linear growth resulted in a total increment in 23.05 sq. km built up area. The population estimation from landscan data highlighted amplified values from 29,39,907 populous in 2000 to 4,384,191 populous in 2013. This implies a population increased by about 32% which endorse the results of the change in urban sprawl. Overlay analysis between urban growth layer and facilities layers like sewerage and water supply, illuminating that utilities are insufficient at present. This study recommends an updated master planning or peri-urban structure planning of the city to avoid chocking the system of utility and service provision to the citizens.

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