

Detecting Urban Growth Using Remote Sensing and GIS Techniques in Taoyuan City, Taiwan

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Understanding spatio-temporal dimensions of land-use changes that shape the urbanization is critical to the process of urban planning. In the recent years, remote sensing data and GIS techniques are widely being used for mapping the urban growth, land-use/land-cover, and sprawl. The aim of this study is to produce land use and cover map for the studied area at varied periods to monitor possible changes that may occurred, particularly in the urban areas and agriculture and subsequently predict likely changes. We explore the urban growth in Taoyuan city through remote sensing data for each 10-year period from 1970 to 2019 using the ISODATA (Iterative Selforganizing Data Analysis Techniques Algorithm) classification to assess the changes of agricultural lands, urban encroachment and water areas during this period with integration by GIS. The data are processed through four steps: (1) data pre-processing, (2) image classification by regional ISODATA, (3) accuracy assessment of the classification results using field verification data, and (4) urban growth analysis to understand the spatial changes of land cover. The results achieved by comparisons between the classification results and ground reference data indicate that the overall accuracy and Kappa coefficient in five periods were all higher than 82.5% and 0.76, respectively. The results of urban growth analysis indicate that the growth rate of built-up areas has a highest value of 26% in 1980s, while the growth rate in other following periods are between 2.3% and 5.7%. Referencing to the development of public works in Taoyuan city, it reveals that urban growth of Taoyuan city was dominated initially by large-scale public work, such as the construction of Taoyuan Airport and Industrial parks and then was subsequently affected by the demand of dwelling space of immigration from Taipei and its immediate vicinity.

Keywords: Remote sensing, GIS, Urban growth