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Comparative Analysis of the Impact of Urbanization on Land Surface Temperature in the United Arab Emirates

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Abstract : The aim of this study is to investigate and compare the changes in the Land Surface Temperature (LST) as a function of urbanization, particularly land use/land cover changes, in three cities in the UAE, mainly Abu Dhabi, Dubai, and Al Ain. The scale of this assessment will be at the macro- and micro-levels. At the macro-level, a comparative assessment will take place to compare between the four cities in the UAE. At the micro-level, the study will compare between the effects of different land use/land cover on the LST. This will provide a clear and quantitative city-specific information related to the relationship between urbanization and local spatial intra-urban LST variation in three cities in the UAE. The main objectives of this study are 1) to investigate the development of LST on the macro- and micro-level between and in three cities in the UAE over two decades time period, 2) to examine the impact of different types of land use/land cover on the spatial distribution of LST. Because these three cities are facing harsh arid climate, it is hypothesized that (1) urbanization is affecting and connected to the spatial changes in LST; (2) different land use/land cover have different impact on the LST; and (3) changes in spatial configuration of land use and vegetation concentration over time would control urban microclimate on a city scale and control macroclimate on the country scale. This study will be carried out over a 20-year period (1996-2016) and throughout the whole year. The study will compare between two distinct periods with different thermal characteristics which are the cool/cold period from November to March and warm/hot period between April and October. The best practice research method for this topic is to use remote sensing data to target different aspects of natural and anthropogenic systems impacts. The project will follow classical remote sensing and mapping techniques to investigate the impact of urbanization, mainly changes in land use/land cover, on LST. The investigation in this study will be performed in two stages. Stage one remote sensing data will be used to investigate the impact of urbanization on LST on a macroclimate level where the LST and Urban Heat Island (UHI) will be compared in the three cities using data from the past two decades. Stage two will investigate the impact on microclimate scale by investigating the LST and UHI using a particular land use/land cover type. In both stages, an LST and urban land cover maps will be generated over the study area. The outcome of this study should represent an important contribution to recent urban climate studies, particularly in the UAE. Based on the aim and objectives of this study, the expected outcomes are as follow: i) to determine the increase or decrease of LST as a result of urbanization in these four cities, ii) to determine the effect of different land uses/land covers on increasing or decreasing the LST.

Keywords : land use/land cover, global warming, land surface temperature, remote sensing
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