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Spatial Effects of Varying Model Coefficients in Urban Growth Modeling in Nairobi, Kenya

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Abstract

Urban land-use modeling has gained increased attention as a research topic over the last decade. This has been attributed to advances in remote sensing and computing technology that now can process several models simultaneously at regional and local levels. In this research we implemented a cellular automata (CA) urban growth model (UGM) integrated in the XULU modeling frame-work (eXtendable Unified Land Use Modeling Platform). We used multi-temporal Landsat satellite image sets for 1986, 2000 and 2010 to map urban land-use in Nairobi. We also tested the spatial effects of varying model coefficients. This approach improved model performance and aided in understanding the particular urban land-use system dynamics operating in our Nairobi study area. The UGM was calibrated for Nairobi and predicted development was derived for the city for the year 2030 when Kenya plans to attain Vision 2030. Observed land-use changes in urban areas were compared to the results of UGM modeling for the year 2010. The results indicate that varying the UGM model coefficients simulates urban growth in different directions and magnitudes. This approach is useful to planners and policy makers because the model outputs can identify specific areas within the urban complex which will require infrastructure and amenities in order to realize sustainable development.

Keywords

Urban Growth Model, Cellular Automata, XULU, Model Coefficients, Prediction, Sustainable Development

1. Introduction

Urban modeling studies are currently considered as an essential component for numerous complex environmental

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