

Transportation Improvement and Local Socio-Economic Development

- Case Study of Vientiane Capital -

Ritsumeikan University	Student member	○ Baythone LOVANXAY
Ritsumeikan University	Student Member	Xeuepeng QIAN
Ritsumeikan University	Student Member	Somepasong AMPHENGPHAI
Ritsumeikan University	Member	Mamoru HARUNA

1 ABSTRACT

The purpose of this study is to analyze the affects of transportation improvement on local socio-economic development especially household incomes, social welfares, job opportunities, and, manufac- turing firm's output. The model is being developed due to the attempt to find a regional development model for Laos. Vientiane Capital will be regarded the case study. During the simulation process, the model will be hypothesized the assumption that the more traveling hours and traveling cost decrease, the more household can supply their labors to production process, the more they can increase their incomes, and the more local economic. This study will be conducted in three main stages: modeling, analyzing, and planning.

2 BACKGROUND TO THE STUDY

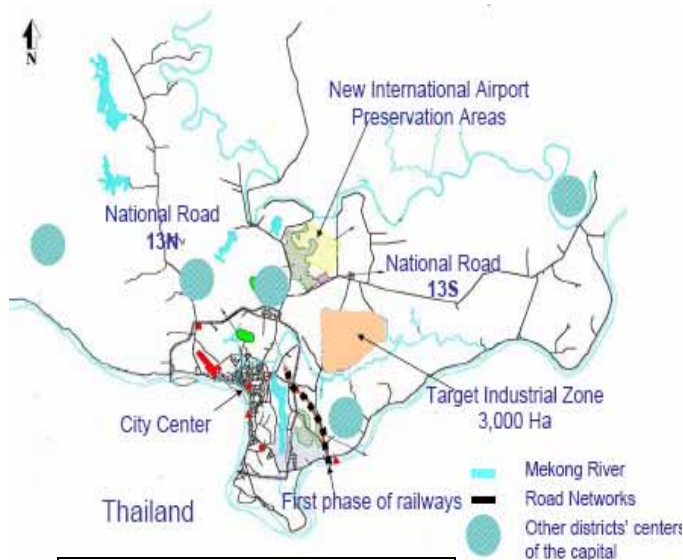


Figure1. Map of Vientiane Capital

Vientiane Capital is the capital of Laos located in the central part of the country and has national roads run through the city. The current population of about 669 000 inhabitants and it is the second biggest province with the number of population. Population density ranges in the first rank of the country with 170 inhabitants per square kilometer. Since 2000, the Government has set the long term social-economic development goal towards 2020 due to release from the poorest condition and become the modernized-industrialization country. With industrialization, five industries have targeted to be the main industries: hydro power, wooden and agriculture, manufacturing, construction material, mining, and, tourism industries (national level). According to the new Master Plan, Vientiane Capital has set an industrial zone with 3000 hectares about 30 km far city center. When this industrial zone is in process, many people are expected to gather around this area and as the result it will bring about the

urban sprawls, social problems, and environmental issues. Due to those circumstances, working on interaction among transportation system, household, and, manufacturing firms will provide alternative solutions to regional planning. What condition will bring about household satisfaction, optimal firms' output, and, local socio-economic development from improving transportation system while limit the negative impacts from the development.

3 STRUCTURE OF THE MODEL

The model is assumed to work with three principle sectors: production sector, household sector, and, transportation sector. The production sector produces non-homogeneous output for external markets and use labor and capital as their main inputs. Household sector is to supply labor units for production purpose, consume goods, and leisure activities. Transportation sector consists of two terms, transportation infrastructure accessibility which is aimed to facilitate the labor movement and transportation infrastructure capacity which is aimed to facilitate production sectors.

4 METHODOLOGY OF MODELING

Transportation Improvement and Local Socio-Economic Development model is assumed to develop in an open economy with two zones. One is household's zones and another is industrial zones. Household zones are assumed to be moveable due to the satisfaction of living condition which is denoted by r ($r=1,...,m$), however, industrial zone is assumed to be fixed in one specific location and there are many manufacturing firms which are denoted as s ($s=1,...,n$).

Key words: transportation improvement, labor incomes, social welfare, local economic growth

Address: 〒525-8577, Shiga Prefecture, Kusatsu City, Nijihigashi 1-1-1. Ritsumeikan University, College of Science and Engineering, City and Regional Planning Laboratory. Tel: 077-561-2736

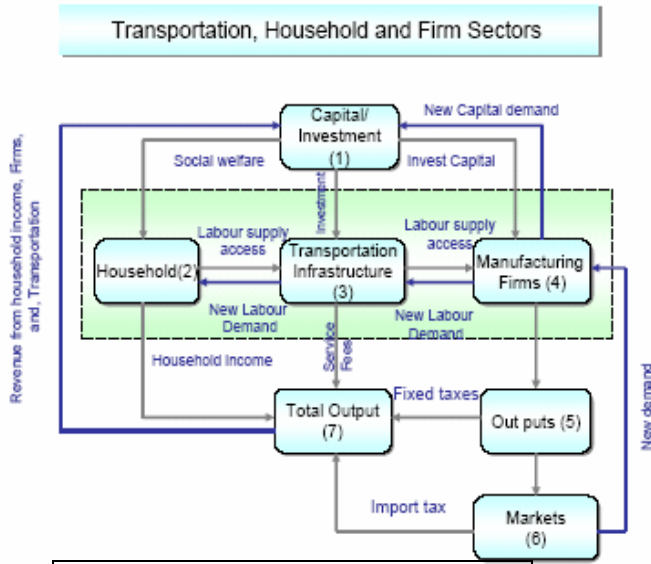


Figure2. Model's Structure in Macro Level

The first model is developed in spatial economy which firms are operated under condition of agglomeration economies, and household that supply labor input are subjected to travel congestion. In simulation process, they hypothesize that firm's agglomeration and individuals' trade-off between leisure and work determine the level of output and employment in the modeled economy. They further hypothesize that when travel time decreases, following capacity expansion, and accounting for firm's location, the additional free time will be part to increase labor supply. To calculate the labor equilibrium from utilizing agglomeration economy, they first find the firm's best location, then optimal firm's output by maximizing profit function, labor and capital demands, equilibrium amount of labor, inter-zonal travel time, amount of leisure time and finally general equilibrium in economy.

The second model is developed to hypothesize that if travel time and costs represent a significant barrier to labor-market participation, improving accessibility, in

terms of reduced travel time and cost, can affect the propensity of potential employees to enter labor market, given their residential and employment location and social-economic attribution. In their study, they have developed 2SLS regression model to assess the effect of accessibility function on labor participation and it is sure that accessibility function and employment function are included in their model.

When we try to apply those two models, however, we find that they can not be applied the whole system of the model directly to our studied case due to different condition and data that will be available. The first model seems to work well on our model, but the assumption cases are different. The first model deals with the two types of firms that assumed to be moveable to find the best location and with fixed household location; however, the condition of target case study is assumed to deal with the fixed industrial zone with moveable households in order to find the optimal condition aiming to increase their incomes. Transportation accessibility will play the important role to determine the condition for labor participation while transportation infrastructure capacity will play an important role to determine the condition for firm's growth. The hypotheses will be analyzed through the following equations.

Production Sector	Household
1) $\sum_{s=1}^n y_s = A_s \cdot (l_s)^\alpha \cdot (k_s)^\beta \cdot (x_s)^\sigma$	3) $\max \sum_{r=1}^m U_r(l^e, c) = \sum_{r=1}^m (l_r^e)^{\mu_1} \cdot (C_r)^{\mu_2} \cdot I_r^{\mu_3}$
2) $\pi_s = p_s \cdot y_s - w_s \cdot l_s - p_k \cdot k_s - p_x \cdot x_s$	4) $w_{s,r} \cdot (\bar{l} - l^e - l_{s,r}^t) > p_c \cdot C_r$
5) $l_{s,r}^s + l_{s,r}^e + l_{s,r}^t = \bar{l}_{s,r}$	
6) $T_{r,s} = \eta_0 + \sum_m \eta_1^m (w_{rs}^m c_{rs}^m) + \sum_m \eta_2^m (w_{rs}^m t_{rs}^m) + \eta_3 d_{rs} + \eta_4 c_r^H + \eta_5 \ln Y_{r,r}^H + \varepsilon_1$	

Where in production sector **1**) is the production function consists of technology (A), labors (l), capital (k), and land use (x). **2**) is the profit function which each firm assume to maximize and it consists of total output ($p_s y_s$), total payment for labors ($w_s l_s$), total investment ($p_k k_s$), and fixed payment for land ($p_x x_s$). **3**) is the household utility function that each household needs to maximize, consists of leisure times (l_r^e), consumption (C_r), and incomes (I_r). It subject to equation four and five. **4**) is the total earning must be bigger than expenditure on consumption. **5**) is the total time available in economy consists of working time, traveling time, and leisure time. **6**) is the transportation accessibility for household. This equation will be the measure factor for the household to decide whether they will participate in labor market and their location.

5 CONCLUSION

From the simulation analyzing, the hypotheses will present the affects of transportation improvement on local socio-economic development especially household incomes, social welfares, job opportunities, and, manufacturing firm's output. Latter, we will propose alternative regional planning model to case study (Vientiane Capital) through controlling and planning variables. However, this paper is a brief about the main part, modeling, while the analyzing stage is under the process. A full version of the study will be prepared and presented latter.