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**Land Use and Land Cover Dynamics and its Impact on Land Surface Temperature in the Ratnapura Municipal Council Area, Sri Lanka**

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**Abstract**

Unplanned urban growth and land use/land cover (LULC) changes are critical global challenges for towns and cities. Urbanization significantly alters land surfaces, particularly in tropical and subtropical regions like South and Southeast Asia. This study analyzes LULC dynamics in Ratnapura, the capital city of Sabaragamuwa Province, Sri Lanka, from 2006 to 2024, and assesses the impact of these changes on land surface temperature (LST) using time-series Landsat data and *geospatial techniques*. The study utilizes freely available medium-resolution satellite images, specifically Landsat TM (2006) and Landsat 8, 9 OLI/TIRS (2013, 2018, and 2024). A pixel-oriented *supervised classification* method was used to monitor LULC changes during this period, while LST was calculated using the same data. Vegetation and built-up areas were evaluated through Normalized Difference Vegetation Index (NDVI) and Normalized Difference Built-up Index (NDBI). Results reveal a 103.3% increase in built-up areas, along with decreases in forest cover (27.19%), agricultural land (24.37%), and other land uses (77.20%). Built-up areas exhibited the highest mean LST, reaching 25.95°C in 2006 to 27.81°C in 2024, despite a temporary drop to 24.97°C in 2013. Meanwhile, the overall mean LST for Ratnapura increased from 25.31°C in 2006 to 27.93°C in 2024, a rise of 2.62°C. Higher temperatures were concentrated in the city center and expanded towards the north, northwest, east, and south of the study area. A strong negative correlation between LST and the NDVI suggests that urbanization and reduced vegetation are driving temperatures increases. Additionally, a positive correlation between LST and the NDBI underscores the heat-retention properties of impervious surfaces in urban areas, further exacerbating temperature increases. The expansion of built-up areas, coupled with the declining forest cover and agricultural land, highlights the need for effective land-use planning and policies to mitigate these impacts and promote sustainable urban Development.

**Keywords:** *Land Use Land Cover, Normalized Difference Vegetation Index, Normalized Difference Built-up Index, Land Surface Temperature*