

MONITORING AND FORECASTING LAND USE CHANGES AND URBAN GROWTH USING MARKOVIAN CELLULAR AUTOMATA SPATIAL MODEL – CASE STUDY: MARSA MATROUH CITY, EGYPT

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Abstract

The objective of this paper is to establish a framework that quantifies land use changes and forecasts urban growth trends. Satellite imageries with moderate resolution (Landsat TM 5 and 7) are used to study the changes in land cover and land uses over a 15 years period (1987 to 2002). Two land use/land cover maps are produced for the two dates, then processed using a two steps Markovian Cellular Automata model. To enhance the projected land use of 2006, socioeconomic preferences and anthropogenic factors are collected and mapped using a raster/vector hybrid geographic information system. The anthropogenic factors are identified and weighted by a selected group of stakeholders. Finally, these factors are mapped and presented in raster form. The final projection of land use and urban growth is assessed both spatially and quantitatively. The spatial assessment is achieved by comparing the projection land use for 2006 against a spatial high resolution image (IKONOS MS) of the same area and date. Quantitative assessment of the model is achieved by creating an error matrix that compares the results of the projected land use to the actual land use depicted in the high resolution image. The accuracy assessment demonstrated an accuracy of 69.5%, which is considered acceptable in the modeling of land use changes using Landsat imageries.

KEY WORDS:

Land Use Changes – Urban Growth - Land Use Dynamics – Markovian Chain Analysis – Cellular Automata – Geospatial Modeling – Participatory GIS.

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