Impacts of the spatial configuration of built-up areas and urban vegetation on land surface temperature using spectral and local spatial autocorrelation indices

Pedzisai Kowe, Timothy Dube, Terence Darlington Mushore, Amos Ncube, Tatenda Nyenda, Godfrey Mutowo

ABSTRACT

Understanding how the spatial configuration of land cover patterns of built-up areas and urban vegetation affect urban surface temperatures is crucial for improving the sustainability of cities as well as optimizing urban design and landscape planning. Because of their capability to detect distinct surface thermal features, satellite data have proved useful in exploring the impacts of spatial configuration of land cover on land surface temperature (LST). In this study, we examine how the spatial configuration of built-up and urban vegetation affects the LST in the Harare metropolitan city, Zimbabwe. In order to achieve this objective, we combined the LST, local spatial statistics of Getis-Ord Gi* and local Moran's I statistic, Normalized Difference Vegetation Index (NDVI) and the Normalized Difference Built-Up Index (NDBI) derived from multi-date Landsat satellite data (1994, 2001 and 2017). The results of local Moran's I statistic showed moderate and negative correlations between LST and Landsat derived NDVI. Overall, these results of local Moran's I statistic demonstrate that clustered vegetation tend to lower LST, providing thermal comfort conditions. In contrast, clustered spatial arrangements of NDBI based on the Getis-Ord Gi* elevate LST, implying that continued clustered built-up expansion has the potential to increase urban surface temperatures.wireless sensor node platforms is provided, and challenges and future research directions are also outlined.