Modeling Future Land Use/Cover Scenarios by Coupling System Dynamic Model and Cellular Automata Model

*RUCI WANG[1]

1. University of Tsukuba

With the rapid urbanization and industrialization, urban areas around the world are expanding at an unexpected high rate. From 1970 to 2000, 58,000 km2 urban land areas have been created (Seto, Fragkias, Güneralp, & Reilly, 2011). Similar with other developed countries, since 1999, Japan has entered to a ripe phase. The urban structure has become stabilized, especially in the Tokyo metropolitan area. Moreover, during this period, the competitive and sustainable land use/cover distribution has been crucial for the environmental protection and urban development. In this study, taking the Tokyo metropolitan area as a study area, an attempt is made to investigate the future urban structure based on system dynamic model and cellular automata model. The primary objective of this study is to analyze and model the spatial distribution and temporal changes in land use affected by natural and socioeconomic factors in the Tokyo metropolitan area. Traditionally, land use/cover change analysis was carried out by either statistical analysis or spatial processing. The combined researches of these two aspects are rarely seen, because regional drivers, such as population and GDP growth, technological progress, market regulation, and policy are difficult to be incorporated into the spatial analysis. We could not discuss the land use/cover changes quantitatively induced by these regional drivers. Different from other researches, this study integrates system dynamic model and cellular automata model, putting statistical analysis into spatial processing and forecasting land use/cover tendencies in the future. It is important to take into consideration the existing demographics, economic and environmental constraints. The simulation result will provide beneficial implications to policymakers and urban planners and allow them to aware the potential challenges and risks brought by this process, such as food security, pollution, urban climate changes and water resource constraints.

Keywords: System Dynamic Model, Cellular Automata Model, Remote Sensing, GIS

