OVERVIEW OF URBAN TRANSPORTATION SITUATION & BUS SERVICE IMPROVEMENT IN HANOI

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Abstract

Hanoi is a motorcycle-dominated city. Similar to other South East Asia cities, the non-laned mix traffic flow makes the traffic situation even more serious. According to IRTAD 2009, Hanoi is the 3rd highest rate of fatalities per 100.000 inhabitants (lower than that of Argentina and Malaysia). In which, motorcycle is the riskiest transport mode which contribute 53 – 56% of vehicle related to traffic accident. The domination of motorcycles results in the energy inefficiency, lower Level Of Service (LOS), pollution and high rate of fatalities. Therefore, it is necessary to promote the transition to a safer and more effective transport mode – Public Transportation. However, the bus – the only Urban Public Transportation in Hanoi now – is not pleased by bus users. Bus service is considered as economically ineffective and low quality. This paper aims to analyze the main problems of bus service in Hanoi and find improvement measures. By conducting surveys and analyzing data from TRANSERCO (Hanoi Transportation Company) and stakeholders, we will propose suitable measure to improve bus service in Hanoi towards a sustainable Urban Transport System.

Keywords: Public transport, Transport modes Transition, Bus service, Public Transport improvement

1. Introduction

Hanoi is a motorcycle-dominated city with non-laned mix traffic flow. According to the TRANCOCEM/ITPM in 2010, motorcycle is account for 95% of Traffic composition in 2004 and 91% in 2009, Fig.1. The domination of motorcycle and the participant of Car, bicycle and other vehicles in a non-laned road make the traffic issue in Hanoi become the most unpredictable, Fig2. There are a few efforts to simulate the traffic follow in Hanoi. However, almost all simulation models are developed based on the homogeneous and Lane-based passenger car traffic. Therefore, the development of any simulation needs to take consideration to many factors including: Vehicle size and type, the maneuver of vehicles, the driver behaviors etc.
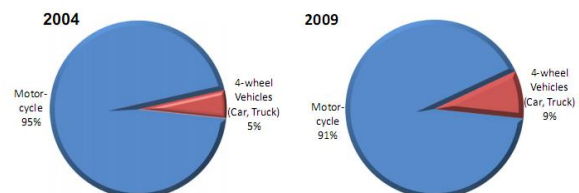

Fig. 1 Traffic composition on Hanoi urban arterial
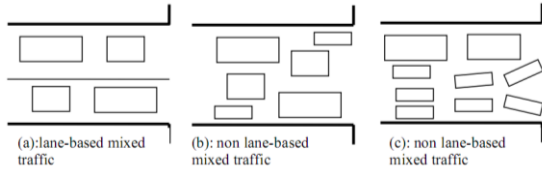*(Cau Giay –Kim Ma, 7:00 am to 8:00 am)* [1]

Fig. 2: Various mix-traffic situations [2]

However, there are nearly 10% of Travel Demand served by bus system and the bus is consider the only Public transportation mode in Hanoi. Therefore, improvement of bus system is a necessary measure to a better Urban transport system in Hanoi. This paper will point out main issue of Urban transportation and improvement for bus services in Hanoi.

2. Literature Review

The non-laned mix traffic flow is the typical traffic flow in South East Asia city especially Hanoi. The mixed traffic flow has been research recently and not yet full developed. For a long time, the Traffic flow element in Vietnam Highway – Specification for design TCVN 4054:2005 is the adoption of ASSHTO standard specifications 1998 which is developed based on homogeneous and Lane-based passenger car traffic. The adoption also have the adjustment call Equivalent Car factors Which is taking account of Passenger Car Unit (PCU) , Table 1. However, the other factors such as: maneuver, driver behavior has not yet taken in consideration carefully but using some local empirical factor. Therefore, the motorcycle (not sync with design specifications) is related to Traffic accident is significantly higher than other type of vehicles (sync with design specifications), Fig.3.

Table 1: Equivalent Passenger Car Factors

Terrain Conditions	Vehicle Types					
	Bicycle	Motorbike	Car	2-axle trucks and <25-seat buses	>3-axle trucks and large buses	Articulated trucks & Buses
Flat & Hilly	0,2	0,3	1	2,0	2,5	4,0
Mountainous	0,2	0,3	1	2,5	3,0	5,0
Note: Hill Mountain slope < 30% Flat & Hilly terrain						
Hill Mountain slope > 30% Mountainous terrain						

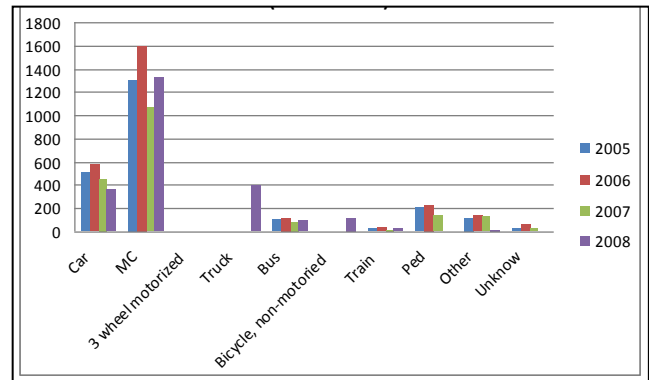**Source:** Vietnam Specifications TCVN 4054:2005 Highway – Specification for design

Fig. 3 Traffic accident by type of Vehicle (unit: vehicle)
Source: Hanoi Traffic Police Bureau 2009

Recently, with the application of Cellular Automata (CA) which divided the road space into cells and the vehicle represent by those cells, the other factor such as vehicle size and maneuver has been researched more carefully. The Institution of Transport Planning and Management – University of Transport and Communications has been using and teaching VISSIM and Simulations. Some efforts are making to put simulation by VISSIM in the transport policy making and designing process.

However, a sustainable transport system requires a good public transport system. With more than 90% of motorcycle dominated, the Transportation mode process in Hanoi needs time and careful researches.

3. Methodology

The researchers of this paper follow 2 approaches. The first is studying the data from the bus system operation stakeholder for example TRAMOC, TRANSERCO etc. The second is conduct survey and site observations for the up to date traffic data.

4. Results
4.1 Overview of Bus service situation

The bus is the only public transportation mode in Hanoi and only served 10% of Travel demand of Hanoi Road users (over 10.800 trip/day)

There are 82 bus route in urban area includes:

+ 49 routes get the subsidy applied the ordering mode

+ 16 routes get the subsidy applied the socializing mode

+ 10 routes don't get the subsidy

+ 7 surrounding routes connect Hanoi with others provinces.

The buses operation time : 5:00 to 22:30

The bus is the vehicle with the highest transport capacity, the least fuel consume and least surface usage in Hanoi

Table 2: Comparison of Transport Capacity

	Occupancy	Traffic flow (vehicles) in 1h/3.5m lane	Traffic flow (people) in 1h
Bus	80 people	300	24 000
Car	1.5 people	1 800	2 200
Motorcycle	1.3 people	12 600	26 380

Source: Hanoi Public Transport Management and Operation Center (TRAMOC) 2011

Table 3: Comparison of Road usage and fuel consume

	Road usage	Surface usage	Fuel consume
Bus	10,8%	8,9%	5,9%
Car	4,0%	19,0%	20,5%
Motorcycle	80,8%	62,4%	69,9%

Source: Hanoi Public Transport Management and Operation Center (TRAMOC) 2011

4.1.1 Stakeholders

TRANSERCO is the company taking responsibility of bus operating system and bus crew while TRAMOC is responsible for issue ticket and policy making.

TRANSERCO is HANOI TRANSPORT & SERVICES CORPORATION which includes 9 subsidiaries. The total number of officer is 8.257 people

The main income of TRANSERCO is from the following sources:

1. The bus fare.
2. The advertising on the bus and bus stop
The revenue from advertising in a bus each year is around $ 3000

Fig. 4 Advertisement position on Bus
Source: TRANSERCO

3. The subsidy from the government. In 2006, There are 203 billion VND subsidy and in 2011 is 1332 billion VND.

4.1.2 Bus, bus stop and bus user

There are 1254 buses satisfies the urban bus requirements at normal rate, 100% of buses have air- conditioner. 50/82 routes have the bus black box with GPS. 2 routes have the bus satisfied the EURO III standard and lower floor board for passenger usage and environmental protection.
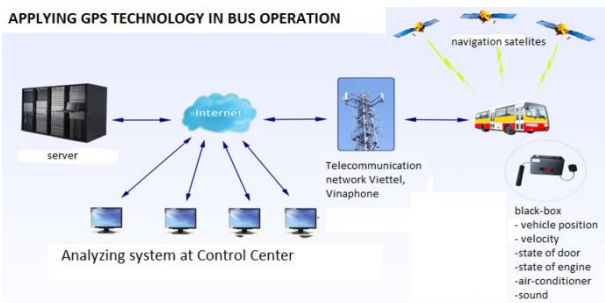

Fig. 5 Applying GPS Technology in Bus operation

However, this number seems not satisfied the higher and higher demand of bus user and there are a lot of problems that make the bus not attractive with users. According to TRANSERCO there are 38% of bus users need to travel more than 500m to access the bus stop. As site observation of Hoang and Hieu in Bus route number 06 (35.9km) there are 39 bus stops in the direction from Giap Bat to Cau Gie. This means the average distance between bus stops is 944m. There are 8 BRT stops share the same position and sign with normal bus stop in bus route 06. Note that the BRTs in Hanoi are also the normal buses. The only different is BRTs will stop only in BRT stops. The time saved by not stopping in every bus stop makes the BRTs become faster than normal buses. The other factor such as size, capacity, velocity and design of BRTs and Buses are the same.

Fig. 6 The BRT stop (left) and the Bus stop (right)

As in the site observation, there are just 5/39 bus stops have shelter, bus route map and other facility. It means the bus user of 87.2% bus stop need to wait for the bus in the rain or hot weather without protection. Moreover, the bus road map of bus route 06 just indicates 15/39 (38.5%) bus stops. There are a lot of other difficulty observed will show here from the observation photos of bus route number 06 in June 13rd and June 14th, 2012

Fig. 7 Rutting, water and dust on road

Fig. 8 Waiting for bus in uncertain weather

Fig. 9 Visibility blocked and illegal parking

Fig. 10 The emission from old bus

There are 63,2 % of road users are students and 6,3 % are factory workers. Therefore, the main

bus user are lower-income and don't have private vehicle people.

The maximum capacity of a bus is 80 passengers. However, according to TRANSERCO, in rush hour, the number of passenger is 1.5 – 2 times higher than the bus capacity. Therefore, the passengers certainly feel crowded and uncomfortable. According to JICA TRAHUD II WG_4 workshop, in comparison with Bangkok, Jakarta, and Yokohama, the bus density of Hanoi is lowest (0.69 buses/km). However, the *"low bus supply provision can be regarded as overstressed rather than efficient system"*. The observation photos in Cau Giay Bus interchange in July 26, 2012 shows the real situation.

Fig. 11 Cau Giay Bus interchange

Fig. 12 Overcrowded at Cau Giay Bus interchange 6 pm July 26, 2012

5. Conclusion/Discussion
5.1 Countermeasures

There are a lot of countermeasures ongoing and in consideration. Apply the push and pull method was suggest in the GTZ SUTP training document "Transportation Demand Management" the Hanoi Department of Transportation are using the following measures to encourage the transition from private vehicle to public transportation

Measures with push-effects
Area-wide parking management, parking space restrictions in zoning ordinances, car limited zones, permanent or time-of-day car bans, congestion management, speed reductions, road pricing...

Measures with pull-effects
Priority for buses and trams, high service frequency, passenger friendly stops and surroundings, more comfort, park-and-ride, bike-and-ride..., area-wide cycle-networks, attractive pedestrian connections...

Measures with push- and pull-effects
Redistribution of carriageway space to provide cycle lanes, broader sidewalks, planting strips, bus lanes..., redistribution of time-cycles at traffic lights in favour of public transport and non-motorized modes, public-awareness-concepts, citizens' participation and marketing, enforcement and penalizing...

Fig. 13 push and pull effects
Source: Müller, P., Schleicher-Jester, F., Schmidt, M.-P. & Topp, H.H. (1992): Konzepte flächenhafter Verkehrsberuhigung in 16 Städten", Grüne Reihe des Fachgebiets Verkehrswesen der Universität Kaiserslautern No. 24.

Push measures

Establishing Parking restriction zone in 262 streets of Hanoi start from February 22ⁿᵈ, 2012

Road pricing and private vehicle usage pricing (proposal)

Pull measure

TRAHUD II - The project for Improving Public Transportation in Hanoi, from December 2011 to June 2014. The project will focus on database development and bus public transport modernization, encouraging modal shift applying TDM and MM, etc.

Increasing bus fare to improve bus quality and accessibility (proposal). According to Hanoi Department of Transportation, if the proposal is approved, TRANSERCO revenue will increase 280 billion VND each year and reduce the subsidy 224.8 billion VND.

Table 4: Proposal of Bus fare increase

Distance	Current fare	Proposal fare	Increase (%)	Increase (VND)
<= 25km	3000	5000	66%	2000
25 – 30km	4000	7000	75%	3000
>30km	5000	7000	40%	2000

Source: TRANSERCO, 2012

Table 5: Proposal of Bus fare increase, monthly ticket

Object		Current fare	Proposal fare	Increase (%)	Increase (VND)
Priority	1 route	25,000	45,000	80%	20,000
	Multiple routes	50,000	90,000	80%	40,000
Normal	1 route	50,000	90,000	80%	40,000
	Multiple routes	80,000	145,000	80%	65,000

Source: TRANSERCO, 2012

Suggest measures

The bus fare in Hanoi is the lowest in comparison with Yokohama, Bangkok and Jakarta and the driver's salary too. Therefore, not only increase bus fare but also change the method of ticketing will improve the bus quality and friendliness.
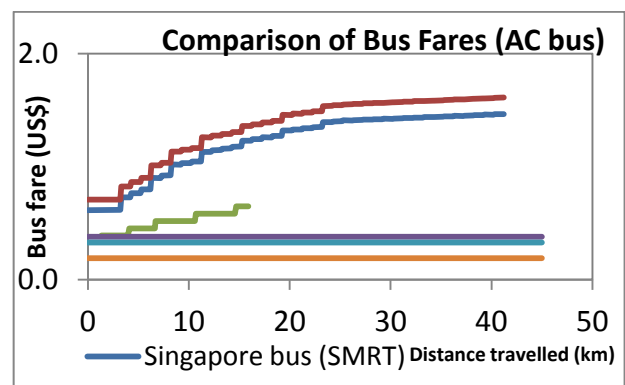

Fig. 14 Comparison of Bus fares
Source: JICA TRAHUD II WG_4 workshop: Comparison of Bus Fares among South-East Asia Countries. May 21, 2012

As can be seen from Fig.14, it is necessary to increase bus fare and change from the constant bus fares to distance-based bus fares as applied in other South East Asia cities.

The automatic ticketing system or Smart card are applied in some route in Hanoi and HoChiMinh City needs to be wide spread and replace the manual ticketing system (issue paper tickets and bus assistant collecting tickets)

5.2 Conclusion

The Urban transportation of Hanoi is complex and need thorough research and study. Once the traffic flow is modeled and simulated precisely, there will be a lot of traffic problems can be solved.

There are still many issues in bus system in Hanoi. As it is improving, many efforts are need and each countermeasure need to be carefully considered to make a better pubic transport system, towards a modern and sustainable transport system

6. Acknowledgement

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