Analysis of Impact from Introducing Parking Restriction in Vientiane Using Traffic Simulation Model

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1. Introduction

Recently, motorization has been expanded in Vientiane, the capital of Laos due to rapid growth of economy and population. Since capacity of off-street parking is not sufficient to meet a such growing demand for vehicle, illegal on-street parked has increased year by year and it has became the cause of traffic congestion. Thus, in this study, assuming implementation of parking restriction policy based on parking management concept which was proposed as one of transportation policy package by Asia Development Bank (ADB), its impact was estimated.

2. Summary of Existing Policies

Several studies have been carried out for urban transportation policy development in Vientiane. For example, ADB carried out the study on "TA 7243: Implementation of Asian City Transport Vientiane Sustainable Urban Transport Project" in 2010. Japan International Cooperation Agency (JICA) also carried out "the Study on Comprehensive Urban Transportation for Vientiane"[1]. Vientiane also selected as one of targeted city under "Asian Mayors' Policy Dialogue for the Promotion of Environmentally Sustainable Transport in Cities". Proposed policies and measures were summarized from viewpoints of Avoid, Sift and Improve strategies as shown in Table 1.

Table 1 Compare of traffic policy

Strategy	Policy	Outline	Comparison		
			EST	ADB	JICA
Avoid	Compact City	Sprowling area put together.	○		
	Transit Oriented Development (TOD)	Land use designed to maximize access to public transport	○		
	Information Communications Technolgies (ICT)	Cut down commute time by using the Internet.	○		
Shift	Non-Motorized Transport (NMT)	Accelerate the use of NMT.	○		
	Bus Improvent	Introduce of Loop bus or Articulating bus.		○	○
	Bus Rapid Transit (BRT)	Public transportation systems using buses to provide faster, more efficient service than an ordinary bus line.	○		
	Light Rail Transit (LRT)	Higher capacity and higher speed than traditional street-running tram systems.			○
	Road Pricing	An economic concept regarding the various direct charges applied for the use	○		
	Provision with Parking Space	Maintenance appropriate parking.		○	
	Parking Management	Introduce of Park and Ride. etc	○	○	○
Improve	Road Improvent	Improvement of the intersection and development bypass.			○
	Cleaner Fuels and Technogies	Eco-car to recommend.	○		
	Road Taffic Law	Implement the Road Taffic Law.	○	○	
	Intellingent Transportion Systems (ITS)	Improvement of the signal control.	○		
	Freight Transport	Efficiency of freight vehicles.	○		

3. Methodology

To deal with different scale of policies and measures mentioned in Table 1 as future study, traffic demand forecasting model which is mainly used for evaluation of road network improvement, bus transport introduction, etc. in macro level and micro traffic simulation model which is mainly used for evaluation of signal control and parking management were employed together. Specifically, with consideration of interaction between macro and micro analysis, VISUM was used for traffic demand forecasting and VISSIM was used for micro traffic simulation at the targeted area with OD data which was cut out from the result of demand forecasting. Impact of illegal on-street parking was simulated using new feature on the latest version of VISSIM.

4. Implementation of Micro Traffic Simulation

The targeted area of micro traffic simulation covered central business district of Vientiane in which traffic volume has been high and the area along planned Bus Rapid Transit (BRT) line because traffic volume will be increased. The area of micro traffic simulation and the area restricted on-street parking were depicted in Figure 1. Traffic volume was estimated based on data from JICA study. OD data in 2010 was set up based on OD data in 2007 and 2013 by applying first order interpolation. On the other hand, OD data in 2030 was estimated by multiplying growth rate of total trip which was obtained as approximate expression to trip distribution. Then, traffic assignment was carried out on the network which was developed by VISUM. The result of traffic assignment was transferred to VISSIM and micro traffic simulation was carried out after over taking movement of motorcycle and behavior regarding on-street parking were set. In this study, simulation was carried out for three cases, in 2010 with on-street parking, in 2030 with on-street parking and in 2030 with restriction for on-street parking were simulated. The process of simulation was depicted in Figure 2.

Keywords: CO2, Macro Simulation, Micro Simulation, Vientiane, Vehicle Behavior

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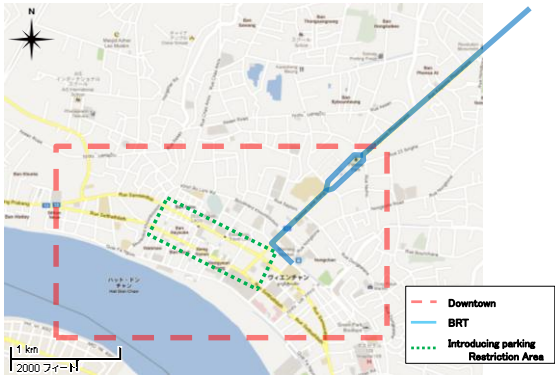

Figure 1 The targeted area of simulation

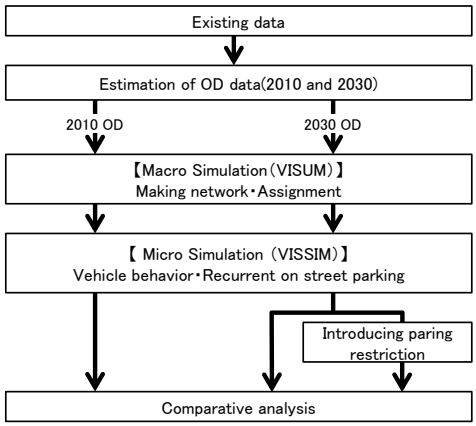

Figure 2 The process of simulation

5. Indicators for Evaluation

Average speed and amount of CO_2 emission on all links were estimated for the evaluation of simulation. Amount of CO_2 emission was calculated by traffic volume, speed, length of road section and emission factor by vehicle type by link. Since the emission factor was not available in Vientiane, the emission factor which was developed for Bangkok, Thailand was used instead[2)].

6. Result of Analysis

1) Average speed on all links

Average speed by vehicle type on all links was depicted on Figure 3. Comparing travel speed in 2010 and 2030, travel speed was dropped according to increment of traffic volume and travel speed was rose by restricting on-street parking.

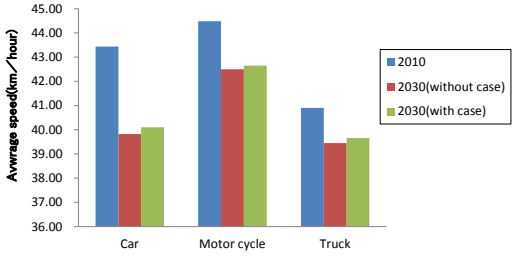

Figure 3 Average speed on all links

2) Amount of CO_2 emission

Amount of CO_2 emission within the targeted area of simulation was shown in Figure 4. Within the targeted area, amount of CO_2 emission will be increased significantly and it will not be decreased even on-street parking restriction will be implemented. However, CO_2 emission will be reduced 2.9t/day on only links on-street parking will be restricted as shown in Figure 5. Therefore, it was found that restriction on-street parking might be effected on the links restriction was adapted.

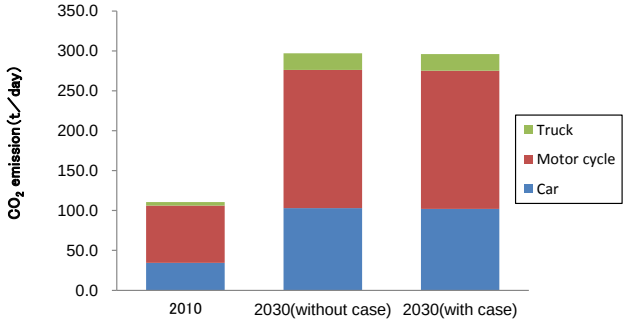

Figure 4 CO_2 emission within the targeted area.

Figure 5 CO_2 emission on the link restriction was adapted

7. Conclusion

Employing micro traffic simulation, the evaluation including take-over movement of a motorcycle could be carried out. Also, it was found that restriction of on-street parking will be affected on improvement of average speed and reduction of CO_2 emission on the targeted links. For a further study, estimation of an impact when the area restricted on-street parking will be expanded and other policies such as BRT introduction will be implemented should be studied

Bibliography

1）JICA : THE STUDY OF MASTER PLAN ON COMPREHENSIVE URBAN TRANSPORT IN VENTIANE IN LAO PDR,2008
2）社団法人海外運輸協力会、日本大学理工学部、財団法人日本気象協会:国際協力銀行委託調査　タイ王国円借款環境改善のための委託調査報告、2006 年