Dynamics Pattern of Land Use and Land Cover Change and Its Driving Factors Based on a Cellular Automata Markov Model: A Case Study at Ibb Governorate, Yemen

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Abstract : Change in Land use and Land cover (LU/LC) has a profound impact on the area's natural, economic, and ecological development, and the search for drivers of land cover change is one of the fundamental issues of LU/LC change. The study aimed to assess the temporal and Spatio-temporal dynamics of LU/LC in the past and to predict the future using Landsat images by exploring the characteristics of different LU/LC types. Spatio-temporal patterns of LU/LC change in Ibb Governorate, Yemen, were analyzed based on RS and GIS from 1990, 2005, and 2020. A socioeconomic survey and key informant interviews were used to assess potential drivers of LU/LC. The results showed that from 1990 to 2020, the total area of vegetation land decreased by 5.3%, while the area of barren land, grassland, built-up area, and waterbody increased by 2.7%, 1.6%, 1.04%, and 0.06%, respectively. Based on socio-economic surveys and key informant interviews, natural factors had a significant and long-term impact on land change. In contrast, site construction and socio-economic factors were the main driving forces affecting land change in a short time scale. The analysis results have been linked to the CA-Markov Land Use simulation and forecasting model for the years 2035 and 2050. The simulation results revealed from the period 2020 to 2050, the trend of dynamic changes in land use, where the total area of barren land decreased by 7.0% and grassland by 0.2%, while the vegetation land, built-up area, and waterbody increased by 4.6%, 2.6%, and 0.1 %, respectively. Overall, these findings provide LULC's past and future trends and identify drivers, which can play an important role in sustainable land use planning and management by balancing and coordinating urban growth and land use and can also be used at the regional level in different levels to provide as a reference. In addition, the results provide scientific guidance to government departments and local decision-makers in future land-use planning through dynamic monitoring of LU/LC change.

Keywords : LU/LC change, CA-Markov model, driving forces, change detection, LU/LC change simulation
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