## Impacts of urbanization on the local thermal environment in Central America

\*Son Thanh Nguyen<sup>1</sup>, Chi-Farn Chen<sup>1</sup>, Cheng-Ru Chen<sup>1</sup>

1. Center for Space and Remote Sensing Research, National Central University, Zhongli District, Taoyuan City 32001, TAIWAN

Central America is recognized as the second-fastest urbanizing region in the world. Today, at least 60.5% of the region's population (30.7 million people) lives in urban areas, and is expected to double in size by 2050. The rapid urbanization has brought both employment opportunities and negative impacts, including heat island effect that is a phenomenon, where higher temperature is observed in urban areas due to changes in properties of land surface. Such effects coupled with congestion of population can trigger severe influences on the local thermal environment, consequently decreasing the health-related quality of life. Information on urbanization and its impacts on the local thermal environment is thus important for urban planning process. The objective of this study is to investigate impacts of urbanization on the local thermal environment in El Salvador, Central America using multi-temporal Landsat data. The data were processed for the period 1986–2016, following four main steps: (1) data pre-processing to account for atmospheric effects and geometric errors; (2) urban image classification using random forests; (3) retrieval of land surface temperature (LST); and (4) hotspot detection, and analysis of impacts of land-cover change on local surface temperature. The results of urban classification, verified with the ground reference data, revealed close agreement between these two datasets, with the overall accuracies and Kappa coefficients, achieved for 1986 and 2016, were respectively 89.8% and 0.8, and 91.4% and 0.84. From 1986 to 2016, the urban area had increased 2,654.7 ha, and the city had expanded into various directions, especially in the northern and eastern parts, owing to advantages of existing and newly developed infrastructures. Due to such a rapid urbanization, the proportion of hotspots (areas of elevated temperature) had also increased from 32% in 1986 to 39.9% in 2016, respectively. The results of decadal analysis of impacts of land-cover change on the local thermal environment also confirmed the significant association between the LST and Normalized Difference Vegetation Index (NDVI), and Normalized Difference Built-up Area Index (NDBI) ( $R^2 > 0.72$ ). The research findings, achieved from this study, highlighted the importance of urban sprawls in conjunction with changes of vegetation cover and temperature. Such information would be valuable to urban planners to successfully devise strategies to regulate effects of urban heats on the city's liveability.

Keywords: Urbanization, Thermal environment, Remote sensing, San Salvador