Remote Sensing and GIS Approach to Evaluate the UHI Effect in Colombo City Using Landsat Satellite Data

***Dissanayake[1] DMDOK and Kurugama[2] KM**

[1]Department of Earth Resources Engineering, University of Moratuwa
[2]Department of Civil and Environmental Engineering,
Tohoku University, Sendai, Japan

*Corresponding author – kithsiridissanayake@yahoo.com

Abstract

This study examines Colombo's heat island effect due to rapid development, with factors including urbanisation, reduced vegetation, increased energy use, heat-absorbing surfaces, and waste heat. Urban expansion absorbs and releases heat, raising night temperatures, while reduced vegetation disrupts natural temperature regulation. Energy consumption from air conditioning, industry, and transport worsens the effect. Heat-trapping surfaces and waste heat intensify the problem. The study analyses land surface temperature (LST), normalised vegetation difference index (NDVI), normalised difference building index (NDBI), and albedo's role in the urban heat island (UHI) effect. UHI spread north, east, and southeast from 2001 to 2019. NDVI inversely correlates with LST, indicating vegetation mitigates UHI; NDBI positively correlates, showing that built areas contribute. Lower albedo values heighten UHI by absorbing more solar radiation. Urban thermal difference index (UTFVI) assessment identifies 27% of the region under high thermal stress. Future Colombo urban planning should integrate strategies like urban greening, cool roofs, sustainable planning, energy efficiency, and public awareness to address the UHI effect, enhance residents' lives, and promote sustainability. Successful implementation requires collaboration among policymakers, urban planners, and residents for a resilient urban environment.

Keywords: Urban heat island (UHI), NDVI, NDBI, LST, UTFVI, Albedo