Urban growth of Damanhur City: a study using Cellular Automata, (SLEUTH) Model

Abstract:

Most cities in the Arab Republic of Egypt suffer from the problems of urban growth and its consequent inadequacies of available resources, particularly, the encroachment on agricultural land around cities is one of the most important manifestations of it. This has prompted urban planners and geographers to pay attention to this issue trying to manage it and predict its future trends.

A number of geographical studies have recently emerged, aimed at achieving a good level of spatial understanding of the causes, trends and behavior of urban growth. So, the literature of geography has witnessed new concepts such as sustainable development, smart growth and modeling tracking, by so doing, the impact of factors influencing it at every stage.

This paper aims at studying the urban growth of Damanhur city (one of the Nile Delta cities) by investigating its stages. It applies "SLEUTH" (one of the urban growth simulation models) to extrapolate the image of the city future growth. The study uses Arc GIS (10.3) Erdas Imagine (2012) and SLEUTH (2.1) in data preparation and analysis.

The SLEUTH model has been developed from the original one, known as "Cellular Automata" at the American University of California. This has been conducted through developing of an algorithm based on the spatial characteristics of a location and its neighbors status by the activation of spatial rules to simulate the urban growth in its development stages.

Choosing "SLEUTH" was for a number of reasons : its ease to use, compatibility with the remote sensing and GIS data, possibility of following results, and it could be downloaded from the Web. It was calibrated based on a number of sequential satellites images and some geographic characteristics of the studied place to simulate the growth behavior in its different stages, and then concludes precise measurements of the impact of varied geographical factors on this growth, with an aim of using it to predict the dimensions and axes of the future urban growth.