Driving Forces and Future Directions of Informal Urban Expansion in Greater Cairo Metropolitan Region.

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（カイロ大都市圏における都市スプロール化の要因と予測に関する研究）

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論　文　内　容　の　要　旨

This research examines the issue of the Informal Urban Expansion (IUE) in agricultural lands in the Greater Cairo Metropolitan Region (GCMR). In GCMR the Informal Urban Expansion phenomenon is expected to accelerate in the next several decades, which will lead to crowding, housing shortages, insufficient infrastructure, and worsening urban climatic conditions. Since the 1950s, Egypt has witnessed a rapid urbanization in the form of expanding residential, industrial, and commercial activities around major cities. Unplanned residential areas accommodate between 12 and 17 million inhabitants or about 40-50% of Egypt's urban population. Despite 30 years of effort by the government to manage this phenomenon, unplanned settlements around the Greater Cairo Metropolitan Region (GCMR) become the home for more than 7 million people by 1998. Unplanned residential areas in GCMR were home for more than 65% of the total GCMR population in 2006. And research based on satellite images have indicated that the surface area of unplanned settlements in GCMR expanded by 3.4% per annum between 1991 and 1998. This expansion deteriorated the built environment and had a negative socioeconomic impact. On the other hand, urbanization supports socioeconomic development and improvements in the quality of life. This demands a system to manage negative impacts of rapid urbanization.

There has been a growing interest in identifying the impact of IUE and its driving factors to develop successful urban plans and management policies in developing countries. In the context of Egyptian urban planning, developing decision support tools for policy analysis, scenario building, and prediction in the early stages of land-use planning requires new research. This research intends to fill the need for research that explores the relationship between existing policies and future growth trends. Dynamic modeling of interactions between IUE and its driving forces can provide a step forward for decision-making and, analyzing appropriate policy interventions. In this research, we focused on Giza Governorate (the western part of GCMR) as a cases study, to analyze and understand the nature of IUE. It also studies the driving forces of IUE and their influences. The specific objectives of this research were: 1) Identifying the influence of government housing policies on IUE and on low-income housing; 2) developing a spatial indices to quantify and analyze spatial-temporal patterns of IUE; 3) Exploring socio-economic and physical driving forces of IUE and their influences; 4) And assessing consequences of different policy interventions on future IUE patterns and potential risk to agricultural lands.

Chapter 1 provides the rationale of the research topic and its scientific and social relevance. Then, it defines the research objectives, the study area and provides an outline of the thesis.　Chapter 2 discusses the nature of the housing policies and their relationship to housing issues. Primary data for this study was

derived from a questionnaire survey. The analysis results revealed that the existing policies have failed to end the phenomenon of IUE of low-income residential areas. The housing policies were not effective enough to meet the urban housing demand among young generation creating an accelerated growth of IUE. Chapter 3 examines the nature of IUE on current literature. Then, it quantifies and analyzes the spatial and temporal patterns of IUE using remote sensing data from 2004 to 2013. The results revealed the rapid expansion of IUE in Giza Governorate and its spatial characteristics. Following attributes of IUE were observed; fragmentation and unevenness of landscape, discontinuous development, strip development, leapfrog development, low density of land use growth, low population density.

Chapter 4 explored the physical driving forces and their influences on IUE by applying Logistic regression model. The findings of this study demonstrated the decreasing significance of the CBD and Nile River and the increasing significance of local urban centers on IUE. Moreover, we found that accessibility factors, especially neighborhood factors have a significant. The study area will experience urban expansion around existing IUE locations in the future. In Chapter 5 a questionnaire survey was conducted among planning professionals to identify the socio-economic driving forces of IUE and to analyze their relative influence within Giza Governorate. The study area was divided into three sectors in this study. The results revealed that current development plans have the lowest significance as a regulating factor of the urban expansion. By contrast, increasing population shows a high significance as a driving factor. Moreover, the results highlighted significant differences in relative significance of driving factors among three sub-sectors. These results highlighted the need for local urban plans that reflects needs of each sector. Current plans ignore such differences and treat the entire governorate as a single unit.

Chapter 6 investigated the consequences of different policy interventions on future IUE patterns and potential risks on agricultural lands. We applied an integrated model based on Markov chain, cellular automata, and logistic regression model to simulate three urban development scenarios namely; historical growth trend (HGT), compact growth (CG) and growth based on official plans (GOP). Under the HGT, and GOP scenarios, the IUE would cover the whole study area in future. IUE will discontinuously expand around major urban areas, or continue along major roads under the CG scenario. The CG scenario was effective in meeting the goal of environment protection. Chapter 7 focused on the middle sector (highly urbanized area near the Giza CBD). This study applied SLEUTH simulation model to investigate three growth scenarios (HGT, CG, and GOP). The results were consistent with the predicted patterns of Markov chain (MC) model. The results showed a highly dispersed development patterns under HGT compared to GOP scenario. The CG scenario constrained the growth in and around major urban centers. These findings are reflecting the effect of flat topography of the area and indicate that the urban development and the agriculture conservation are conflicting goals in Giza environment. The HGT scenario is preferable if the priority is given to urban development. However, the other two scenarios are recommendable if the priority is conserving agriculture lands. Finally, Chapter 8 provides the synthesis of the results and the conclusions of chapters two to five.