Abstract ID: 040

ASSESSING URBAN HEAT ISLAND DYNAMICS IN SOUTHEASTERN REGION OF SRI LANKA USING LANDSAT-8/9 AND GIS (2019–2025)

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Abstract

This study examines the spatiotemporal dynamics of the Urban Heat Island (UHI) effect in the Southeastern region of Sri Lanka, from 2019 to 2025, utilizing Landsat-8/9 satellite imagery and ArcGIS Pro analysis. Despite minimal land use changes, results indicate a significant rise in Land Surface Temperature (LST) from 36.31 °C in 2019 to 37.54 °C in 2025, with Urban Heat Island Intensity (UHII) increasing from 0.009172 to 0.01159. Supervised classification revealed a decline in vegetation cover (NDVI from +0.81 to -0.13) and an increase in urban (9% to 16%) and bare land (2% to 15%) areas, correlating with elevated LST and UHII, particularly during dry seasons. Albedo measurements using a lux meter showed low reflectivity (0.055-0.278) for urban surfaces like roads and concrete, enhancing heat retention, while paddy fields (0.07-0.11) contributed to temperature rises under reduced moisture. It indicates Sammanthurai has low albedo surface and it causes to rice temperature of the area. Weather data from 2024 highlighted a peak temperature of 38.7 °C, with a weak positive correlation (slope 0.02) between solar radiation (224.64 W/m²) and temperature, exacerbating UHI effects. Comparative analysis with Kitulgala's wetter, forested region (207.065 W/m², 24-31 °C) underscores the role of vegetation and climate in mitigating heat. The study, achieving 91% classification accuracy (Kappa 0.88541), emphasizes climatic factors and land management as key drivers of UHI in semi-rural, agrarian landscapes.

Keywords*: Urban Heat Island, Land Surface Temperature, NDVI, Albedo, Solar Radiation, Sri Lanka, Landsat-8/9, ArcGIS Pro, Semi-Rural Landscapes*