

Investigating the relationships between land surface temperature and social-ecological variables: A case study of Nanchang City, China

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In the context of rapid urbanization and population growth, urban planners and policy makers require information on factors contributing to the urban heat island (UHI) effect. This study investigated the relationship between land surface temperature (LST) and multi exploratory variables in Nanchang City, China. We used Landsat images from 2000 and 2013 to detect land use/land cover changes (LULC). Exploratory variables included: Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI), population density and fossil-fuel carbon dioxide (CO₂) emissions. The urban area increased from 4,830–12,090 ha, a net increase of 150.31%. The autumn LST ranged from 17.09–35.20° C on September 15, 2000 and from 14.98–37.87°C on October 5, 2013. This indicated that urbanization has resulted in a strong UHI effect in Nanchang City. NDBI, population density, fossil-fuel CO₂ emissions and LST were positively correlated, while LST and NDVI were negatively correlated. The highest temperatures were in urban and bare land, while water and forest had the lowest temperatures. Urban green space planning could be used to alleviate the UHI effect and create a livable city. Population density should be distributed more evenly to mitigate disparity and fossil-fuel CO₂ emissions should be controlled to save energy consumption.

Keywords: Urban heat island, Land surface temperature, Land use/land cover, Population density, Fossil-fuel carbon dioxide emission, Nanchang City