Geospatial Simulation of Land Surface Temperature using Biophysical Descriptors: A Case Study of Onitsha Metropolis, Nigeria

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Abstract:

Introduction: Smart electric meters are used for near The aim of this paper was to present a critical evidence of man's (modifying) activities in an urban landscape from a (lower scale) geospatial perspective. Hence, the study deployed geospatial techniques to model the Land Surface Temperature (LST) of Onitsha Metropolis in south-east Nigeria based on the dynamics of urban biophysical descriptors. Data acquired for the study comprised of Landsat-8 satellite imagery of 2016 and the Advanced Spaceborne Thermal Emissions and Reflections Radiometer's Global Digital Elevation Model (ASTER GDEM) data from appropriate authorities. LST was extracted from Landsat thermal bands while eighteen (18) land biophysical descriptors which comprised of Latitude and Longitude; aspect, slope and elevation; Linear Spectral Mixture Analysis (LSMA) of LULC categories of vegetation, impervious surface, soil and water endmember fractions; and nine (9) other land cover indices computed via image thresholding: UI, NDBI, NDVI, SAVI2, EVI2, NDWI, MNDWI, NDMI and MSAVI. Principal Component Analysis (PCA), Pearson Correlation test and step-wise multiple regression were used. The study was carried out using ArcGIS 10.5, IDRISI Terrset and the Statistical Package for Social Sciences (SPSS 25) software and the results were presented using tables, graphs and maps. NDWI, Unmixed soil fraction, unmixed vegetation fraction, slope, elevation and locational descriptors were found to be most significant and thereby impactful in modelling LST in the study area, with a coefficient of determination (R) of 0.86 and an adjusted R2 greater than 0.73.

Conclusion: The chaotic and non-linear dynamics of LST can be modelled, and the efficiency of the model developed in this study can be improved upon if other descriptors are included (such as proximity to waterbody, paved surfaces, and urban geometry) as shown in the study. Meanwhile, all the biophysical descriptors utilized and further recommended must be factored-into the planning and management of our cities.

Biography:

Eneche Patrick Samson Udama is working as assistant lecturer at Kogi State University, Anyigba. His research interests include Urban Climatology, Remote Sensing & Geographic Information System