

# Classification of Local Climate Zones Using Landsat Data in Tsukuba Center Area

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## Motivation

In order to comprehensive recognized the phenomenon of urban heat island, an effective land classification system has been established to analyze the behavior of complex land cover types (Cai, Ren, Xu, Dai, & Wang, 2016). This study aims that by using Landsat 8 data to the identification and classification of Local Climate Zone by taking a case of Tsukuba center area.

## Introduction

Local Climate Zone developed by Stewart and Oke in 2012 (Stewart & Oke, 2012). It has become an international standard to analyze the physical properties of the surface structure and correspond urban heat island phenomenon. According to the literature, Local Climate Zone based on remote sensing technology can efficiently distinguish the thermal contrasts among all Local Climate Zone classes.

## Methodology

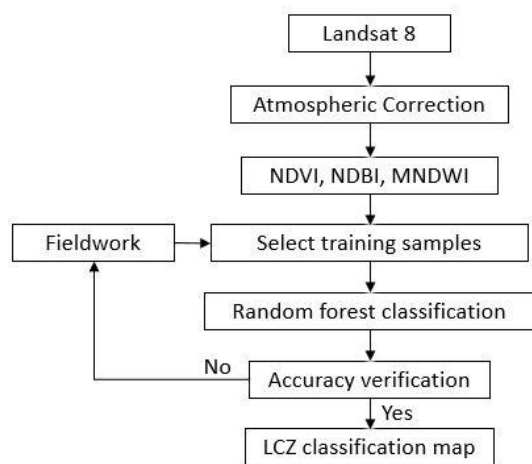


Figure 1. Flow chart of LCZ classification.

In this study, Landsat 8 OLI/TIRS (20180102) image with cloud-free (<10%) used as original data, zenrin data also employed as the ancillary data for selecting training samples. The workflow (Figure 1) consists three main steps. Firstly, the indices of Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI) and Modified Normalized Difference Water Index

(MNDWI) were employed for distinguishing local climate zone types. Secondly, using the method of visual interpretation to select training samples, this part is carried out in Google Earth. Finally, the classification is conducted with the random forest classifier based on the Landsat image and the training area polygons.

In order to accurately extract local climate zone from Landsat 8 image, the Google Earth image in the corresponding period was used as a reference. The total of 54 polygons was select as training samples to classify local climate zones.

## Results and discussion

For local climate classification, the random forest classifier detected 14 local climate zone classes for Tsukuba center area based on fieldwork and training samples. In this study, the total of 48 random points have been selected and putted into classification map and Google earth to check the accuracy. The average accuracy is around 83%, but some category is low-fidelity due to study area limitation. The result of LCZ classification in Tsukuba center area was shown in Figure 2. Most of the built-up are classified into LCZ5 and LCZ 6, and around 20% area is LCZ A and LCZ D. These phenomenon illustrate that different with other traditional cities, Tsukuba city is a planned city, most of built-up are surrounded by grass and tree.

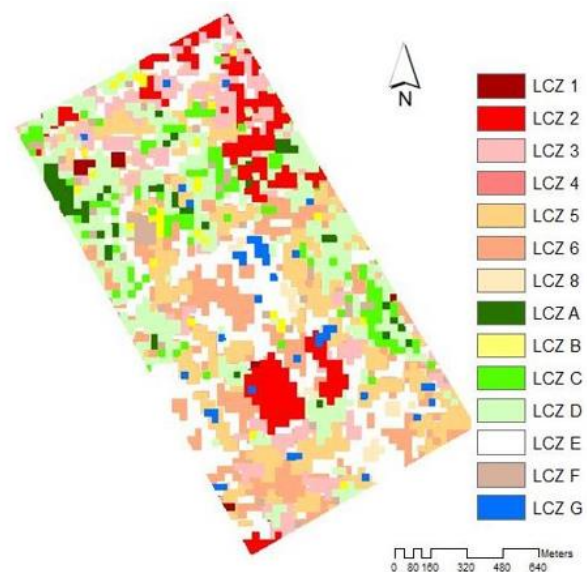


Figure 2. LCZ classification image of the study area.