IV-34 RESIDENTIAL ALLOCATION MODEL FOR DEVELOPING CITIES
The CALUTAS Heritage

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Abstract. This paper describes households behavior in choosing housing locations in developing cities with case study of the Greater Bangkok Area (GBA). Residential allocation model of the Computer Aided Land Use Transport System (CALUTAS) is modified by introduction of various socio-economic groups in order to suit with situations in developing cities.

1 Introduction

The growth of cities in the last two decades, particularly in Third World countries, has been remarkable. Accompanying this growth has been the increase in infrastructures. The impact created by the proliferation of infrastructures has been enormous. A planner must take into account this impact and the way in which it changes the locational pattern.

The purpose of this paper is to modify CALUTAS/Residential Allocation Model which can explain the housing locational changes in long time horizon due to the impact of transport improvement and social economic mobility. The authors described the possibility in application of CALUTAS to GBA in general aspects.[1)] This paper emphasize in residential allocation model with social groups, their divergence of income and budget constraint are taken into consideration.

2 GBA Household Behavior

In GBA, the social composition is considered to disaggregate into three groups based on type of tenure as shown in Fig.1. Those in upper medium and high income groups are able to participate in housing market. They choose the housing location by maximize locational surplus. The medium income group and those in low income group have to seek for rented dwelling units by also maximize locational surplus. The lowest income group is considered to be slum inhabitants who locate in slum areas (or congested areas). At present the slum areas are generally scattered around the areas of the extensive employment opportunities, and it is estimated that there are more than 410 slums totalling approximately 550,000 persons or about ten percent of the GBA population in 1978. Table 1 shows private households by type of tenure.

3 Overview Of The Model

The original residential allocation model of CALUTAS taking no account of social groups and budget constraint. With consideration of the fact of household behavior in developing cities, the disaggregated social groups and budget constraint are introduced, therefore the model shows more sound theoretical aspects.

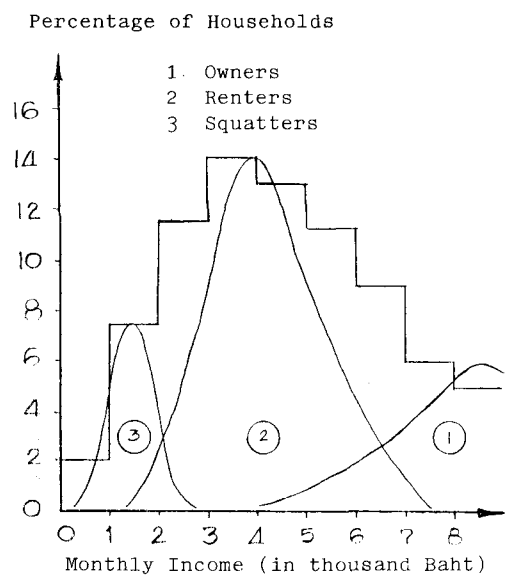

Fig.1 Estimated Income Distribution of Each Social Group Assuming Normal Distribution

Table 1 GBA Private households by type of tenure (1980)

Tenure	Households	Percent
Owner	613420	57.6
Renter	309084	29.0
Payment in kind of service	34516	3.3
Rent Free	80144	7.5
Unknown	27576	2.6
Total	1064740	100.0

Source: National Statistical Office (NSO)

3.1 Locational Surplus

$$L^{k}_{ij(t)} = U^{k}_{ij(t)} - P_{i(t-1)}$$

where
$L^{k}_{ij(t)}$ is the locational surplus of households group k who work in zone j and live in zone i at time t,
$U^{k}_{ij(t)}$ is the expected utility of households group k who work in zone j and live in zone i at time t,
$P_{i(t-1)}$ is the land price in zone i at time t-1.

3.2 Land Price Function

Land price function is formulated to assume that everyone can participate in land market. The log form of multiple regression is adapted.

3.3 Utility Function

Every group is assumed to have the same utility function. In estimation, the generalized time of each group is calculated independently.

3.4 Constraints

Apart from available area constraint, budget constraint is also taken into account. A locator can lacate in any zone i if monthly housing price/rent is not exceed monthly income after all expenses and savings are deducted.

$$ß(P_i A^k + H^k) \leqq (I^k - E^k - S^k)$$

where
ß is the capital recovery factor,
P_i is the land price in zone i,
A^k is the required housing area for group k,
H^k is the housing construction cost for group k,
I^k is the monthly income of households group k,
E^k is the other consumption expenditures of households group k,
S^k is the savings of households group k

3.5 Allocation

In order to consider the variance of income in the same group, those people in several groups are divided into some segments according to their income levels and each segment is allocated into each zone considering their locational surplus and budget constraint.

4 Results and Concluding Comment

Fig.2 shows residential location pattern of the increment of observed population and estimated population from 1973 to 1978. There are two sets of estimated population, with considering budget constraint and without considering budget constraint. The correlation coefficient between observed and estimated of with budget constraint and without budget constraint are 0.7814 and 0.6494 respectively.

It should be noted that behavior models can explain households behavior in developing cities but such models as this are often face with data availability and also often be difficult to obtain consistent data on household budgets and amenity levels, and require more computing time.

Reference

1) HIDANO, N., NAKAMURA, H., YOSHIE, K., RATCHAPOLSITTE, Samart, and FUKUDA, A. (1984), The Possibility in Application of CALUTAS to GBA, Proceedings of Infrastructure Planning, Vol.6, (in Japanese)

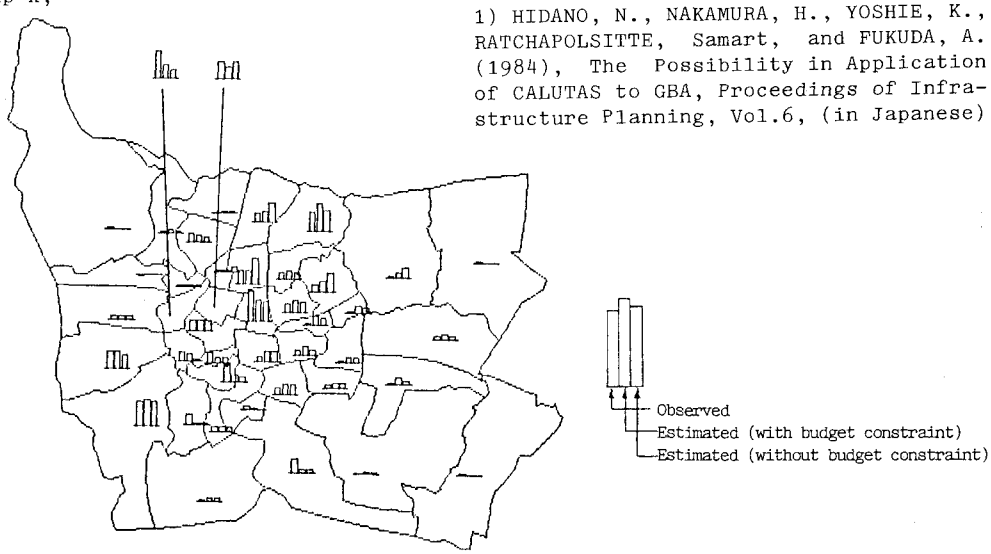

Fig.2 The Increment of Population from 1973 to 1978