MODELING OF UNAUTHORIZED LAND USE SPRAWL USING HIGH RESOLUTION DATA AND GIS BASED-CELLULAR AUTOMATA

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ABSTRACT

This study uses Cellular Automata (CA) model, Geography Information System (GIS) and remote sensing data to produce trend and sprawl pattern simulation of un-authorized land use in Kuantan, Pahang. The objective of this study is to forecast the trend and movement of un-authorized land uses for the year 2015. The author has identified three categories of land use that have the potential to sprawl as un-authorized land uses which consist of housing, commercial, and industry. Two land use maps were produced, the land use map for the year 2005 was produced using remote sensing image of IKONOS, meanwhile the land use map for the year 1990 was produced through digitizing process using GIS software. Based on the two maps, the un-authorized land use sprawl direction and pattern simulation for the year 2015 were produced. Sprawl analysis that uses spatial development features namely leap frogging, land use segregation and highway strips for the year 1990 and 2005 was also carried out to determine the trend of sprawl based on their development features. A calibration process was also carried out on the 1990-2005 land use map by using a combination of CA component and GIS in order to fix CA parameter on simulation for year 2015. The result shows land use mapping using remote sensing achieved an accuracy level of more than 85 percent (%). Using spatial development analysis, it was found that the three spatial development features studied showed that the study area experienced land use sprawl and that most land use development occurred along major roads within the study area. The result for sprawl calibration also showed correlation level of more than 90% was achieved for analysis done on land use simulation result for the year 2005 and the actual land use for the same year. The simulation also showed land use changes that are significant where percent of changes showed an increase of 20.6% change of non-built-up land use to built-up land use compared to year 1990. The trend and movement pattern also shows that land uses in the study area expanded following the development of major road infrastructure producing ribbon land use development pattern more than 50% were developed as housing area. This proved the tendency of land use classes to develop as un-authorized land use and used as input in producing a general guidelines for urban planning particularly for detecting un-authorized land use development. This also provide evidence that the combination of operational technologies in CA model is able to produce a model development that is sound both from the technical and practical aspects to be used in the field of urban planning.

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