



## ANALYSIS OF THE SURFACE URBAN HEAT ISLAND IN CAN THO CITY USING LANDSAT DATA

Nguyen Kieu Diem<sup>1\*</sup>, Phan Kieu Diem<sup>1</sup>

<sup>1</sup> College of Environment and Natural Resources, Can Tho city,  
Campus II, 3/2 street, Xuan Khanh ward, Ninh Kieu District, Can Tho city, Vietnam.

Email: \*[nkdiem@ctu.edu.vn](mailto:nkdiem@ctu.edu.vn), [pkdiem@ctu.edu.vn](mailto:pkdiem@ctu.edu.vn)

**Abstract:** Can Tho city is currently undergoing a rapid urban sprawl process which has well documented negative consequences for society and human beings, including the loss of greenspace, spatial temporal change to urban surface temperatures, and an intensification of the surface urban heat island phenomenon (SUHI). Surface urban heat island described surface temperature differences between urban and surrounding rural areas, which is a vital concern in urban and urban climate studies. SUHI effect is a most crucial issue, as its generation and evolution are closely related to social and economic activities. Studies on the distribution of SUHI and its evolutionary mechanism have become a hot topic in multi-disciplines. Hence, research aims to analyze SUHI phenomenon in Can Tho city in 2019 using Landsat imagery.

As primary data freely, available Landsat 8 imagery which covered in Can Tho city area in 2019 was downloaded in this study from the U.S Geological Survey (USGS). The land surface temperature (LST) retrieval from Landsat thermal infrared band (Band 10) will be estimated as following steps (1) Converting digital numbers (DNs) on thermal band to Top of Atmosphere (TOA) spectral radiance, (2) Converting TOA spectral radiance values to TOA reflectance, (3) Converting TOA reflectance values to brightness temperature, (4) Estimating the LST by calibrating brightness temperature using NDVI-based Land Surface Emissivity (LSE). The spatial of surface urban heat island was defined as the difference between average temperature of UHI area and that of rural area, which is observed based on the land surface temperature (LST) and an area occurring SUHI. The surface urban heat island intensity ( $I_{SUHI}$ ) is determined as a difference between the LST of the UHI areas ( $LST_{urban}$ ) and the temperature in rural areas ( $LST_{non-urban}$ ). Simultaneously, the land use map in Can Tho city in the year of 2019 was combined to extract land use types, especially in built-up areas is the key factor for analysis of the urban heat island.

According to the land use map in 2019, the urban area was estimated at 17,775.3 ha (12.34% in the total area) mostly located in Ninh Kieu, Binh Thuy, Cai Rang districts, and sparse in the surrounding areas. In combination with the LST results, research pointed the spatial variation of LST within urban area with temperature above 29°C. By 2019, the SUHI proportion at 24.18% which cover at 34,740.45 ha in different level of heat island. The results also highlighted that the area affected by a highly SUHI intensity around 4-6°C covered a total of

approximately 87 ha, mainly in industrial zones and Can Tho international airport ( $> 4^{\circ}\text{C}$ ), thermal power plants (5-6 $^{\circ}\text{C}$ ), densely populated areas (3-4 $^{\circ}\text{C}$ ) (Figure 1). The results revealed the effectiveness of remote sensing data application in analyzing the SUHI in Can Tho city. The research outcomes provide an important practical basis to encourage maintaining a green environment in long-term urban planning in the future.

**Keyword:** Surface urban heat island, land surface temperature, Can Tho city.

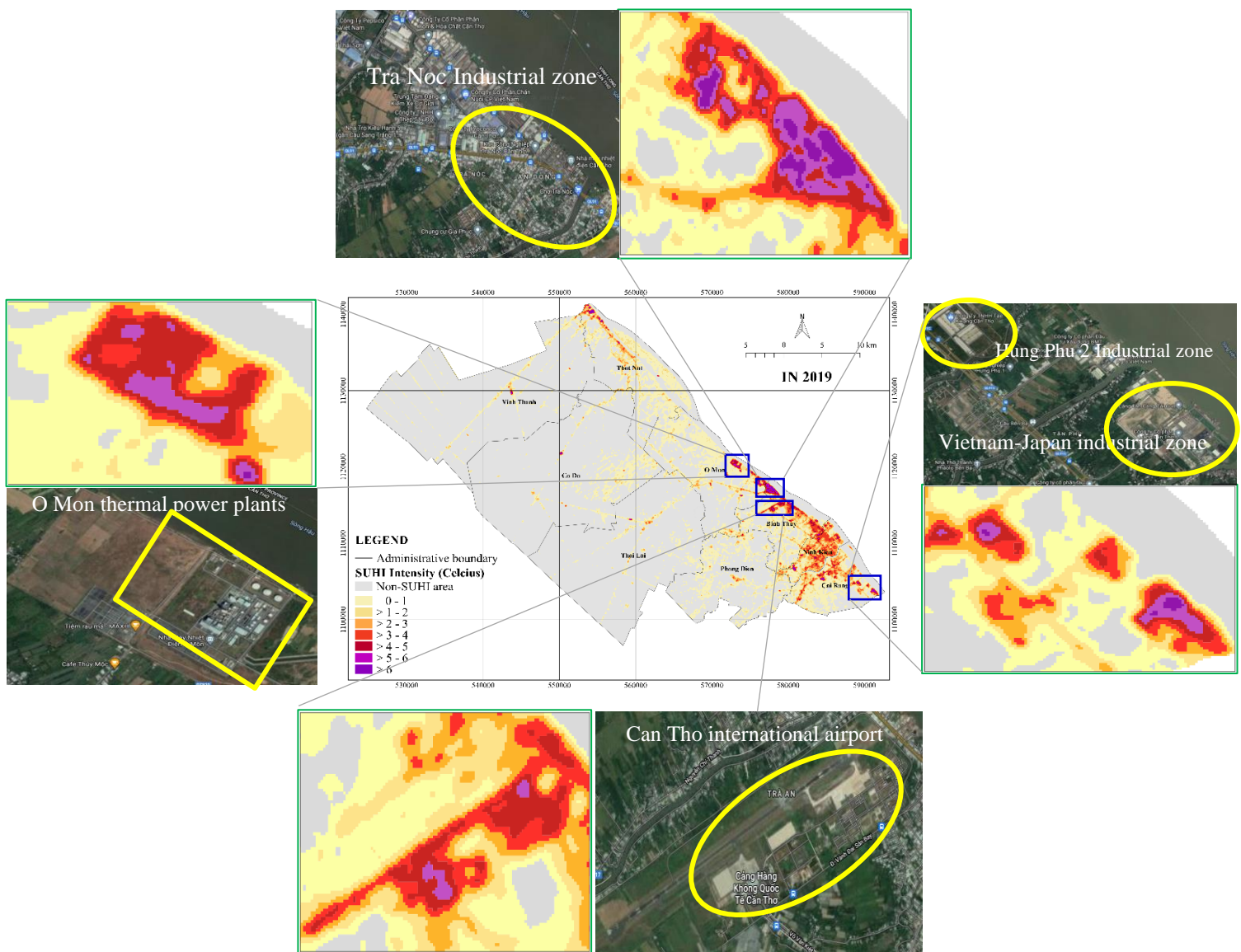


Figure 1: Map of surface urban heat island and pointed the areas within high intensity