論文の内容の要旨

論文題目　OPTIMIZING URBAN LAND USE ALLOCATION FROM STAKEHOLDERS' PERSPECTIVE: CASE STUDY OF DHANMONDI RESIDENTIAL AREA, DHAKA, BANGLADESH

(利害関係者の視点から見た都市土地利用の最適配置:
バングラデシュ・ダッカ・タンモンディ居住区におけるケーススタディ)

氏名　ハック アフサナ

本文 ABSTRACT

The present study is carried out from a realization of the need for effective and computationally easy and efficient tool for the land use planners at the city and land development authorities in generating and evaluating alternative feasible land use plans and decisions. In order to perform these tasks competently in an extreme resources constrained environment, one needs to have a clear understanding about land use planning problems, role of multiple stakeholders, their priorities and government interventions and policies. Analyses of space use distribution in small range also help to understand and solve large scale allocation problems.

Dhaka, the capital of Bangladesh, accommodates 40 percent of the total urban population of the country (Jahan and Maniruzzaman, 2007). The first Master Plan for Dhaka was prepared in 1959, which became obsolete in the newly liberated country. Later on Dhaka Metropolitan Development Plan (DMDP) has been prepared for 1995-2015. It tells about 26 Strategic Planning Zones (SPZ) and decides to prepare Detail Area Plan (DAP). Non-existence of DAP even for a single zone after a decade of the inception of DMDP has created the scope for misinterpretation of the statement of DMDP. Therefore, Dhaka which is going to be the fourth largest city in the world with a gross density 193 persons/hectare suffers from aimless development with acute land allocation problem.

Under such circumstances, an effort is made here to exercise on the interests of two major stakeholder groups: government planners/ planners and land owners/ developers, while making urban land use allocation decision. From government planner's perspective two objectives are initially selected. One, maximizing land price (Model 1) as it emphasizes and ensures the importance of high value and static

supply of urban land and the second is minimizing the incompatibility (Model 2) among adjacent land uses that might control and restrict environmental deterioration. These two objectives are conflicting and therefore treated simultaneously (Model 3) building a trade-off between them. The underlying concern is to achieve a land use distribution where both the mentioned objectives can be balanced. The interest of individual owner or group of owners (termed as developers) is modeled to maximize the land price of each and every lot of the locality (Model 4).

To the author's knowledge, one of the main strengths of these models is that they consider urban land use distribution in terms of floor wise space use in each building of the concerned area. This may be again considered as one of the shortcomings as they do not recognize any kind of space use except building. Hence, vacant lots, open spaces etc. are not considered in the application of the models.
Since the models have non-linear formulation and refers to a huge combinatorial problem, a heuristic approach namely genetic algorithm (GA) is selected as it is faster and capable of solving large combinatorial optimization though not guarantee for a genuine true optimal solution. It is based on evolution theory in which the selection of new generation is based on the best fit species. Following some systematic steps GA is applied over Dhanmndi R/A to test the model.

While applying the models on Dhanmondi, land price is estimated through hedonic regression analysis. Three semi-log linear equations explain about 73 percent, 76 percent and 67 percent of natural logarithm of unit price of the lots having dwelling units, commercial and office employment respectively. Due to limitations regarding data, the price accrued from other uses like school/college, health, or civic uses etc. are not considered.

The major portion of data was collected through field survey in August-September, 2006, which recorded the land price data for sample plots and land uses of each floor (sq. ft. area) of every building of Dhanmondi. Data on accessibility to important activity centre namely Newmarket was obtained using GIS (Geographic Information System) application. The other relevant data like adjacency of the plot to major road, green space and lake were derived from the base map of ward no. 49, zone 5 prepared by the Urban Planning Department, Dhaka City Corporation (DCC). 12 professional's views were statistically categorized to determine the incompatibility index.

Using this database, five optimization runs are selected at the outset to solve Model 1 and 2 under two different sets of constraints with GA. Constraint set 1 allows one and only one use in each plot, whereas the other set consents to more than one use in each plot. Each optimization run permits

specific share of change of residential, commercial and office space with respect to the existing distribution to test the models. Once both these two models are optimized individually effort has been made to balance them considering high redevelopment cost.

With two different sets of constraints, the models appeared with pretty similar outcomes at the optimization of their objectives. Model 1 maximizes land price with the growth of commercial and office use to their highest limits. It complements the fact that the more the non-residential use the higher the land price. With the decreasing amount of allowed change it is observed that land price also goes down as the share of non-residential (here, commercial and office use) uses also become restricted. The result eventually reflects the existing trend of haphazard development in Dhanmondi losing its initial residential character. In contrast, land use distribution for Model 2 shows pretty organized setup providing options for planners to maintain better quality of urban built environment. It depicts that inconsistency among adjacent space uses decreases in a considerable amount facilitated by the inclusion of more residential use at the diminution of commercial and office use constrained by their limit.

The visual inspection of Model results reveals that commercial and office uses tend to gather nearer to roads (here, nearer to major road) and other non-residential facilities while inhabitants want to be closer to the amenity facilities like school/college, playground, health facilities etc. An interesting point comes forward while optimizing model 1 and 2 with the second set of restrictions. It reflects that model 1 does not at all encourage mixed use in the same plot for Dhanmondi though model 2 does not provide any definite inclination to such conclusion. The result derived from the application of Model 3 over study area indicates for the designation of few blocks for non-residential use in general and specifically for commercial and office purposes.

The interest of land owners is then optimized respecting the Floor Area Ratio (FAR), Building Coverage Ratio (BCR) and consulting private residential land development rules and DMDP statements. Model 4 turns the whole area as a mixed use zone. However, the model results have implications to highlight the perspective of one of the prime stakeholder groups at the time of policy formulation and to create some scope for further investigation.

To this end this research provides some generalized suggestions with the hope that it would improve the land distribution decision for Dhanmondi R/A.