

**REMOTE SENSING APPROACH ON TEMPORAL
CHANGES ON LAND SURFACE TEMPERATURE AND
URBAN HEAT ISLANDS IN GAMPAHA DISTRICT**

SRI LANKA



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ABSTRACT

Industrialization and urbanization have increased the number of surfaces covered in man-made materials such as concrete and asphalt. The growth in the use of materials with high heat storage qualities, as well as the expansion of metropolitan areas, have a direct impact on the Land Surface Temperature (LST), which indicates an increase in the region's sensible temperature. Furthermore, the removal of vegetative cover and waste heat emissions from a variety of sources contribute to the accumulation of heat energy, resulting in the formation of urban heat islands (UHIs).

The main objective of the study was to assess the effect of Land Surface Temperature on Urban Heat Islands in Gampaha for the period 2008 – 2021 using Thermal infrared bands (TIR) of Landsat images. The study also attempted to map the study area's spatial and temporal distribution of NDVI, NDBI, MNDWI and UHIs between 2008 and 2021.

The study used clouds free Landsat 5 – MSS/ TM and Landsat 8 OLI/ TIRS data for 2008-2021. TIR bands were used to develop LST maps and Visible and IR bands were used to develop NDVI, NDBI and MNDWI maps of Gampaha District. An unsupervised classification technique was applied to study the LULC pattern of the study area.

The classification of LULC resulted that vegetation and built-ups being the dominant LULC followed by Paddy and Coconut plantations in 2008 and 2021. LST analysis revealed that higher surface temperature in built-up areas and low in healthy vegetative areas. The minimum LST ranged from 24-26°C, maximum LST ranged from 30-32°C and average LST ranged from 27.3 - 29°C from 2008 to 2021 in the

study area. The highest NDBI were recorded within the built-ups with a range of 0.54-0.72, while higher NDVI values were recorded in vegetative areas ranging between 0.76 and 0.84 and MNDWI ranged between 0.95-0.89 from 2008 to 2021.

Paired t-test revealed that LST, NDBI, NDVI and MNDWI had significant differences between 2008 and 2021. There was a significant positive association ($p < 0.05$) observed between NDBI and LST between 2008 and 2021. The positive link discovered between NDBI and LST implies that the built-up region is the primary contributor to urban heat islands by causing significant surface temperature differences. There is negative correlation was observed between LST and NDVI in Gampaha District for the 13 year period. The relationship between MNDWI and LST of 2008 was found to be negative, which implied that pure water decreases the surface temperature. In contrast, MNDWI shows a positive correlation with LST in 2021 but not at a significant level. The results revealed that the urban heat island (UHI) effect occurred mostly in the residential and industrial zone. UHI Graph profile in 2008 and 2021 indicates that UHIs are high in the coastal area of the district. The UHIs were detected around Negombo, Katana, Seeduwa, Wattala and Kelaniya DS divisions. The study shows that the TIR bands of Landsat 4-5 TM and Landsat 8 OLI/TIRS images have the potential to detect the LST level and UHIs in Gampaha District.

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