

**Limits to Urban Growth and Urbanization \***

A case study of Bangkok Problems

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**Abstract**

This paper suggests integrated teaching approaches of System Dynamics method for socio-economic analysis, and Geographic Information System for spatial analysis, in examining, evaluating and planning the limits to urban growth and urbanization of a city in the course of Urban Planning by taking Bangkok city as a case study. The course is offered for graduate students in the field of Social Sciences at Kasetsart University. Urban Dynamic Model applied in this study includes interactions of population, capital investment of housing, industry and transportation; economic development in terms of gross provincial product and loan interest rates, and land subsystems. The model aims to illustrate problems of shortage and ineffectiveness of City Planning Act which could not control disorderly urbanization and the over supplies of capital investment of housing and industry. Historical patterns of spatial settlements interacting with changes of socio-economic behaviour were illustrated. The policy revising the City Planning Act to limit clearly floor area ratio for building construction within the city in relation to land use categories - commercial areas, residential areas, industrial areas - generates the desired urban growth and urbanization.

**Summary**

**Problems**

One way of geographically understanding the evolution of cities is to think of urban future as being a response to the present pattern of socio-economic forces. Urban system can be conceived of as comprising two main components : the system of cities focusing on cities as points in space and the internal structure of cities focusing on the spatial arrangement of place and activities within those cities (Cadwallader, 1985:1). Model-building approaches to understanding urban process and phenomena are only selective approximations of reality, in that incidental detail is omitted in order to generalize certain fundamental relationships. Although models can be used as tools in that they allow complex phenomena to be visualized and understood more easily , they also entail disadvantages. In particular, despite the recent advances involving dynamics models (Clarke and Wilson, 1983: Wilson, 1981), models can present an overly simplified view of reality which leads to unsuccessful predictions. Most analytical modelling methods seldom incorporate the historical context of urban development, thus failing to appreciate the role of changing patterns of landownership, legislation, government or institutional policy (Gordon, 1981). Observations in real behaviour of urban development such as Bangkok, both government and business sectors consider the importance of economic growth as priority and separately from the spatial planning. The delay and unawareness of urban legislations due to political economy result in uncontrolling urban growth and disorderly urbanization. City Planning Act was ineffective to control specific land use policy and speculative development, especially at the edge of the city within the rural-urban fringe due to rapid economic growth and regulations related to City Planning are disorganized and diverged in implementation.

Many studies and teaching in the City Planning Courses also individually focus on socio-economic planning or spatial planning. Due to this shortcomings, this paper attempts to integrate both aspects into one approach, based on modelling concepts of classical model - the Concentric Zone Model and advanced model: System Dynamics Model of Urban Growth.

### **Model Design and Reference Modes**

Two models are linked and applied for spatial and socio-economic analyses for this study. The Concentric Zone Model which was formulated by Burgess (1925), suggested that the urban pattern could be summarized in terms of five concentric land use zones. These land use zones not only described the pattern at a particular point in time, but also represented the successive zones of urban expansion. The innermost zone was the *central business district*. This zone contained the downtown retailing districts, plus major office building and banks. Surrounding this area was the wholesale business district, with its associated warehouses called the *zone in transition*. This zone was characterized by inner factory belt and an outer ring of deteriorating residential neighbourhoods. The third zone was labelled the zone of *independent workingmen's homes* while the fourth zone was the zone of *better residences*. The fifth or outermost zone was the *commuter's zone*. This zone lay outside the legal boundary of the city (Cadwallader, 1985:118). This model is applied to explain patterns of spatial interaction or movement patterns within the city. Spatial distributions of particular variables such as land use and land value are connected to the Urban Growth Model which was formulated based on the URBAN1 model developed by Alfred and Graham in 1976, to explain the dynamic interactions of socio-economic variables within the urban system. The model represents interactions between population, housing, business structure, economic development, transportation access and land system subsystems with the policy inputs of exercising the City Planning Act. Two key-policy parameters- floor area ratio and building code-coverage area were tested.

Three kinds of maps were used for spatial analyses by means of Geographic Information System- (1) spatial data from a color composite of three Spot Pla Images acquired on 7 December 1989, 10 November 1992 and 14 April 1994 were employed showing the expanding urban area of Bangkok and spatial analyses of urbanization; (2) Aerial photo map of particular district such as Donmuang district in 1991, scale :1:20,000 was used to observe the changes of settlement patterns, (3) actual land use map from field survey conducted by Office of City Plan in 1986 (the lowest economic growth rate in a cycle of eight years (1986-1993) was also used as base map to examine the changes of particular vacant land use in response to the urban growth. A cycle of urban growth from 1986 to 1993 in terms of interactions between economic growth (loan interest rates for housing) and the expansion of housing was illustrated in time series as reference mode.

### **Policy Experiments**

Policy alternatives with various regulations related to the City Planning Act were tested and illustrated spatially the possibilities to limit urban growth and urbanization.

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\* Full paper will be distributed and presented at the Conference' s session.