

Land -Use/Land- Cover Dynamics In Chiang Mai : Appraisal from Remote Sensing, GIS and Modelling Approaches

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ABSTRACT

Remotely-sensed images and Geographical Information Systems (GIS) data were integrated into the SLEUTH cellular automata (CA) model to analyze land –use/land- cover dynamics in Chiang Mai city and its surrounds. The land-use and land-cover statistics, obtained from GIS data base and satellite images from 1952, 1977, 1989 and 2000 revealed rapid increased in urbanization during these periods. To understand the underlying causes of land- use and land-cover dynamics, remote sensing, GIS and modeling techniques were applied. The SLEUTH model contains a characteristic that offers advantages in integrating with raster-based remote sensing data and in increasing the capability of GIS in modeling the spatial dynamics. The objectives of this research are (1) to systematically analyze remotely- sensed images of Chiang Mai area from available time series into major land-use-land -cover types and to identify the significant land- use/land- cover changes; (2) to apply a GIS for capturing the information on the temporal transportation layers, zones excluded from urbanization, and topographic layers such as slope and terrain hillshading in Chiang Mai; and (3) to test if the SLEUTH cellular automata model can be applied for simulating urban growth and land-use change in Chiang Mai. The study reveals that: (1) land –use/land -cover types in Chiang Mai can be classified based on the satellite images into Urban land, Agriculture, Forest, Water, and Miscellaneous; and the urban area increased from 13 km² in 1952 to 339 km² in 2000, with the tendency to increase over time; (2) the temporal transportation layers and slope developed by GIS served as the important variables for modeling urban growth by SLEUTH model; and (3) the urban development in Chiang Mai was best captured by Xmean and edge growth regression scores. In conclusion, the combination of remote sensing, GIS and SLEUTH model can be best applied to study urban growth and land -use change in Chiang Mai, if some adaptations for spatial accuracy and scale sensitivity are made.

Key words: Cellular automata; GIS; Remote sensing; SLEUTH, Scenario, Terrain hillshading, Urbanization; Chiang Mai; Model; Xmean

INTRODUCTION

Remotely -sensed data can be defined as data acquired from any sensor system, which includes those carried on aircraft, spacecraft and satellites. Deployment offers fast and accurate up-dating of spatial information about the Earth's surface. Remotely-sensed data have