

# Land Use Classification in Tsukuba Center Area

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## 1. Motivation

The high quality of classification result is quite necessary to be obtained and provided for the society. The purpose of this study is to investigate more accurate information of land use for Tsukuba Center Area of 2016 using remote sensing and GIS techniques.

## 2. Introduction

Land use classification is a challenging work because of the complexity of landscapes and limitations of remote sensing data. Several case studies were classified with the use of ancillary data for improving the quality of classification result (Fang et al., 2016; Lei et al., 2016). In this study, the integration of Landsat image and ancillary data would be conducted for Tsukuba Center Area.

## 3. Study Area

The study area is shown in Figure 1. 5-km circle area has been established, covering the majority of urban areas of Tsukuba City. Both Tsukuba Center and Kenkyugakuen were included in the study area. The categories of classification include Urban, Forest, Cropland, Grassland, Bareland, and Water. Landsat 8 OLI/TIRS image (March 17, 2016) would be priority selected for extracting land use information.

## 4. Methodology

Maximum Likelihood Classification is a widely used classification approach in the realm of remote sensing. The indices of Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI) and Normalized Difference Water Index (NDWI) were employed as the ancillary data for selecting training samples. These indices were more effective because they can help to enhance the remote sensing reflectance for each element in the image and subsequently improve the accuracy of classification result.

## 5. Results and Discussion

Land-use classification map of Tsukuba Center Area in 2016 is shown in Figure 1. The majority of landscapes covered with Cropland and Urban, what can be found from Table 2, following Bareland, Forest, Water and Grassland. The percentage of urban area was 25.64% in 2016, which can be recognized as high urbanized in Tsukuba Center Area. Accuracy assessment of classification results was conducted

during field work and the matrix is presented in Table 1. Most of accuracy results beyond than 80%, which can be accepted at least. Obviously, the accuracy of water was relatively lower than others due to the mixture between water and urban. Thereby the challenge of classification for Tsukuba Center Area is to provide precise information on water body.

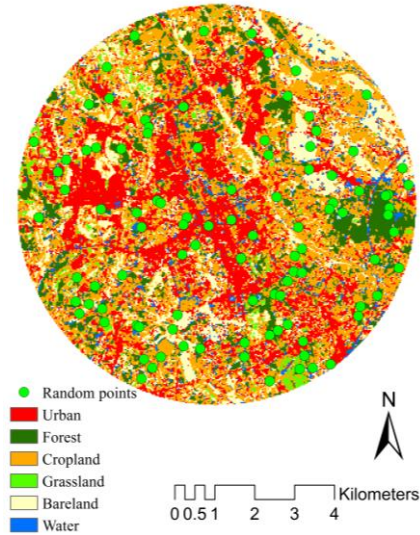


Figure 1. Land-use classification map of Tsukuba Center Area, Japan.

Table 1. Classification accuracy assessment results.

Class	Classified	Reference	Number correct	Producers accuracy	Users accuracy
Urban	17	22	15	68.18%	88.24%
Forest	17	17	17	100.00%	100.00%
Cropland	16	17	13	76.47%	81.25%
Grassland	16	17	14	82.35%	87.50%
Bareland	17	17	14	82.35%	82.35%
Water	17	10	7	70.00%	41.18%
Totals	100	100	80		

Table 2. Hectare and percentage of land use in Tsukuba Center Area.

Urban	Forest	Cropland	Grassland	Bareland	Water
2012.31	842.22	2903.58	164.34	1559.34	365.13
25.64%	10.73%	37.00%	2.09%	19.87%	4.65%

## References

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- Lei, G., Li, A., Bian, J., Zhang, Z., Jin, H., et al. (2016). Land Cover Mapping in Southwestern China Using the HC-MMK Approach. *Remote Sensing*, 8(4), 305.