

Urbanization Effects on Land Surface Temperature in Soba Local Government Area, Kaduna State, Nigeria: A Spatio-Temporal Analysis

Adamu Bala (China, PR), Ademola Fidelix Fasuba, Umar Barde (Nigeria) and Saied Pirasteh (China, PR)

Key words: Geoinformation/GI; Remote sensing; Land Surface Temperature; Urbanization Effects; Urban Heat Islands; LULC

SUMMARY

Urbanization is a continuous and dynamic phenomenon that is mostly influenced by humans' direct interaction with the immediate environment. These interactions in most cases result in the alteration of land use land cover. Likewise, the environment where such urbanizations occur usually faces changes in climate resulting in temperature increase or simply termed Urban Heat Islands. The Urban Heat Islands (UHI) represent a global phenomenon arising from substantial alterations in land use and land cover. Consequently, the local climate and the surrounding environment have direct consequences from the urbanization effects. Our paper aims to study the effects of urbanization on land surface temperature in the Soba Local Government Area of Kaduna State for a period of over 20 years using noncontact surveying techniques and other ancillary data. The research relies on secondary data, specifically Landsat 8 OLI/TIRS and Landsat 7 ETM+ imagery, to extract information on land use and land cover changes over the two-decade span. The methodology involves the use of Landsat thermal images to determine land surface temperature, exploring the relationships between land use/land cover classifications, the Normalized Difference Vegetation Index (NDVI), and the Normalized Difference Built-up Index (NDBI) in relation to land surface temperature. These relationships are evaluated through correlation and linear regression analyses. Findings from the study show that in 2001, the mean temperature in the area was 30.29°C, which decreased to 29.01°C in 2011 and then to 29.65°C in 2021. Notably, the relationship between NDVI and land surface temperature shows a positive correlation, with correlation coefficient R^2 values of 0.348, 0.168, and 0.381 for the years 2001, 2011, and 2021, respectively. Similarly, the connection between NDBI and land surface temperature reveals a strong positive correlation, with R^2 values of 0.270 in 2001, 0.491 in 2011, and 0.376 in 2021. The significant increase in temperature and built-up areas in 2021 suggests potential health risks due to higher temperatures for residents. Considering that the minimum temperature in 2001 was lower than in 2021, it is reasonable to argue that Soba experienced an urban heat island effect during the period. The study

Urbanization Effects on Land Surface Temperature in Soba Local Government Area, Kaduna State, Nigeria: A Spatio-Temporal Analysis (12488)

Adamu Bala (China, PR), Ademola Fidelix Fasuba, Umar Barde (Nigeria) and Saied Pirasteh (China, PR)

FIG Working Week 2024

Your World, Our World: Resilient Environment and Sustainable Resource Management for all

Accra, Ghana, 19–24 May 2024

recommends that the state government establish a consistent program for monitoring urban expansion and development in the study area, leveraging geospatial tools to enhance decision-making. Furthermore, it suggests conducting further research on this issue to gain a deeper understanding of the problem.

Urbanization Effects on Land Surface Temperature in Soba Local Government Area, Kaduna State, Nigeria: A Spatio-Temporal Analysis (12488)
Adamu Bala (China, PR), Ademola Fidelix Fasuba, Umar Barde (Nigeria) and Saied Pirasteh (China, PR)

FIG Working Week 2024

Your World, Our World: Resilient Environment and Sustainable Resource Management for all
Accra, Ghana, 19–24 May 2024